



UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

**Exploring Teacher Readiness to Integrate Information and
Communication Technologies into the Teaching and Learning Process: A
Case Study of Two Gauteng Schools.**

BY

TINIKA NAICKER

(556916)

**A research report submitted to the School of Education, Faculty of
Humanities, University of the Witwatersrand, in partial fulfilment of the
requirements for the degree of Master of Education.**

AUGUST 2017

DECLARATION

I declare that this research report is my own unaided work. It is submitted for the degree of Master of Education at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any other degree or examination to any other University.

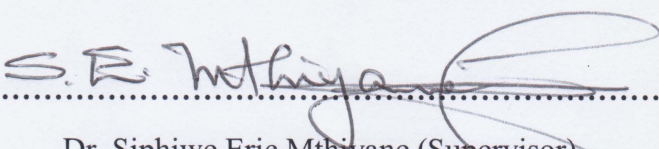
.....

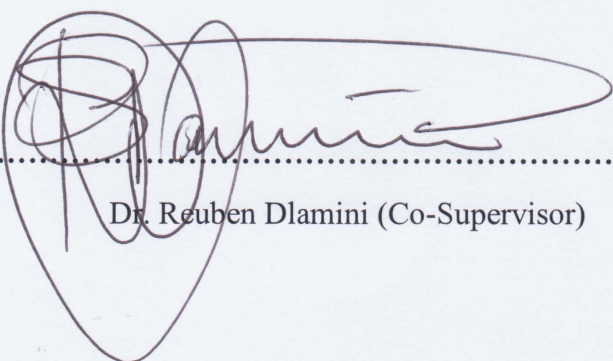
Tinika Naicker

August 2017

SUPERVISORS' STATEMENT

This research report has been submitted with/~~without~~ our approval


.....
Dr. Siphwe Eric Mthiyane (Supervisor)


.....
Dr. Reuben Dlamini (Co-Supervisor)

August 2017

DEDICATION

I dedicate this research study to my beloved parents, Jessy and Lorraine Naicker. You have both been a source of inspiration and a guiding light throughout my life. You have made sacrifices and have dedicated your life to ensuring that your children succeed. Thank you for allowing me to explore my horizons by giving me unbridled opportunity. You have instilled in me the importance of education. Forever shall I remain indebted to you.

ACKNOWLEDGEMENTS

The culmination of my Master's journey is largely attributed to the support received by the following individuals, to whom I am immensely grateful:

To Lorenzo Ephraim, I cannot thank you enough for being so supportive and understanding throughout my research journey. You have always shown interest in my research and have dedicated time to offering me advice, assistance and continuous encouragement. Thank you for helping me to succeed.

My sisters Larissa and Tiasha and brothers-in-law Merlin and Vieolin, you have all been my support system and have encouraged me to persevere and never give up. You have allowed me to rejuvenate when I needed to clear my mind. Thank you for being so understanding when many events were attended by both my computer and I.

To my dearest Meera Pather, you have become my whole world in the short space of two years. You have been my source of motivation and have helped me to remain determined during the completion of my research. Your company, heart-warming smiles, and hugs have constantly fuelled my research journey. I hope that, in turn, I have fuelled your spark to welcome all the knowledge that unravels as you journey into this world.

To all my aunties, uncles, cousins, and friends, thank you for your continuous support and concern throughout my studies. You have motivated me to achieve my goals.

My supervisor Dr Siphwe Mthiyane, you have been a knowledgeable mentor who has offered me guidance, clarity and support. Thank you for your continuous effort throughout this journey. You have offered me useful and insightful feedback. To my co-supervisor, Dr Reuben Dlamini, thank you for your support.

ABSTRACT

The Department of Education (2004) stipulated in the White Paper on e-Education policy document that all teachers (including Gauteng teachers) were to be Information and Communication Technology (ICT) capable by the year 2013. This research study was targeted at exploring how ready the teachers from the researched schools were to integrate ICTs into the teaching and learning process. In exploring teachers' readiness, the study focused upon four areas, namely teachers' ICT knowledge (informed by Mishra and Koehler's (2006) TPACK model), teachers' ICT attitudes (informed by Parasuraman's (2000) TRI), the ICT training received, and the role played by school principals in contributing to teachers' ICT readiness. By exploring these areas information was obtained on how teachers were prepared and whether they were prepared, which gave insight into how ready they were for the ICT integration process. In order to gain the relevant data, ten teachers from two Gauteng schools were interviewed and administered a questionnaire to complete. In addition, the school principal from each school was interviewed. It was found that the majority of the research participants had a positive attitude towards the integration of ICTs into teaching and learning. These teachers also had a good leadership influence, which provided support and conditions that were also essential in facilitating the ICT integration process. However, it was found that the training that majority of the teachers received was not instrumental in providing them with the required ICT knowledge. Consequently, based on these two areas (ICT knowledge and ICT training) serving to be problematic, it is concluded that the teachers at the researched schools were not adequately prepared and thus predominately not ready to integrate ICTs effectively into the teaching and learning process in their schools. The findings of the study, the literature reviewed, and the theoretical foundations central to this study were used to develop a teacher ICT preparation framework. This framework was developed to inform the preparation that teachers receive for the ICT integration process. The framework could contribute to teachers being more ready to integrate ICTs effectively into the teaching and learning process in their schools.

Keywords: ICT Knowledge, ICT Attitude, ICT Training, Role of School Principal, ICT Readiness

TABLE OF CONTENTS

Declaration.....	ii
Supervisors’ statement	iii
DEDICATION.....	iv
ACKNOWLEDGEMENTS	v
Abstract.....	vi
List of Acronymns.....	xi
List of Tables	xii
List of Figures.....	xiii
List of Appendices.....	xiv
Chapter One : Introduction to the Study	1
1.1 Introduction and background	1
1.2 Problem statement	2
1.3 Purpose and rationale for the study	3
1.4 Significance of the study	4
1.5 Aims of the study	5
1.6 Primary research question	6
1.6.1 Sub-research questions	6
1.7 Theoretical foundations.....	6
1.7.1 Technological Pedagogical and Content Knowledge (TPACK) model	6
1.7.2 Parasuraman’s (2000) Technology Readiness Index (TRI)	8
1.8 Delimitations of the study	9
1.9 Outline of the study	9
1.10 Chapter summary	10
Chapter Two : Literature Review and Theoretical Framework	11
2.1 Introduction	11
2.2 The integration of Information and Communication Technologies.....	11
2.3 The affordances of ICTs.....	12
2.4 The role of ICT policy.....	14
2.5 Teachers’ ICT readiness.....	18

2.6 Teachers' ICT knowledge	19
2.7 Teachers' attitudes towards ICT integration	24
2.8 The state of ICT teacher development	27
2.9 The role of school principals in contributing towards teachers' ICT readiness.....	32
2.10 Theoretical framework	34
2.10.1 Understanding the theoretical framework	36
2.10.1.1 ICT attitude	37
2.10.1.2 ICT training and ICT knowledge.....	37
2.10.1.2.1 Baseline assessment	37
2.10.1.2.2 Phase 1.....	37
2.10.1.2.3 Phase 2.....	38
2.10.1.2.4 Phase 3.....	38
2.10.1.2.5 Content focus.....	38
2.10.1.2.6 Teaching subject and phase specific	39
2.10.1.2.7 Teacher input.....	39
2.10.1.2.8 Lecture- and practical-based	39
2.10.1.3 School principal's role	39
2.11 Chapter summary	40
Chapter Three : Research Design and Methodology	41
3.1 Introduction	41
3.2 Research paradigm	41
3.2.1 Epistemology.....	41
3.2.2 Ontology	42
3.2.3 Methodology.....	42
3.3 Research design.....	42
3.4 Research methodology	44
3.5 Research Sampling.....	46
3.6 Data generation methods.....	48
3.6.1 Questionnaires	48
3.6.2 Semi-structured interviews	49
3.7 Pilot phase	50
3.8 Data analysis	51
3.8.1 Interview data analysis	51

3.8.2 Questionnaire data analysis	52
3.9 Trustworthiness of the study	54
3.9.1 Credibility	54
3.9.2 Transferability	55
3.9.3 Dependability	56
3.9.4 Confirmability	57
3.9.5 Authenticity	57
3.10 Ethical issues	58
3.11 Limitations of the study.....	60
3.12 Chapter summary	61
Chapter Four : Data Presentation and Analysis.....	62
4.1 Introduction	62
4.2 Data presentation and analysis	62
4.2.1 Profile of the researched schools	62
4.2.2 Profile of the research participants	63
4.2.3 Teachers' level of ICT knowledge	64
4.2.3.1 Technological Knowledge	64
4.2.3.2 Technological Content Knowledge.....	68
4.2.3.3 Technological Pedagogical Knowledge.....	70
4.2.3.4 Analysis of data presented	73
4.2.4 Teachers' attitudes towards ICT integration into the teaching and learning process	79
4.2.4.1 Analysis of data presented	86
4.2.5 The type of training that teachers attended to acquire the requisite ICT knowledge	90
4.2.5.1 Analysis of data presented	96
4.2.6 The role of school principals in contributing towards teachers' ICT readiness	100
4.2.6.1 Analysis of data presented	104
4.3 Chapter summary	107
Chapter Five : Study Summary, Conclusions, Recommendations and Implications for further research	108
5.1 Introduction	108
5.2 Study summary.....	108

5.3 Conclusions	109
5.3.1 Teachers' level of ICT knowledge	109
5.3.2 Teachers' attitudes towards ICT integration	110
5.3.3 Teacher ICT training	111
5.3.4 The role of school principals in ICT integration	111
5.3.5 Teachers' ICT readiness	112
5.4 Recommendations	113
5.4.1 Recommendation One	113
5.4.2 Recommendation Two.....	115
5.4.3 Recommendation Three.....	116
5.4.4 Recommendation Four	117
5.5 Implications for further study.....	118
5.5.1 Implication for policymakers.....	118
5.5.2 Implication for district offices	119
5.5.3 Implication for school principals.....	120
5.5.4 Implication for teachers.....	120
5.5.5 Implications of the study	120
5.6 Overall summary of the study	126
5.7 Chapter summary	1266
References.....	127

LIST OF ACRONYMNS

CK- Content Knowledge

DoE- Department of Education

ICT- Information and Communication Technology

ICTs- Information and Communication Technologies

PCK- Pedagogical Content Knowledge

PK- Pedagogical Knowledge

TCK- Technological Content Knowledge

TK- Technological Knowledge

TPACK- Technological Pedagogical and Content Knowledge

TPK- Technological Pedagogical Knowledge

TRI- Technology Readiness Index

LIST OF TABLES

Table 1: Profile of the researched schools	63
Table 2: Profile of the research participants	63
Table 3: Technological Knowledge Frequency Distribution.....	67
Table 4: Technological Content Knowledge Frequency Distribution	70
Table 5: Technological Pedagogical Knowledge Frequency Distribution	73
Table 6: Optimism Frequency Distribution	82
Table 7: Innovativeness Frequency Distribution	83
Table 8: Discomfort Frequency Distribution.....	84
Table 9: Insecurity Frequency Distribution	85
Table 10: Overall Summary of the Study.....	122

LIST OF FIGURES

Figure 1: Mishra and Koehler's (2006) Technological Pedagogical Content Knowledge (TPACK) model	7
Figure 2: Theoretical framework adapted from Mishra and Koehler's (2006) TPACK model and Parasuraman's (2000) Technology Readiness Index (TRI).....	36

LIST OF APPENDICES

Appendix A: Questionnaire	137
Appendix B: Teacher interview schedule	143
Appendix C: Principal interview schedule	145
Appendix D: Cronbach's Alpha measurement	147
Appendix E: University of the Witwatersrand ethical clearance	150
Appendix F: Gauteng Department of Education approval letter	151
Appendix G: Information sheet and letter for permission from principals.....	153
Appendix H: Information sheet and letter for permission from Teachers	157
Appendix I: TURNITIN plagiarism report.....	153

CHAPTER ONE

INTRODUCTION TO THE STUDY

1.1 Introduction and background

It has become a truism that we live in a digital age and that large proportions of the world operate most aspects of their lives through various forms of Information and Communication Technologies (ICTs) (Kumar, Rose, & D'Silva, 2008). ICTs refers to the networks, hardware and software of a technological device, which is also a means of communicating, collaborating, engaging, teaching, learning and researching to create and share information and knowledge (Carbová & Betáková, 2013; Department of Education, 2004). The integration of ICTs into schools worldwide is rapidly increasing (Clark & Luckin, 2013; Sackstein, 2014), with South Africa being no exception. The implementation of ICTs into education is a fast-growing trend and has been identified as a priority area (Howie & Blignaut, 2009), which highlights the need to explore its integration in greater detail.

The White Paper on e-Education, a policy document established by the Department of Education (DoE) to explain their response and plan regarding the introduction of ICTs into schools, has identified ICTs as a priority area (Department of Education, 2004). According to the National Development Plan, one of the major reasons for the introduction of ICTs into education is the belief that ICTs will bring about great advancements and improvements for education (National Planning Commission, 2011). One of the policy goals stipulated in the White Paper is that all teachers were to be ICT competent by 2013 (Department of Education, 2004). ICTs are thought to enhance the teaching and learning process (Department of Education, 2004; Summak, Bağlıbel, & Samancıoğlu, 2010); however, Summak et al. (2010) state that being able to integrate ICTs successfully to enhance teaching and learning is an intricate process. This implies that integrating ICTs is not a one-step process, but entails various dimensions.

Teachers are considered one of the primary enabling executors of ICT integration and play a crucial role in its success or failure (Aremu & Adediran, 2011; Hlatshwayo, 2005; Kumar et al., 2008; Summak et al., 2010). Therefore, it is vital that teachers are prepared and ultimately ready to integrate ICTs into the teaching and learning process effectively. This is so as to enhance teaching and learning in their classrooms. Teacher 'readiness' for ICT integration

relates to the necessary knowledge required in order to use ICTs effectively, as well as the attitude an individual has towards the use of ICTs (Aremu & Adediran, 2011; Department of Education, 2004; Kumar et al., 2008). ICTs are considered to be effectively integrated and used when teachers have the necessary ICT knowledge, and when they value and have a positive attitude towards ICT integration. Based on this understanding of teacher readiness, and with a specific interest in the South African educational climate, this research study adopted a case study approach to explore whether teachers from two Gauteng schools were ready to integrate ICTs into the teaching and learning process.

1.2 Problem statement

Teachers have vastly different personal experiences with ICTs, and consequently have different aptitudes and attitudes, which play a role in how they embrace and integrate technology in their teaching (Ertmer & Ottenbreit-Leftwich, 2010; Inan & Lowther, 2010). If teachers fail to embrace technology in their teaching, learners and teachers will not benefit from the enhancements in teaching and learning that ICTs may afford, nor will they be introduced to new teaching and learning opportunities. In addition to this, teachers and learners may be deprived of essential technological preparation required to function in the 21st century (Department of Education, 2004). Teachers should thus be encouraged and prepared to embrace technology use. In this study, an ICT teacher preparation framework was developed to provide insights regarding how teachers should be prepared.

The Department of Education (2004) maintains that efforts have been made to prepare the majority of teachers by providing them with training to acquire ICT knowledge. This preparation was aimed at enabling teachers to integrate ICT devices into their teaching. The challenge appears to be that teachers receive and complete training, which is often once-off, and then revert to traditional teaching approaches which can be considered largely passive and teacher-centred (Hlatshwayo, 2005; Kumar et al., 2008). This can be attributed to insufficient ICT training received, lack of continuous support and specialised technological knowledge required in the process of integrating ICTs into their classrooms.

Teachers' reliance on traditional teaching approaches could be a factor hindering the Department of Education's effort to integrate ICTs into schools. To help teachers successfully use ICTs and avoid reverting to traditional teaching approaches, Mishra and Koehler (2006) present the Technological Pedagogical and Content Knowledge (TPACK)

model. The key theoretical underpinning of the TPACK model, which is explored in more detail later in this chapter, is that teachers require and should develop different types of knowledge. This is considered essential to capacitating them to implement ICTs as instruments to enhance teaching and learning. Many teachers, particularly in-service teachers, may have content knowledge (knowledge relating to their teaching subject) and pedagogical knowledge (knowledge relating to methods of teaching and learning). The concern is that many teachers may not necessarily have the necessary ICT knowledge (knowledge relating to how to operate technology) and, most significantly, knowledge on how to combine their knowledge of technology with their content and pedagogical knowledge (Ertmer & Ottenbreit-Leftwich, 2010). In other words, teachers may not necessarily know how to use ICTs as instruments that can enhance their content knowledge and pedagogical knowledge, ultimately enhancing teaching and learning. This study explored whether teachers have knowledge gaps relating to how to use ICTs successfully as instruments that can enhance teaching and learning.

Not knowing how to integrate ICTs effectively can lead to teachers developing negative attitudes towards technology integration. This may result from them not being aware of how ICT devices may represent and enhance subject content; allow teaching and learning to occur at any time and space; enable easy storing and sharing of information; or allow for more collaborative, interactive and personalised teaching and learning; among many other potential benefits of using ICTs in the classroom (Clark & Luckin, 2013). The negative attitudes of teachers may lead to teachers' becoming frustrated at the idea of integrating ICTs in their classrooms. All of the aforementioned challenges may be considered a key barrier to teacher readiness and successful technology integration (Carbová & Betáková, 2013; Hlatshwayo, 2005; Howie & Blignaut, 2009) and may be an attributing factor to why some teachers seem to be resorting to their traditional teaching methods. The White Paper on e-Education stipulated a policy goal of achieving ICT competency in all teachers by 2013, yet in reality many Gauteng teachers do not seem sufficiently prepared for ICT adoption. This makes this study, which explored these challenges in greater depth, especially necessary.

1.3 Purpose and rationale for the study

Exploring teachers' ICT readiness is due to a personal interest in the integration of ICTs into the education system, which emerged from visiting schools and finding many teachers reluctant to use ICTs to improve teaching and learning in their classrooms. Many teachers

consider having the necessary knowledge, confidence, and attitude as enough to encourage and enable them to integrate ICTs into their classrooms meaningfully (Ertmer & Ottenbreit-Leftwich, 2010). Therefore, it is necessary to determine which factors related to equipping teachers with the required ICT knowledge, and attitude are vital to their readiness. These factors include the ICT training approaches offered to teachers and the role played by school principals in contributing to teachers' ICT readiness, which form part of the areas that this research analysed. Exploring these factors are necessary in a context where the literature (Aremu & Adediran, 2011; Hlatshwayo, 2005; Howie & Blignaut, 2009; Inan & Lowther, 2010; Summak et al., 2010) suggests that many teachers do not feel ready to integrate ICTs.

1.4 Significance of the study

In South Africa, and particularly in relation to Gauteng's ICT integration process, the Department of Education's (2004) White Paper on e-Education policy document contained a defined implementation plan. Within this plan were various phases that set out a programme of action and specific deadlines for their completion. These phases were to take place over a nine-year period, from 2004–2013. In the final year, 2013, one of the major policy goals was that ICTs were to be incorporated into the teaching and learning process by all schools, and that all teachers were to be ICT-capable (Department of Education, 2004).

A previous study conducted by Hlatshwayo in 2005, explored whether teachers from Gauteng were ICT capable. The researcher views Hlatshwayo's (2005) study as being prematurely conducted as the policy in question had been introduced only a year before. Consequently, it could be expected that the selected teachers were not ICT-capable, as the findings suggested. The policy stipulates that the Department of Education (2004) had until 2013 to prepare for the integration of ICTs into the teaching and learning process, and any policy implementation needs to be given sufficient time before its effectiveness is fairly evaluated. This furthers the relevance of this study because it explored the developments since the policy was introduced in 2004. As the phrase goes, *one swallow does not make a summer* and we cannot rely on a single study to evaluate the degree to which the Department of Education's (2004) policies had or have been successfully implemented. This study therefore contributed more insight into whether teachers from the researched schools were in fact ICT-capable and ready to integrate ICTs into their teaching and learning process.

There is currently a scarcity of research, even in Gauteng, exploring teachers' readiness to integrate ICTs into teaching and learning. As such, the present research study can offer significant and valuable insight to the research area relating to the integration of ICTs into schools. The study was significant as it targeted and examined the ICT readiness of teachers from the researched schools, situated in the Gauteng province, in relation to four areas. The first was an analysis of teachers' ICT knowledge; the second was exploring teacher's attitudes towards ICT; the third was identifying the training provided and/or received; and the fourth was examining the role played by the school principal in ensuring teachers' ICT readiness. These areas are not widely explored in relation to teachers' ICT readiness and this research aimed to contribute to this gap in current literature.

The significance of this study was that it was largely informed by Mishra and Koehler's (2006) TPACK model, which is useful as it lays out the specialised types of knowledge that teachers need. In addition, it adopted Parasuraman's (2000) Technology Readiness Index (TRI) to provide insight into teachers' attitudes towards technology use. This research study considered that ICT training programmes and the role of the school principal should be centred on equipping teachers with specialised types of knowledge, and ensuring that teachers have a positive attitude towards ICT use. If teachers have the required ICT knowledge and a positive attitude this could contribute towards an effective ICT integration process.

The knowledge gained from this study has the potential to inform stakeholders involved in ensuring teacher ICT readiness. These stakeholders can be informed regarding which efforts and training interventions have been effective or ineffective. Exploring the role of the school principal is also significant. At a school level, insight can be gained regarding the influence that school leadership has and how school leadership can help move towards more effective achievement of set goals, particularly related to ICTs at a national, departmental, and school level.

1.5 Aims of the study

The aim of this study was to explore teachers' readiness to integrate ICTs into the teaching and learning process. The intention was to explore teachers' ICT readiness in relation to the required ICT knowledge, teachers' ICT attitudes, the ICT training received and the role played by the school principal. By exploring these areas, the overall aim was to provide

understanding with regards to more effective approaches to preparing, training, and supporting teachers. Moreover, informed by the literature reviewed and the findings gained by conducting this study, an ICT preparation framework was developed, aimed at creating an enabling ICT teacher development environment.

1.6 Primary research question

Given the aims set out above in conducting this study, the following key research question underpinned the study: *How ready are the teachers in the two researched schools to integrate ICTs into the teaching and learning process?*

In addition to this, and to assist in answering the primary research question, four sub-research questions were developed, as follows:

1.6.1 Sub-research questions

1. What are teachers' level of Technological Knowledge, Technological Content Knowledge and Technological Pedagogical Knowledge?
2. What are teachers' attitudes towards ICT integration into the teaching and learning process?
3. What type of training have in-service teachers received to acquire the requisite ICT knowledge necessary to integrate ICTs into teaching and learning?
4. What role have the school principals played in contributing towards teachers' ICT readiness?

1.7 Theoretical foundations

In order to explore teachers' readiness to integrate ICTs into the teaching and learning process at two Gauteng schools, this research study was informed by two key theoretical dimensions. These dimensions are Mishra and Koehler's (2006) Technological Pedagogical and Content Knowledge (TPACK) model and Parasuraman's (2000) Technology Readiness Index (TRI), which are explored in more detail in the sections that follow.

1.7.1 Technological Pedagogical and Content Knowledge (TPACK) model

The Technological Pedagogical Content Knowledge (TPACK) model proposed by Mishra and Koehler (2006) encapsulates a key argument proposed by this research study: that teachers require specialised types of knowledge to integrate ICTs effectively in the

classroom. In exploring the problem statement, it is apparent that there is a knowledge gap among teachers that needs further examination.

In order to target this knowledge gap, the TPACK model proposes that teachers need Content Knowledge (knowledge regarding the subject that they teach), Pedagogical Knowledge (knowledge regarding methods of teaching and learning), and Technological Knowledge (knowledge regarding how to operate technology) as the base forms of knowledge needed to integrate ICTs into teaching and learning. The interaction of these three bodies of knowledge results in additional forms of knowledge, namely Pedagogical Content Knowledge (knowledge regarding how to teach subject content so as to enhance learning and in relation to a unique teaching and learning context), Technological Content Knowledge (knowledge regarding how to use technology to teach subject content), and Technological Pedagogical Knowledge (knowledge regarding how to implement technology to enhance methods of teaching and learning) (Koehler, Mishra, & Cain, 2013; Koehler, Mishra, Kereluik, Shin, & Graham, 2014). When all of these knowledge forms are integrated with each other, the result is Technological Pedagogical Content Knowledge (TPACK), which is the main underpinning of the TPACK model. Figure 1 below shows the TPACK model and its various interrelations between the knowledge types.

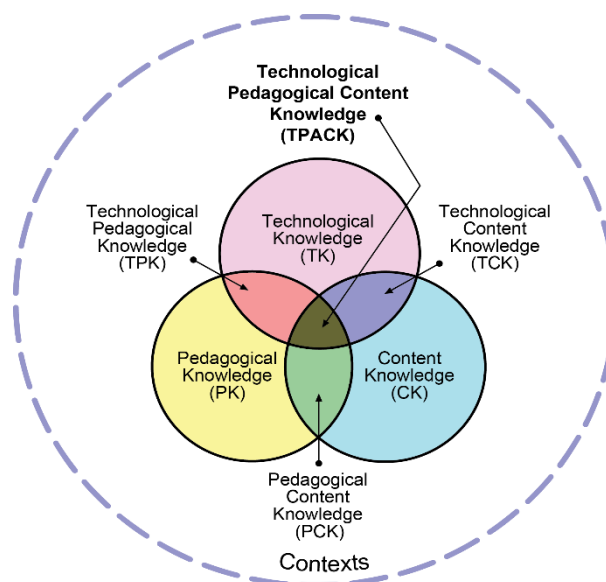


Figure 1: Mishra and Koehler's (2006) Technological Pedagogical Content Knowledge (TPACK) model

TPACK entails skilled and effective teaching with ICTs, by knowing how to present subject content and concepts using ICTs, adopting pedagogical methods that use ICTs for effective teaching and learning, knowing how ICTs can facilitate clarification of learner misunderstanding, knowing how ICTs can build on learners' prior knowledge to build new knowledge, and knowing how to use ICTs in different teaching and learning contexts (Koehler et al., 2013; Koehler et al., 2014). This research study focused on developing teachers' ICT knowledge, and consequently an assumption was made that in-service teachers have adequate levels of Content Knowledge, Pedagogical Knowledge and Pedagogical Content Knowledge. The TPACK model was used to explore teachers' level of ICT knowledge by focusing on their Technological Knowledge (TK), Technological Content Knowledge (TCK) and Technological Pedagogical Knowledge (TPK). The researcher considered that capacitating teachers with these knowledge forms (TK, TCK and TPK) is essential to integrating ICTs into teaching and learning effectively and should be the key focus of ICT training courseware and initiatives.

1.7.2 Parasuraman's (2000) Technology Readiness Index (TRI)

The second theoretical dimension that was adopted for this study is Parasuraman's (2000) Technology Readiness Index (TRI). The TRI recognises four different dimensions of an individual's attitude towards ICT use, which are either influencers or inhibitors of their ICT readiness. Level one (optimism) and level two (innovativeness) are considered influencers of technology readiness. Level three (discomfort) and level four (insecurity) are considered inhibitors of technology readiness (Parasuraman, 2000). The first dimension is optimism, which entails having a positive view of technology and a belief that technology offers individuals greater control, flexibility and effectiveness. The second dimension is innovativeness, which entails an inclination towards being a technology innovator and leader. The third level is discomfort, which entails a recognised lack of control over technology and a sense of being overwhelmed by it. The last level is insecurity, which entails an individual distrusting technology and being sceptical about the reliability of the devices. This research study adopted the TRI in order to identify the dimension (optimism, innovativeness, discomfort, or insecurity) with which teachers related. In doing so, insights were gained regarding what teachers' attitudes towards ICT integration were, and whether this influenced or inhibited their ICT readiness and integration in the classroom. The two theoretical foundations discussed, TPACK and TRI, played a vital role in answering the research

questions of this study and were fundamental in the establishment of the theoretical framework that informed this study, which is discussed in Chapter Two.

1.8 Delimitations of the study

Delimitations refer to certain elements that restrict the scope and specify the boundaries of a research study (Simon, 2011). This research study was a small-scale study and was limited to just two schools (one primary and one high school). While the suggested findings and recommendations offer useful insights, they are not generalisable beyond the researched schools and selected participants.

1.9 Outline of the study

An outline of the study and structure of the manuscript is given below:

Chapter One: Introduction to the Study. This introductory chapter explored various components such as: an introduction to the study, the research problem, the purpose and rationale, the significance of the study, the aim, the critical research questions, the theoretical foundations, the delimitations, and an outline of the study. Discussing these components were aimed at introducing the research study.

Chapter Two: Literature Review and THEORETICAL Framework. In this chapter, existing literature relating to the research focus is reviewed and explored, including international, continental, and national literature. In the next half of this chapter the theoretical framework that underpinned and informed this research study is discussed.

Chapter Three: Research Design and Methodology. In this chapter the research paradigm, design, and methodology are discussed, along with the selected participants, data generation, and data analysis methods. In addition, issues of trustworthiness and ethical considerations are explored.

Chapter Four: Data Presentation and Analysis. In this chapter the generated data is presented and analysed. This was with the purpose of obtaining evidence and insight in order to answer the main research question.

Chapter Five: Study Summary, Conclusions, Recommendations and Implications for Further Research. In this chapter, the presented and analysed data from the previous chapter was used to summarise key findings, draw conclusions, present recommendations and identify implications of the study.

1.10 Chapter summary

The first chapter focused on introducing the research study. The overall background, intention, direction, reasoning, and structure of the study were explored. In the next chapter, existing literature relating to the research area is reviewed and the study is situated within the reviewed body of literature. In addition, the theoretical framework that informed this study is introduced.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

The previous chapter introduced the study, which was focused on exploring teacher readiness to integrate ICTs into the teaching and learning process at two Gauteng schools. In this chapter, current literature relevant to the research study is explored. The literature explored speaks directly to certain themes that play a significant role in understanding teacher readiness to integrate ICTs into teaching and learning in more depth. These thematic areas include: the integration of ICTs, the role of an ICT policy, the affordances of ICTs, teacher ICT readiness, teacher ICT knowledge, teacher attitude towards ICT integration, teacher ICT training, and the role of school principals in contributing towards teachers' ICT readiness. In exploring these themes, reference is made to existing literature from three main perspectives, being international, continental, and national literature. Exploring such literature will provide insights into the status of teachers' ICT readiness on the international, continental, and national stage, with particular reference to the Gauteng province. Once these themes are explored, the next section of this chapter introduces the theoretical framework that informed this research study. The theoretical framework was fundamental in providing insight into exploring the research problem and questions that underpinned this study. In order to understand teachers' ICT readiness, it is useful first to explore what is entailed by integrating ICTs into the classroom. The first section of the literature review focuses on the integration of ICTs in relation to what is meant by the term ICT integration. Next, reasons for the push to adopt and integrate ICTs into schools are explored.

2.2 The integration of Information and Communication Technologies

Integrating ICTs into teaching and learning is also known as electronic learning or e-learning (Ouma, Awuor, & Kyambo, 2013). ICT integration entails using old and new technological devices, in relation to their hardware, software and various applications to support teaching and learning through electronic means (Carbová & Betáková, 2013; Department of Education, 2004; Ouma et al., 2013). Technological devices that have been widely integrated as teaching and learning tools, and that have been explored and recognised across the literature include multimedia projectors (Mengtao, 2001), computers/laptops (Fried, 2008; Hermans, Tondeur, van Braak, & Valcke, 2008), mobile phones (Thornton & Houser, 2004;

Yerushalmy & Ben-Zaken, 2004), smartboards (Gursul & Tozmaz, 2010; Preston & Mowbray, 2008) and tablet technology (Neumann, 2014; Rafiki, 2015), among many others. It is evident that there are a variety of old and new technological devices that can be integrated, which implies that relevant stakeholders such as teachers and learners would need to be continuously exposed to technological advancements and trends. This research intended to explore teachers' overall readiness to integrate ICTs (old and new) into their classroom.

There are various reasons why teachers should be ready to integrate ICTs into the teaching and learning process. A possible and major reason for the shift towards ICT integration is that among the literature there is large recognition internationally (Badri, Mohaidat, & Rashedi, 2013; Isaacs, Vosloo & West, 2012; Shaffer, Nash, & Ruis, 2015; Summak et al., 2010), continentally (Farrell & Isaacs, 2007) and nationally (Department of Education, 2004; Department of Education, 2010) that ICTs have huge potential for education as a whole. The potential offered by ICTs is mainly highlighted in relation to three key areas: the ability of ICTs to decrease the digital divide between teachers, learners, and schools (Department of Education, 2007; Department of Education, 2010; Farrell & Isaacs, 2007); improve management and administration tasks (Department of Education, 2010; Isaacs et al., 2012); and enhance the quality of teaching and learning (Department of Education, 2004; Department of Education, 2007; Department of Education, 2010; Isaacs et al., 2012; SchoolNet SA, 2015; Shaffer et al., 2015; Summak et al., 2010). It can be said that the potential benefits offered by ICTs are far-reaching, as they have the ability to improve various dimensions of the educational system. It would follow that schools should take advantage of the benefits offered by ICTs and should consequently ensure that ICTs are integrated effectively. Specifically, in relation to being able to enhance teaching and learning, it is evident that this is widely recognised across the literature. The ability of ICTs to enhance teaching and learning can be understood in relation to exploring the potential affordances that ICTs offer teachers and learners, which are explored in greater depth to show why ICT integration is a trend worth following.

2.3 The affordances of ICTs

There are various perceptions regarding the definition and explanation of the concept affordances (John & Sutherland, 2005), which was originated by Gibson (1986). The concept of affordances became relevant to the practice of integrating ICTs into education, specifically in relation to Gibson's (1986) understanding of the term as entailing the potential

opportunities and limitations of ICTs, which could influence a teacher's pedagogy (method of teaching and learning) (Hammond, 2010). Conole and Dyke (2004) argue that having an understanding of the various affordances of ICTs can provide insight, which can help teachers make informed decisions regarding which ICT device to use and how to implement the device in ways that support teaching and learning. Essentially, it can be said that the fundamental principle is that ICTs should not simply be integrated arbitrarily, but that the integration process should be informed by preparation, support, and specialised knowledge in order to ensure effective use of ICTs. Some of the affordances that can be exploited by teachers are explored in the sections that follow.

Accessibility is considered an affordance of ICTs (Conole & Dyke, 2004; Department of Education, 2010). The opportunity of this affordance is that by using ICTs, teachers and learners may have easier access and different means of accessing continuously growing stores of information. This means that learners would easily be able to access different representations of difficult subject content in order to enhance their understanding. Easier and different means of accessing information can also allow teaching and learning to occur at any time and space, and not be confined to the classroom, which relates to the next affordance, flexibility (Clark & Luckin, 2013; Department of Education, 2007; Laurillard, 2007). However, the limitation of these two affordances can be that flexibility and easier access to information may lead to an overload of information, which requires information to be critically evaluated, quality assured and selected appropriately by teachers and learners (Conole & Dyke, 2004). The implication is that if teachers are to implement ICTs into the classroom, they would need to know how to ensure that ICTs do not hamper the teaching of their subject content, but rather serves to enhance specified teaching content in accordance with curriculum goals.

Another affordance is communication and collaboration, which makes it possible for teachers and learners to communicate, engage and share information in new and quicker ways than before, which may result in enriched learning and teaching (Conole & Dyke, 2004, Melhuish & Falloon, 2010). This new way of sharing information and communicating can allow teachers and learners to refer back constantly to shared information, knowledge and data, which can be used to clarify misunderstandings and improve practice. In addition, another affordance of ICTs is that they allow for individualised experiences, where ICTs can be suited to cater to personal needs and preferences (Conole & Dyke, 2004; Melhuish &

Falloon, 2010; Hu, 2011; Shaffer et al., 2015). The opportunity of this affordance is that ICTs make it possible for learners and teachers to engage in more individualised paths and forms of learning and teaching (Conole & Dyke, 2004). However, the implication is that teachers and learners may need the necessary skills and knowledge to explore, as well as ensure that alternative forms of learning and teaching are indeed effective. Exploring some of the affordances of ICTs was only briefly touched upon and should be a research area that is given more attention and larger weight.

It can be seen that the potential affordances offered by ICTs are plenty and bring to light the benefits that ICTs can have for teaching and learning. However, it is considered that in practice not much is understood by teachers regarding how the affordances of ICTs can be exploited in their classroom, which could hamper the effective use of ICTs (Conole & Dyke, 2004). This stresses the importance of exploring teachers' level of knowledge relating to ICT use, specifically with regards to whether they are aware of the pedagogical affordances of ICTs and know how to use ICT devices effectively – the very issue that this research aimed to explore. Knowing this information can help inform teacher ICT training, enabling specific areas of ICT knowledge to be targeted and developed among teachers. In this complex process of preparing teachers, having policies and plans in place is useful to direct and inform the ICT implementation process. The role of ICT policy is explored in the next section.

2.4 The role of ICT policy

The literature reviewed recognises the usefulness of having ICT plans and policies in place (see Farrell & Isaacs, 2007; Mndzebele, 2013; Shaffer et al., 2015). ICT policy plays a significant role and acts as an impetus for the development of ICT in a country and within the educational environment. Consequently, the literature shows that ICT policies and plans are formulated and implemented at an international (Kumar et al., 2008), continental (Aremu & Adediran, 2011; Farrell & Isaacs, 2007) and national level (Department of Education, 2004; Howie & Blignaut, 2009). Looking specifically at Farrell and Isaacs' (2007) study, which was a summary report informed by 53 African country questionnaires, it was found that 48 of the participating countries had national ICT policies in place or were involved in establishing one. It was also found that 39 of these countries had education sector ICT policies and strategies in place or were involved in establishing one. This implies that ICT integration and development is a priority area for African countries and that efforts are being made to make both countries and schools ready for the integration process.

Knowing that ICT policies are in place can raise questions regarding what the role of policy is and how it influences the ICT integration process. It is considered that one of the central purposes of national policy is to provide a deliberate, thought-out roadmap that aims to provide guidance to address a particular public concern or goal (Torjman, 2005). Essentially, policies are considered to entail a desired objective with various targets to be met, a pathway to achieve the objective, and an approach to measure achievement of the stated objective (Torjman, 2005). It can be said that policies offer direction and Tondeur, Van Keer, van Braak, and Valcke (2008) found that, specifically in relation to the targeted goal of implementing ICTs into schools, an ICT-related policy has a large impact on the use of ICTs in teaching and learning. The finding by Tondeur et al. (2008) implies that ICT policy plays a significant role in ensuring that the necessary conditions are in place, which in turn can influence the extent to which teachers use ICTs in their classroom. Understanding the role of policy in ICT integration is explored in more detail by discussing the ICT policy landscape in South Africa.

The White Paper on e-Education developed by the Department of Education (2004) can be considered a major policy targeted at the ICT integration process in South African schools (including those in Gauteng). Particular focus was placed on how the White Paper on e-Education policy (Department of Education, 2004) speaks to and promotes the integration of ICTs and teacher ICT readiness. Within this policy document there were three main phases of implementation. Phase One, titled “Enhance system-wide and institutional readiness to use ICTs for learning, teaching and administration” (Department of Education, 2004, p. 39), among other things, focused largely on providing schools with access to technological devices, developing a framework for teacher ICT development and ensuring that teachers and managers had access to basic ICT training. This training was to focus on how to operate an ICT device, how to integrate it into teaching and learning and how to solve technical problems. These were some of the measures that were to take place in Phase One, which was to commence in 2004 and be achieved by the end of 2007 (Department of Education, 2004). It can be said that Phase One was targeted at providing a foundation for teacher ICT competencies, through ensuring that the necessary conditions, such as access to ICTs and the provision of training, were in place.

Phase Two, titled “System-wide integration of ICTs into teaching and learning”, focused largely on teachers’ integration of ICTs into the curriculum (Department of Education, 2004,

p. 40). In this phase, it was expected that 50% of teachers would have received training on the basic integration of ICTs into the teaching and learning process. In addition, it was expected that teachers would be given opportunities to attend technical support training on ICTs, and that all schools would have a teacher serving the role of a digital champion, who would facilitate the use of ICTs into their schools. Phase Two was to start in 2007 and be achieved at the end of 2010 (Department of Education, 2004). It is evident that Phase Two was targeted at ensuring that a majority of teachers would by 2010 have adequate knowledge to enable them to integrate ICTs into their classrooms. In addition, Phase Two also focused on ensuring that efforts were made at a school level, through having a staff member dedicated to contributing towards teachers' ICT readiness. Phase Two suggests that schools were also expected to play an instrumental role in preparing teachers and equipping them with the competencies needed to integrate ICTs.

The final phase was titled "ICTs integrated at all levels of the education system-management, teaching, learning and administration" (Department of Education, 2004, p. 41). In this phase, it was expected that all teachers would be ICT capable, and that all schools would have integrated ICTs into the teaching and learning process. Phase Three was to begin in 2010 and be achieved at the end of 2013. The targets set in Phase Three imply that the first and second phase were practical and achievable stepping stones that would eventually ensure that all schools and teachers would be sufficiently prepared for the ICT integration process. Essentially, Phase Three was the culmination of all efforts directed at system-wide ICT integration, in order to achieve the key vision of ensuring that all schools and teachers (including those in Gauteng) were ICT ready. By exploring the White Paper on e-Education policy document, it can be seen that through the stated use of resources, the outline of expectations and various targets to be met and the strategies laid out, policy plays a significant role in moving towards stated objectives, especially that of successfully integrating ICTs into schools and ensuring teacher readiness to do so.

It has been identified that policy does help in moving towards the achievement of stated objectives. However, despite Tondeur et al.'s (2008) finding that ICT related policy has a large influence on the use of ICTs in the classroom, it was also found that ICT policies are underdeveloped and underused. This raises huge concern, especially because it was also found that policy goals are not always achieved. For example, Aremu and Adediran's (2011) study particularly targeted Nigeria's ICT policy, and explored the policy goal stating that

Nigeria was to be an ICT-capable country by 2005. However, it was found that five years after this stipulated target, ICTs were still not adequately integrated into the teaching and learning process in the majority of Nigerian schools. In addition, another area of concern is that there is not always commitment to the ICT integration process, as shown in Howie and Blignaut's (2009) study. Howie and Blignaut (2009) found that only two of the nine South African provinces, which included Gauteng, were committed to the ICT integration process. Commitment was shown by these provinces having the applicable policies and plans in place to move towards this process. These studies suggest that the uptake and implementation of ICTs, as well as the achievement of ICT policy goals, is not always a clear-cut process.

Having policies that are underused and underdeveloped, not achieving stated policy goals, and not being committed to the ICT integration process can highlight the need for policy analysis. Policy analysis entails a systematic evaluation of a policy or policies (Walker, 2000), which would allow a critical review to ensure that the implementation process speaks to the real needs of schools and is feasible and effective (Mndzebele, 2013). It is considered that policies should be explored and evaluated in relation to whether they are or were successful or unsuccessful in achieving their intentions and goals (Walsh, 2006). Policy failure can be explained as an existing policy that fails to achieve its stated objectives (McConnell, 2010; Mantino, 2013; Walsh, 2006) in relation to various aspects such as spending inefficiencies (Mantino, 2013), resources not being used effectively (McConnell, 2010), or taking a longer time to achieve objectives (McConnell, 2010). In contrast, policy success is considered as a policy that achieves its stated objectives (McConnell, 2010) in relation to aspects such as engaging relevant stakeholders and using their input to inform the implementation process, having an implementation process that is in check with stated objectives, and creating benefits for the target group (McConnell, 2010). Reviewing a policy implies that there are various component parts of a policy that determine its success or failure, such as the manner in which resources are/were used, time management, and the extent to which goals were achieved, among others.

Policy success can be evident in some policy dimensions and policy failure can be evident in other dimensions [within the same policy] (McConnell, 2010). The argument presented by Walsh (2006) is that policy failure should create pressure and lead to change on the basis of understanding past policy failures. Three vital steps form part of policy analysis. The first involves identifying the policy problem, which focuses on aspects such as identifying what

constraints were evident and which stakeholders will be affected. The second step is identifying the goals of the new policy, which are to be targeted at solving the initial policy problem. The third step is identifying a criterion which will be able to measure the costs required to carry out a policy and the degree to which the new policy achieves stated objectives (Walker, 2000). This would mean that change can entail replacing policies that were unsuccessful, modifying existing policies, or using alternative policies that will most likely achieve stated objectives. In addition, it would require policymakers to relook the “probable effectiveness, potential cost, resources required for implementation, political context and community support” (Torjman, 2005, p. 4), which are considered integral factors to successful policy implementation and achievement of stated objectives. Change on the basis of failure is considered essential as government is considered accountable and should make an effort to overcome criticism by society and maintain political influence (Walsh, 2006). Consequently, it can be said that the Department of Education has huge responsibility in ensuring that the necessary conditions are in place, which include capacitating the relevant stakeholders, providing resources, and ensuring that deadlines and expectations are met.

In addition, simply developing ICT policies does not guarantee that they will be implemented effectively or yield the desired results. Instead, the management, maintenance and implementation process is largely dependent on the support received. The literature highlights support in terms of government action (Department of Education, 2010; Farrell & Isaacs, 2007) and government commitment to the ICT drive in schools (Farrell & Isaacs, 2007). In addition to support, in order to implement ICT policies and plans successfully, it is considered vital that key stakeholders such as national, provincial and district officials, as well as school principals and teachers among other relevant stakeholders are ready for the integration process. The focus of the section that follows turns to teachers’ ICT readiness.

2.5 Teachers’ ICT readiness

In this section, specific focus is placed on teachers, who have a primary role to play and are key to the success or failure of the integration of ICTs (Kumar et al., 2008). In order to ensure effective integration, teacher ICT readiness is crucial.

In order to understand teachers’ level of ICT readiness, it is important first to understand what the term ICT readiness means. The concept ICT readiness has been explored by various studies conducted internationally, continentally, and nationally. An international study

conducted in the United Arab Emirates by Badri, Mohaidat, and Rashedi (2013, p. 2672) mention that, “teachers’ embrace, and willingness to adopt, directly affect their success in technology readiness”. Similarly, a continental study conducted in Nigeria by Aremu and Adediran (2011, p. 181) states that “[r]eadiness or preparedness has to do with awareness, knowledge of use, attitude to use as well as getting skilled in the use of information technology.” Likewise, a study conducted in Kenya by Ouma, Awuor, and Kyambo (2013, p. 97) also mention that “[t]eachers’ and students’ computer literacy as well their perceptions and attitude towards technology were significant measures of e-learning implementation readiness.” Specifically, in South Africa, “[t]he readiness of learners, teachers and communities in terms of the necessary background knowledge as well as their attitudes towards ICT needs to be carefully monitored before implementation can be effectively and efficiently achieved” (Department of Education, 2004, p.33). The common link between all of these explanations; and among international, continental, and national literature; is that there seems to be some sort of consistency in the areas in which teachers’ ICT readiness is measured. Reference is particularly made to two key elements, being ICT knowledge and attitude. In this study, teacher ICT readiness was explored in relation to these two key elements, which are believed to influence teachers’ ability to integrate and use ICTs. It is important to explore the literature related to the areas of teachers’ ICT knowledge and attitude in more depth, so as to gain insight into the status of teachers’ ICT readiness. Teachers’ ICT knowledge is explored in the following section.

2.6 Teachers’ ICT knowledge

Although ICTs present new opportunities to teaching and learning, it simultaneously places huge demands on the knowledge required by teachers (Department of Education, 2007). Among the international (Inan & Lowther, 2010), continental (Aremu & Adediran, 2011; Ouma et al., 2013) and national (Department of Education, 2004) literature, teachers’ ICT knowledge is considered a determining factor of ICT readiness. This is in relation to the type and level of teachers’ ICT knowledge, which can serve as a facilitator or inhibitor of ICT integration in the classroom (Farrell & Isaacs, 2007). In addition, across the literature (see Aremu & Adediran, 2011; Badri et al., 2013; Department of Education, 2004; Department of Education, 2007; Ertmer & Ottenbreit-Leftwich, 2010; Kumar et al., 2008; Shaffer et al., 2015; Mndzebele, 2013; Ouma et al., 2013) it is largely acknowledged that ICTs will not be transformative by themselves, and consequently both high school and primary school teachers (Department of Education, 2004) should be capacitated with the required knowledge

to use and integrate ICTs effectively. This research study argued that the necessary knowledge needed by teachers is comprised of Technological Knowledge, Technological Content Knowledge and Technological Pedagogical Knowledge, which form part of Mishra and Koehler's (2006) TPACK model, presented in Chapter One.

It is particularly important that teachers have the required ICT knowledge, because teachers have mixed expertise (Department of Education, 2004; Oliver, 2010). Mixed expertise can also be referred to as the knowledge divide, which is explained as a divide between those who are more ICT knowledgeable and those less so. Howie and Blignaut (2009) highlight the knowledge divide as a major problem that is experienced in South Africa. It is therefore considered crucial to address the knowledge divide by equipping teachers with the required ICT knowledge but this raises an important question: what exactly constitutes the necessary ICT knowledge required by all teachers?

There seems to be great debate among the literature regarding what constitutes the ICT knowledge that teachers require to enable them to integrate ICTs into the curriculum. This has been conceptualised in a number of ways. One view presented by the literature (Ertmer & Ottenbreit-Leftwich, 2010; Shaffer et al., 2015) is that if teachers wish to integrate ICTs successfully, they need to expand their existing knowledge forms. Expected existing knowledge forms of in-service teachers include Content Knowledge (CK), Pedagogical Knowledge (PK) and Pedagogical Content Knowledge (PCK) (Ertmer & Ottenbreit-Leftwich, 2010; Mndzebele, 2013; Shaffer et al., 2015). In other words, if teachers have a deeper understanding of their subject content and different teaching and learning methods, it is argued that this can help teachers make informed decisions and select the most suitable technological device to allow learners to achieve their learning goals (Ertmer & Ottenbreit-Leftwich, 2010). Essentially, this implies that having deeper CK, PK and PCK enables teachers to have a more extensive understanding of the teaching and learning process.

Another view presented is that teachers require knowledge of various technological devices (Department of Education, 2004; Department of Education, 2007; Ertmer & Ottenbreit-Leftwich, 2010; Hew & Brush, 2007; Inan & Lowther, 2010; Ouma et al., 2013). Having knowledge of technological devices entails knowing what the affordances and constraints of the device are, how to operate the device, and how to solve technical issues. This view is

expected, particularly due to the fact that if teachers are to integrate ICTs they need to have a good understanding of various technological devices.

Still another view presented by the literature (Ertmer & Ottenbreit-Leftwich, 2010; Hew & Brush, 2007; Mndzebele, 2013; Shaffer et al., 2015) is that teachers need to apply their Content Knowledge and Pedagogical Knowledge in relation to their knowledge of technological devices. This means that teachers need to think about how to teach their subject content and how to select various teaching and learning approaches directly in relation to various technological devices and their affordances and constraints. It can be said that this view is a combination of the first and second views discussed above. These views can be considered some of the necessary types of knowledge that teachers should have when integrating ICTs.

In relation to the views presented on the required ICT knowledge, it is important to explore the status of teachers' ICT knowledge. There seem to be two major problems identified among the literature, which can be considered complementary to each other. The first problem is that it appears that many teachers do not have adequate technological knowledge relating to how to use a device in terms of its software, hardware, affordances, and constraints (Ertmer & Ottenbreit-Leftwich, 2010). The second problem is that having knowledge about various technological devices, although important, is not enough. Instead, teachers also need knowledge relating to how to use ICT devices as instruments that can enhance teaching and learning, which a majority of teachers do not know how to do (Carbová & Betáková, 2013; Ertmer & Ottenbreit-Leftwich, 2010; Farrell & Isaacs, 2007; Howie & Blignaut, 2009; Mndzebele, 2013). This is considered extremely problematic, especially because teachers need to be able to use technological devices in specific ways oriented to education. This is particularly in relation to specific content areas, learning grades, and learning goals, among others (Ertmer & Ottenbreit-Leftwich, 2010), which can contribute to enhanced teaching and learning and essentially teachers' being able to use ICTs effectively and appropriately. These problem areas highlight the need to have a well-thought-out approach to inform teacher ICT preparation, which was the target of this research study.

The inadequate teacher ICT knowledge and skills expressed in the literature is supported by various studies. For example, an international study conducted by Hakkarainen et al. (2001) was targeted at assessing Finland teachers' ICT skills within the classroom. From the 600

primary and high school teachers who were respondents of the study, it was discovered that the majority of the teachers (the exact percentage was not given) did not have adequate ICT skills, despite having access to ICT devices in their schools. Another international study, which was carried out by Alazam, Bakar, Hamzah, and Asmiran (2013), was aimed at assessing the level of Malaysian teachers' ICT skills and usage. Of the 329 teacher respondents, it was found that majority of teachers (the exact percentage was also not stated) had moderate levels of ICT skills. Studies have been conducted within the African continent, such as that of Buabeng-Andoh (2012), which was aimed at exploring Ghanaian teachers' level of technological skills in the classroom. From the 231 teachers, who were respondents of the study, it was found that teachers did not have a wide variety of ICT skills. Instead, they were moderately proficient in certain ICT skills, such as word processing, and less proficient in others, such as database systems used to capture and analyse data. Overall, the study inferred that teachers need to be proficient in a variety of ICT skills to allow for successful ICT integration, which was found not to be the case in this study.

Similarly, another study was conducted by Aremu and Adediran (2011), which was aimed at exploring Nigerian teachers' level of ICT knowledge. The study surveyed 470 teachers, consisting of 232 primary school teachers and 238 high school teachers. The findings show that 250 teachers (54%) had below average ICT knowledge, with the remaining 220 (46%) with above average knowledge. Of the 220 teachers with above average knowledge, 118 of these teachers were high school teachers, which suggested that high school teachers were more ICT knowledgeable when compared to primary school teachers. A study carried out by Ouma et al. (2013) was also a national study aimed at exploring teachers' technical competency. From the 72 Kenyan teachers who were part of the study, it was found that 48.8% of teachers were not very ICT competent, whereas 47.2% of participants were considered ICT competent. In this case, there seems to be a fine line between those who are considered ICT competent and those who are less competent.

However, from the studies conducted it can be said that an overall majority of teachers have ICT knowledge that ranges from below average to moderate. There appeared to be limited studies that gave a different account and portrayed teachers as having high levels of ICT knowledge. In addition, a common correlation was that teachers' level of ICT knowledge influenced their level of ICT usage in the classroom (Alazam et al., 2013; Hakkarainen et al., 2001; Howie & Blignaut, 2009). Particularly in South Africa, Howie and Blignaut's (2009)

study was aimed at exploring the extent to which South Africa was sufficiently prepared to integrate ICTs into grade 8 maths and science classrooms, and the extent to which ICTs were actually integrated into these classrooms. The study gathered data from 500 schools from across all nine provinces, which included 666 maths teachers and 622 science teachers. The findings from the study show that only 18% of maths teachers and only 16% of science teachers indicated that they used ICTs in the teaching and learning process. The findings were attributed to the fact that most of these teachers did not have the necessary ICT knowledge to enable them to integrate ICTs effectively. The overall recommendation put forward by these studies (Alazam et al., 2013; Hakkarainen et al., 2001; Howie & Blignaut, 2009) was that efforts need to be made to enable teachers to gain the necessary technological knowledge, which will likely influence the extent to which they integrate ICTs in the classroom.

In exploring teachers' level of ICT knowledge and integration, it appeared that a quantitative research methodology, through the use of questionnaires, was the dominant research approach adopted by the various studies (Alazam et al., 2013; Aremu & Adediran, 2011; Buabeng-Andoh, 2012; Hakkarainen et al., 2001; Howie & Blignaut, 2009; Ouma et al., 2013). This research study also used a questionnaire to explore teachers' level of ICT knowledge, which made it easier to draw comparisons across the literature. In drawing comparisons, a major limitation that was identified was that some studies (Alazam et al., 2013; Aremu & Adediran, 2011; Buabeng-Andoh, 2012; Hakkarainen et al., 2001) failed to discuss the theoretical framework that was used to inform the study, which could have provided added insight relating to what informed the measurement or basis of teachers' ICT knowledge.

The studies explored above did, however, have a fairly large sample size, which was useful in order to gain insight regarding the overall status of teachers' ICT knowledge. Although the findings are not generalisable, there seems to be agreement across the literature presented from various contexts (which included Finland, Malaysia, Nigeria, Ghana, Kenya, and South Africa) that many teachers do not have adequate ICT knowledge and consequently their readiness to integrate ICTs is questionable. The heavy reliance on international and continental literature was due to the fact that research exploring teachers' ICT knowledge in South Africa, and particularly Gauteng (the research area of focus), seems to be limited.

There appears to be a gap and simultaneously a need to explore teacher readiness in more localised contexts such as Gauteng, which was the target of this research study.

2.7 Teachers' attitudes towards ICT integration

In addition to exploring teachers' ICT knowledge, it is also imperative to explore teachers' attitudes towards ICT integration. This is particularly because it was found that there is a positive relationship between teachers' ICT knowledge and attitude (Jegede, Dibu-Ojerinde, & Ilori, 2007), whereby teachers were more willing to develop their ICT knowledge if they had a positive attitude towards ICT integration. This research study explored the nature of teachers' attitude towards ICT integration, as it provided insight relating to their willingness to develop their ICT knowledge and embrace ICTs in their classroom.

Among the international (Badri et al., 2013; Inan & Lowther, 2010; Kumar et al., 2008; Summak et al., 2010), continental (Aremu & Adediran, 2011; Farrell & Isaacs, 2007; Ouma et al., 2013), and national (Department of Education, 2004) literature, there is large recognition that teachers' attitude towards ICT adoption and integration has a huge influence on their readiness to integrate ICTs and ultimately their success in using ICTs. In other words, attitude plays a significant role in facilitating or constraining the ICT integration process (Farrell & Isaacs, 2007; Hu, Clark, & Ma, 2003), which is also another major reason why this research study explored teachers' attitudes towards ICTs. In order to gain more insight, an important starting point would be to understand what is meant by the term attitude.

The literature seems to distinguish attitude as being either a positive or a negative construct. Teachers who are willing to accept and embrace technology use often yield a positive attitude, whereas those teachers who are more hesitant towards ICT use often yield a negative attitude. The argument that is presented by the literature (Badri et al., 2013; Kumar et al., 2008) is that if ICTs are to be effectively integrated, teachers need to view ICTs positively, and they need to be willing to become skilled and effective in ICT use. If this is not the case, then it is recommended that teachers need to change their attitude and mindset. In other words, it is suggested that teachers need to change their existing beliefs and should engage in activities that challenge these beliefs (Ertmer & Ottenbreit-Leftwich, 2010). What this implies is that teachers play an instrumental role in the ICT integration process and this is not simply integrating and using the device itself, but also ensuring that they are ready, willing and able to use ICTs in order to reap the benefits thereof.

It is considered that an effort needs to be made to ensure that teachers are able to change their attitude and mindset and shift towards viewing ICT use and adoption positively (Badri et al., 2013; Ertmer & Ottenbreit-Leftwich, 2010; Kumar et al., 2008). This can entail informing teachers about the relevance and potential uses of ICTs (Badri et al., 2013; Department of Education, 2004; Hu et al., 2003; Kumar et al., 2008), showing teachers how ICTs can impact learner performance (Ertmer & Ottenbreit-Leftwich, 2010), how ICTs make teaching and learning more exciting and easier (Ertmer & Ottenbreit-Leftwich, 2010; Kumar et al., 2008), and acknowledging teachers for their creative and innovative use of ICTs in the classroom (Isaacs et al., 2012), among other approaches. If these approaches are adopted, it is believed that they will influence teachers towards having a more positive attitude and becoming more confident and accepting of ICT use. A vital question that should be answered and addressed is what is teachers' attitude towards ICT integration.

Studies have been conducted aimed at exploring both primary and high school teachers' attitudes towards the use of ICTs. These studies have adopted various approaches to exploring teachers' attitude. Aremu and Adediran's (2011) study assessed teachers' attitudes by using a questionnaire, which was informed and adapted from Selwyn's (1997) Computer Attitude Scale. The Computer Attitude Scale was segmented into the following components: affective, perceived usefulness, perceived control, and behavioural intention components. From the 470 Nigerian teachers who were respondents of the study, it was found that 87.7% (412 teachers) had a positive attitude, and the remaining 12.3% (58 teachers) had a negative attitude. The overall findings showed that the majority of teachers had a positive attitude towards ICT use, with primary school teachers furthermore comprising the majority of these.

Similarly, Ouma et al. (2013) also used perceived usefulness (a component part of Selwyn's (1997) model) as a factor to assess teachers' ICT attitude. However, in addition to perceived usefulness they also used perceived ease of use (not part of Selwyn's (1997) model) as a component to assess teachers' attitude. Together these two components form part of Davis, Bagozzi, and Warshaw's (1989) Technology Acceptance Model (TAM). The overall findings from this study indicate that from the 72 Kenyan teachers surveyed, a majority of these teachers considered that the use of ICTs could improve their teaching and make learning more interesting. In addition, it was found that the majority of teachers (93.1%) were comfortable using ICTs and would use ICTs even if they were not required to do so. Overall, it was concluded that the majority of these teachers had a positive attitude towards ICT use.

A study conducted in South Africa by Hart and Laher (2015) also used a component part of Selwyn's (1997) scale, which was perceived usefulness, to assess teachers' attitude towards technology. In addition, other factors were also used which included competence, access, and perceived cultural relevance. There were 112 teachers from various parts of Johannesburg, a city in Gauteng, who were respondents of the study. It was discovered that the majority of teachers had a positive attitude towards technology, and the most influential determining factor of teachers' having a positive attitude was when they perceived technology as being useful to teaching and learning. The findings from Hart and Laher's (2015) study suggest that when teachers are exposed to the relevance and impact that ICTs have on teaching and learning they will be more likely to implement ICTs to aid teaching and learning in their classroom.

In contrast, Badri et al. (2013), as well as Summak, Bağlıbel & Samancıoğlu (2010), used an adapted version of Parasuraman's (2000) Technology Readiness Index (TRI) as the basis to determine teachers' attitude. Parasuraman's (2000) Technology Readiness Index (TRI), which was discussed in Chapter One, was adopted in this study to explore teachers' attitudes towards ICTs. In studies by Badri et al. (2013), which surveyed 796 teachers from Abu Dhabi, and Summak et al. (2010), where respondents were 207 teachers from Turkish primary schools, overall finding from both showed that a majority of teachers were found to be optimistic about ICTs and had a positive view about its use in the classroom. It can be said that having a positive attitude is likely to make teachers more supportive of efforts targeted at capacitating them and the ICT integration process as a whole.

Among the various literature (Aremu & Adediran, 2011; Badri et al., 2013; Hart & Laher, 2015; Ouma et al., 2013; Summak et al., 2010) teachers' attitude towards ICT integration was mainly assessed by means of a quantitative research methodology, through the use of questionnaires. It is evident that the studies adopted questionnaires that were informed by different theories. However, regardless of this variation it was found that an overall majority of teachers had a positive attitude towards ICT integration in the teaching and learning process. A major limitation was that within South Africa and particularly Gauteng, there are very limited studies focused on exploring the attitude of teachers towards ICTs. Instead, studies that have been conducted in South Africa (see Bovée, Voogt, & Meelissen, 2007; Van Rensburg, Ankiewicz, & Myburgh, 1999) seem to place a larger focus on exploring the learners' attitudes towards technology. Consequently, there seems to be a gap in the

literature, and as such this research study particularly focused on exploring the attitude of teachers from the researched schools which is situated in Gauteng. Exploring teachers' ICT attitude provided more insight that can inform the ICT integration process.

It is considered important to explore teachers' attitudes and understand how they embrace change, because they do not all embrace change the same way, and some teachers may be more unwilling to do so than others (Nsele, 2014). Understanding whether teachers are willing or unwilling to implement ICTs can provide insight into whether ICT implementation will be successful or unsuccessful. Findings show that effective ICT implementation in the teaching and learning process was found to occur through a positive attitude and willingness from teachers (Nsele, 2014). In addition, there seems to be a correlation between teachers' attitude towards ICTs and their use of ICTs (Hu et al., 2003; Jegede et al., 2007). This means that if teachers view ICTs more positively they are likely to integrate and use ICTs in their teaching. These findings propose that schools should focus more on understanding teachers' perceptions towards implemented change, as they provide useful insight that can guide the relevant stakeholders to implement and sustain change successfully in their schools. Another possible way to sustain change is to ensure that teachers engage in training, which can positively influence their attitude and knowledge base.

2.8 The state of ICT teacher development

Specifically in the South African context, it was found that the fundamental factor most needed is a platform to acquire the required ICT knowledge to enable ICT integration into schools (Howie & Blignaut, 2009; Mndzebele, 2013). Gaining the necessary ICT knowledge is particularly important because it has been argued in the literature (Department of Education, 2004; Department of Education, 2007; Department of Education, 2010; Ertmer & Ottenbreit-Leftwich, 2010) that teachers are unique individuals who have various experiences and have grown up in varying environments. This implies that many teachers may not have been exposed to technology and may have had limited access to technological devices. Consequently, they may not be comfortable with ICT use and may find it difficult to adapt to this recent trend of integrating ICTs into the classroom. This situation is one of the many reasons giving rise to the large need to have in place a training or development programme that would help teachers gain the competencies needed to integrate ICTs successfully (Department of Education, 2004). It is necessary to understand the ICT training situation in

more depth, so as to identify what efforts have been made to empower teachers and ensure their readiness.

Among the international (Carbová & Betáková, 2013; Ertmer & Ottenbreit-Leftwich, 2010; Shaffer et al., 2015), continental (Aremu & Adediran, 2011; Mndzebele, 2013; SchoolNet SA, 2015) and national (Department of Education, 2004) literature, there is large recognition of the need to train and enable teachers to use ICTs confidently and effectively. Consequently, there has been investment in teacher ICT training, focused on equipping teachers with ICT knowledge (Department of Education, 2004; Howie & Blignaut, 2009; Kumar et al., 2008). By spending money on training, the assumption is that ICT integration is considered a valuable and worthwhile investment. Investment in training is evident from some of the studies conducted.

The International Institute for Communication and Development and the Commonwealth of Learning (2004) conducted a study and found about 61 professional development programmes, courses and training initiatives focused on ICT that were offered to thousands of teachers across Africa (SchoolNet SA, 2015). In addition, particularly in South Africa, the Department of Education is considered key in providing teacher professional development, and is believed to account for 70% of teacher development activities (Department of Education, 2010). According to the Department of Education (2006), it is believed that within the various provincial departments over 48 000 teachers have received ICT training that was of a basic level, and over 46 000 teachers have received training on the integration of ICTs into the curriculum (Howie & Blignaut, 2009). These investments highlight the efforts made at contributing towards teachers' ICT readiness, including Gauteng, the study area of focus.

However, despite these accounts of providing teachers with ICT training, a study conducted in 2007 by the Department of Education found that 30% of teachers across South Africa have not spent any time on professional development (Department of Education, 2010). This is particularly problematic as it is part of the conditions of service that teachers are expected to spend 80 hours per year on engaging in teacher development. This problem is experienced on a wider scale, as shown by an international study conducted by Carbová and Betáková (2013), who also found that only a few teachers had received training on how to integrate ICTs into the teaching and learning process. Even though this is the case, it is significant to bear in mind that neither the mere time spent on training nor sheer numbers of teachers

receiving training may be an indication of how valuable or impactful teacher development is. In order to ensure that ICT training is impactful, there are particular considerations that should be taken into account.

From the literature reviewed (Carbová & Betáková, 2013; Ertmer & Ottenbreit-Leftwich, 2010; Farrell & Isaacs, 2007; Howie & Blignaut, 2009; Mndzebele, 2013), it has been highlighted that many teachers are still unable to use ICTs as effective tools to support teaching and learning in their schools. This implies that there seems to be a knowledge gap and consequently ICT training should target this area. In order to close this gap, within the various studies conducted, much of the literature has put forward recommendations to be considered by ICT teacher development programmes or schools when facilitating teacher ICT readiness. Ertmer and Ottenbreit-Leftwich's (2010) study is particularly useful in this regard. Some of the recommendations presented by the literature include showing teachers how to integrate ICTs into the teaching and learning process through having demonstrations or models of what effective teaching with ICTs looks like (Carbová & Betáková, 2013; Department of Education, 2007; Ertmer & Ottenbreit-Leftwich, 2010; Mndzebele, 2013), giving teachers opportunities to become active participants and experiment with the integration of ICTs in their classroom (Ertmer & Ottenbreit-Leftwich, 2010; SchoolNet SA, 2015), monitoring teachers' ICT use and allowing them to receive feedback on their progress or areas that need improvement (Ertmer & Ottenbreit-Leftwich, 2010; SchoolNet SA, 2015), helping teachers view themselves as individuals who have the potential to implement change (Ertmer & Ottenbreit-Leftwich, 2010), providing teachers with support to facilitate teacher change and effective use of ICTs (Department of Education, 2004; Department of Education, 2007; Department of Education, 2010; Ertmer & Ottenbreit-Leftwich, 2010; Shaffer et al., 2015), showing teachers how to use ICTs to improve student performance by providing cases of other teachers' achievements (Ertmer & Ottenbreit-Leftwich, 2010), reconceptualising teachers' understanding of good teaching to include incorporating the use of ICTs in the classroom (Ertmer & Ottenbreit-Leftwich, 2010), showing teachers how to implement ICTs to make their job easier (Department of Education, 2010), offering training that is specific and appropriate to a teacher's teaching subject (Department of Education, 2004), and building teacher confidence in using ICTs (Mndzebele, 2013), among other recommendations. It is evident that there are variations yet at the same time agreement in terms of the recommendations that should be considered for teacher ICT training. There are also various views presented regarding the nature of ICT training that should be offered to teachers.

In relation to the need to train teachers, the integration of ICTs into teaching and learning means that the nature of preparation that teachers receive also needs to change from what it traditionally was (Shaffer et al., 2015). Part of this shift from traditional teacher training means that efforts should be made to incorporate a technological dimension, targeting ICT use and integration in the classroom, into teacher training courses. The literature presents various views on this incorporation. It is considered that ICT professional development should focus on equipping teachers with various technological skills and knowledge (Ertmer & Ottenbreit-Leftwich, 2010; Hew & Brush, 2007; Inan & Lowther, 2010), teaching teachers about the affordances of technology (Ertmer & Ottenbreit-Leftwich, 2010), teaching teachers how to use their technological skills and knowledge to support their pedagogy (Ertmer & Ottenbreit-Leftwich, 2010; Hew & Brush, 2007, Mndzebele, 2013), and teaching teachers how to use ICTs to support their subject content (Ertmer & Ottenbreit-Leftwich, 2010). These are views presented regarding the content of ICT training, which can be said to link closely to the specialised ICT knowledge types required by teachers, as discussed above.

The form of ICT training is another aspect that warrants discussion. It is considered that ICT training should be continuous (Department of Education, 2004; Department of Education, 2007) as technology is constantly advancing and teachers need to stay up to date with new trends and integrate these into the teaching and learning process. In contrast, there is also the view that short-term, once-off ICT training is also effective, as found in a study carried out by Isaacs et al. (2012). In addition, it is argued that the training offered should not overload or overwhelm teachers (Shaffer et al., 2015), should be accessible (Aremu & Adediran, 2011; Department of Education, 2007; Mndzebele, 2013; Shaffer et al., 2015) so as not to disrupt teaching and learning time. There is also the view that ICT training should not adopt a one-size-fits-all approach, but should take teachers' diverse needs into account (Sackstein, 2014). Taking teachers' needs into account is essential because teachers may have varying levels of ICT knowledge and consequently would need to develop their own knowledge accordingly. These are just some of the views presented regarding the form of ICT training.

It is evident that the literature presents various views pertaining to the content and form that training initiatives should take. These variations can cause confusion, which could lead to a lack of standardisation in teacher ICT preparation. Consequently, leading to disparity in teachers' attitudes towards ICTs and the type and level of ICT knowledge with which they are equipped. In order to prevent such disparity, it can be said that there is a desperate call for

an effective ICT teacher preparation framework. Such a framework could provide some direction and insight regarding what ICT training initiatives should entail, whilst speaking directly to the needs of schools and teachers. Establishing an ICT teacher preparation framework was a major aim of this research study, which could provide valuable insight and contribution towards more effective ICT training and preparation for teachers. This is greatly needed, especially due to current problems identified regarding ICT training initiatives and its related courseware.

Nationally, the White Paper on e-Education (2004) has been identified as the major policy that has targeted South Africa's (including Gauteng's) ICT integration process. In terms of its plan to provide teachers with professional development, there were various training initiatives that included those facilitated by SCOPE (Finnish Development Support), SchoolNet SA, the South African Institute for Distance Education, INTEL "Teach to the Future", and Microsoft (Department of Education, 2004). These initiatives have established teacher development modules for the introduction of ICTs into schools, which were targeted at equipping teachers with ICT knowledge. It is useful to explore the content offered by these training initiatives, in order to gain understanding regarding the ICT knowledge to which teachers were being exposed. Focus will be placed on the ICT training initiative offered by Microsoft, as it was possible to gain access to the relevant courseware that informed the training sessions offered.

Through analysing the courseware, it was found that there were various course options offered, which were relevant to this research study. These training options included: ICT Skills for Teachers, ICT for Principals, One Step Further (ICT Integration), and ICT Leadership for Education Managers (Microsoft in Education, n.d.). Within these course options there were various activities divided into beginner, intermediate, and advanced levels. The logic behind this is that all teachers can identify an area that relates to their level of ICT knowledge and that they find useful. A more in-depth look at the activities reveals that teachers are simply taught how to carry out a particular activity. In other words, the activities are targeted at showing teachers how to carry out certain tasks, such as creating a PowerPoint presentation with a focus on how to adjust the font, background colour, and other options. This is the case at all the levels (beginner, intermediate, and advanced), for all the activities, and for all the course options offered. The fundamental problem that can be highlighted is that there is no focus on how to use ICTs and its related software, such as a PowerPoint, to enhance teaching and learning or for teaching and learning purposes. This problem was

echoed by Jegede's (2009) study, which was aimed at exploring the ICT training received by teachers in Nigerian training institutions. This is particularly alarming and raises major concerns, especially since the target should be to prepare teachers to support and enhance teaching and learning through ICTs.

Another concern identified in much of the literature, policy documents, and even course content of ICT training is that they all place a focus on ensuring that training equips teachers with *basic* ICT skills and knowledge. The concern is that equipping teachers with basic skills and knowledge seems to be an end in itself. This is evident by the various references made in the literature: "more than 48,000 educators have undergone *basic* ICT training" (Howie & Blignaut, 2009, p. 349, emphasis added); "The ministry should further encourage pre-service teacher training institutions to include *basic* computer literacy and *basic* ICT integration into their teaching and learning" (Mndzebele, 2013, p. 411, emphasis added); "Every teacher and manager has access to *basic* training in the use of ICTs" (Department of Education, 2004, p.39, emphasis added); "The following are the essential skills levels for the integration of ICT into curriculum delivery: *Basic* ICT knowledge and skills. These are the knowledge and skills to use ICT at a *basic* level" (Department of Education, 2007, p.6, emphasis added); "Most teacher training programmes in Africa aim to promote the development of *basic* ICT skills" (Isaacs et al., 2012, p.20, emphasis added). The question remains: should basic ICT knowledge simply be the focus, as was the case in the above references, or should there be room for more advanced levels of ICT knowledge, which can be considered necessary for effective ICT integration in the classroom?

It must be noted that in the ICT integration process, training is not the only form of essential support required by teachers. In addition to training, school principals play a fundamental leadership role in supporting and helping teachers become ICT ready.

2.9 The role of school principals in contributing towards teachers' ICT readiness

Particularly in the implementation of ICTs into schools, the literature has acknowledged the role of school leadership (Ertmer & Ottenbreit-Leftwich, 2010; Farrell & Isaacs, 2007; Isaacs et al., 2012; Kumar et al., 2008). However, there seems to be limited literature that specifically focuses on the role of the school principal in the ICT implementation process. This is particularly important because it is argued that school principals should adopt a 'change facilitator' role in their schools, due to being responsible for leading educational

innovations into schools (Bush, Joubert, Kiggundu, & Van Rooyen, 2010; Ramatseba, 2012). A change facilitator is described as a knowledgeable person who is aware of the change being made, and is able to offer appropriate support and knowledge to help others with the transition (Hall & Hord, 1987). Based on the role associated with principals in the literature, it would be important, as was the case in this study, to identify the role played by principals in supporting teachers in the ICT integration process.

Even though it is argued that school principals should adopt the role of a change facilitator (Bush et al., 2010; Ramatseba, 2012), leading the ICT integration process can be a daunting task. Some principals may feel overwhelmed leading the ICT integration process, as they themselves may have a lack of ICT knowledge and may not be familiar with the integration of ICTs into schools (Yuen, Law, & Wong, 2003). In addition, some principals may not have received any ICT training, which is considered essential to developing ICT knowledge to effectively lead and manage the ICT integration process (Yuen et al., 2003). As a result of not being adequately prepared, school principals may rely on other ICT champions, such as expert teachers within the school or an external ICT facilitator, to take charge and lead the ICT integration process (Schiller, 2003; Yuen et al., 2003). Regardless of whether school principals lead the ICT integration process directly or indirectly, the support that they provide to teachers and the contribution to their ICT readiness is considered an indicator of the principal's commitment to integrating ICTs into their school. In addition, it is argued that teachers' readiness to use technology is considered to increase with strong support (Inan & Lowther, 2010; Kumar et al., 2008). Inan and Lowther's (2010) study found that overall support had the second largest effect (teachers' proficiency in technology use had the largest effect) on teacher's readiness to integrate technology. If there is a lack of leadership and its associated support, this is considered a factor that can inhibit the integration of ICTs (Isaacs et al., 2012).

Key to supporting teachers in the ICT integration process is that school principals should carry out certain duties. Yuen, Law and Wong (2003) argue that a principal should go beyond simply providing and managing ICT resources. Due to the complexity of the ICT integration process, there are various other duties that a principal should perform. The literature suggests that these include, among others, motivating teachers (Kumar et al., 2008), being committed to the overall development of the ICT integration process (Farrell & Isaacs, 2007), monitoring the ICT integration process and ensuring that teachers are implementing what

they have learnt from training received (Kumar et al., 2008; Schiller, 2003), making sure teachers' feedback and concerns are acknowledged and the appropriate action taken (Kumar et al., 2008), and making ICT training available to teachers (Department of Education, 2007; Kumar et al., 2008; Schiller, 2003; Yuen et al., 2003). The provision of ICT training is considered to have a positive influence on the likelihood of teachers integrating ICTs into their classroom (Schiller, 2003). Making ICT training accessible would entail relooking the school timetable and slightly adjusting it, so as to allow time for teachers to attend training sessions (Kumar et al., 2008). Teachers should not be made to feel like they are not performing their job and duties by developing their ICT knowledge. Consequently, school principals would need to take charge and lead the ICT implementation process, by performing certain roles and duties along with ensuring that the necessary conditions are in place.

In conclusion, the reviewed literature relevant to this research study showed that schools have been engaged in the process of adopting and integrating ICTs into their curricula. This process has been largely informed by established ICT policy documents, which have stipulated goals and plans of action, which are meant to direct and govern the integration process. However, in order to integrate ICTs, it has been identified in the literature that teachers play a key role and their readiness is furthermore key to the success or failure of the integration process. It has thus been suggested that it is vital to explore the status of teachers' ICT readiness in terms of their level of ICT knowledge and their attitude towards ICT adoption. Key to equipping teachers with the required ICT knowledge and a positive attitude is the ICT training that they receive, as well as the role of school leadership. Based on this understanding, which has largely been grounded on the reviewed literature, the next section presents the theoretical framework which informed this research study.

2.10 Theoretical framework

The two theoretical underpinnings (TPACK and TRI, discussed in Chapter One), along with the reviewed literature, were fundamental in the establishment of a theoretical framework for this research study. The theoretical framework spoke to some of the dimensions (ICT attitude, ICT training, ICT knowledge, and the role of the school principal), which are directly related to teachers' ICT readiness. The established theoretical framework was useful for this study, as it presented a guide that was relevant to these dimensions in terms of the problems, influences and needs identified in the literature and within the educational

environment. The first relevant area is being able to identify teachers' ICT attitude, which can have an influence on their willingness to receive ICT training, develop their ICT knowledge, and integrate ICTs into teaching and learning. The second relevant area is teachers' lack of specialised ICT knowledge. The third relevant area is linked to the form and content of ICT training, which can contribute to teachers' developing the specialised ICT knowledge and a positive attitude towards ICT integration in the classroom. The final relevant area relates to the leadership role that should be played by school principals to ensure that teachers gain the required ICT knowledge and develop a positive attitude towards ICTs. In relation to the identified areas, the established theoretical framework was used to determine what is happening in reality versus what the framework proposed should be happening to contribute to teachers' ICT readiness. Figure 2 below is the established theoretical framework, which is explained in more depth in the sections that follow.

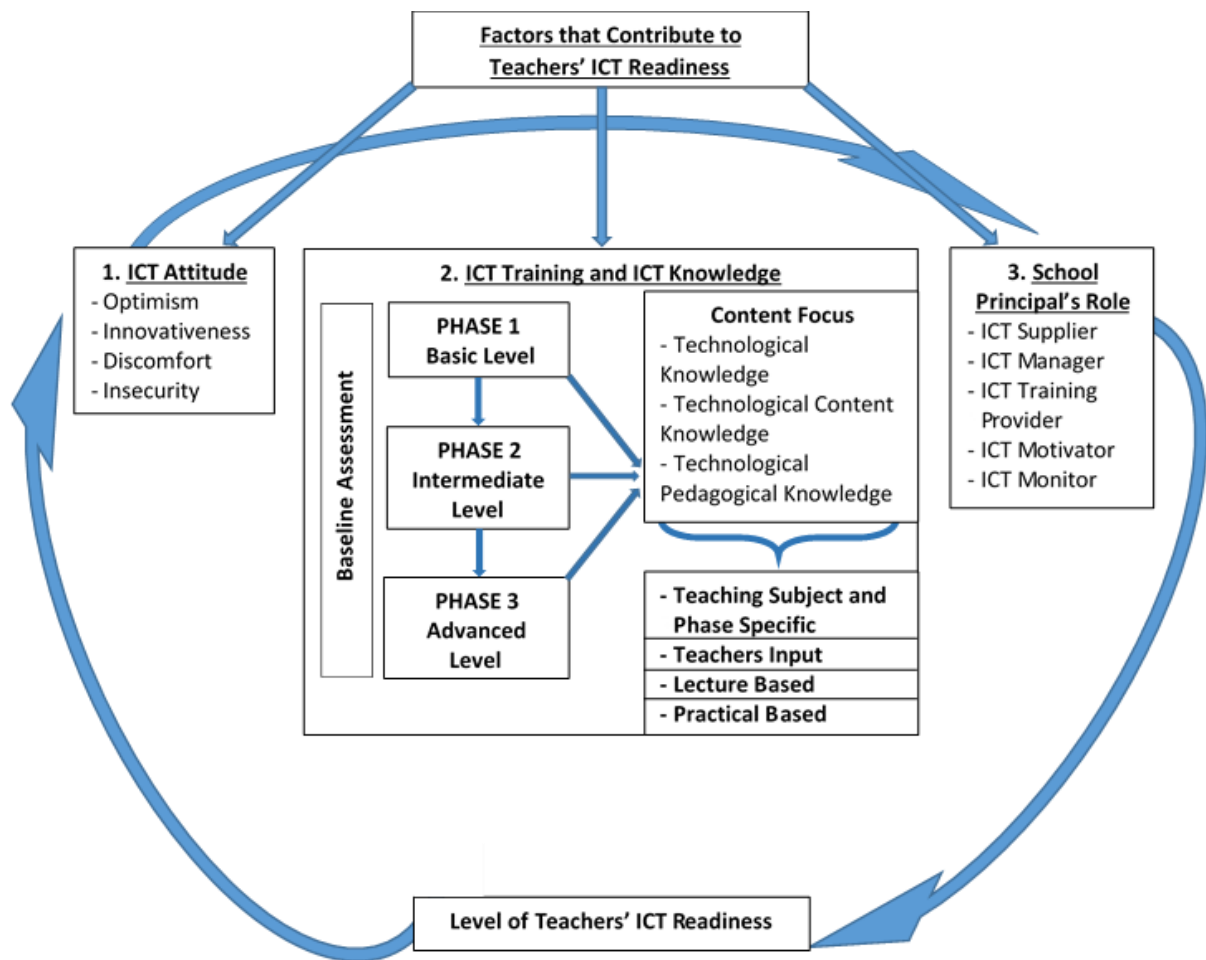


Figure 2: Theoretical framework adapted from Mishra and Koehler's (2006) TPACK model and Parasuraman's (2000) Technology Readiness Index (TRI)

2.10.1 Understanding the theoretical framework

The theoretical framework presented three pertinent dimensions that contribute to teachers' ICT readiness. These dimensions were ICT attitude, ICT training and knowledge, and the role of school principals, which are portrayed as being in a cyclical process. The cyclical process represented the notion that each of these dimensions needs to be developed continuously, so that teachers' level of ICT readiness may be continuously improved. A continuous process of development meant that teachers' attitudes can in time change from being negative to positive, as they receive training, develop their ICT knowledge, and receive support from school leadership. In addition, the cyclical process represented the idea that teachers need to engage in ICT training continuously so as to develop their ICT knowledge. Lastly, the cyclical process also represented the idea that school principals continuously need to support

teachers by performing certain roles that contribute to their level of ICT readiness. The theoretical framework proposed that if a teacher's ICT attitude is positive, if they receive relevant ICT training, if they develop specialised ICT knowledge areas, and if they receive appropriate support from their school principal, their level of ICT readiness can be continuously improved. Each of the dimensions that are part of the theoretical framework are explained in the following sections.

2.10.1.1 ICT attitude

Within the framework, one of the dimensions that contribute to teachers' ICT readiness is their ICT attitude. Teachers' ICT attitude is to be determined in relation to Parasuraman's (2000) Technology Readiness Index (TRI). The TRI was a key theoretical dimension that underpinned the study, and served as a basis for the different attitudes (optimism, innovativeness, discomfort, and insecurity) that teachers may have towards ICT integration in their school. Attitude serves as a key driver of the entire ICT integration process, and is likely to influence teachers' willingness to receive training, develop their ICT knowledge base and receive support to ensure their readiness.

2.10.1.2 ICT training and ICT knowledge

Another dimension that contributes to teachers' ICT readiness is ICT training and ICT knowledge. The various elements that were part of this dimension in the framework are discussed below.

2.10.1.2.1 Baseline assessment

The baseline assessment served as the first essential step part of the ICT training and ICT knowledge dimension. It is argued that when teachers receive training and develop their knowledge, there should be a baseline assessment to determine what ICT knowledge teachers have in a particular area. Understanding teachers' level of knowledge in a certain area can be used to determine into which training phase (phase one, two, or three) teachers should be placed when developing a particular knowledge area.

2.10.1.2.2 Phase 1

Teachers are to be placed in the various phases according to their current level of ICT knowledge. Phase one is the basic level and relates to teachers who do not have a high level of knowledge in a particular ICT area and who are uncomfortable performing a particular

ICT task. Consequently, these teachers would need to develop this particular knowledge area at a basic level.

2.10.1.2.3 Phase 2

Phase two is the intermediate level and relates to teachers who have a moderate level of knowledge in a particular ICT area and who are more comfortable performing a particular ICT task. Consequently, these teachers would need to develop this particular knowledge area at an intermediate level.

2.10.1.2.4 Phase 3

Phase three is the advanced level and relates to teachers with a high level of knowledge in a particular ICT area and who are comfortable performing a particular ICT task. Consequently, these teachers would need to develop this particular knowledge area at an advanced level.

2.10.1.2.5 Content focus

The content focus of the ICT training was informed by the knowledge areas central to Mishra and Koehler's (2006) TPACK model, which was another theoretical dimension that underpinned this study. This study argued that the TPACK model presents some of the specialised knowledge areas (TK, TCK and TPK) that teachers should develop in order to integrate ICTs effectively. The study assumed that teachers have adequate Content Knowledge, Pedagogical Knowledge and Pedagogical Content Knowledge, and specifically focused on developing teachers' ability to integrate ICTs successfully. The knowledge areas that were presented in the framework and that should be developed at all three phases (basic, intermediate, and advanced) include Technological Knowledge, Technological Content Knowledge, and Technological Pedagogical Knowledge.

The first knowledge area is Technological Knowledge, which entails developing teachers' knowledge in relation to knowing how to use new and old ICT devices in terms of their hardware and software, affordances and constraints, and as tools for teaching and learning (Koehler et al., 2014). It also entails learning how to solve technical problems (Carbová & Betáková, 2013).

The second knowledge area is Technological Content Knowledge, which entails developing teachers' knowledge in relation to understanding the relationship between ICTs and the

subject content that they teach. The relationship is specifically in relation to how their subject content can be represented, enhanced, or restricted by different ICTs (Koehler et al., 2013; Koehler et al., 2014).

The third knowledge area is Technological Pedagogical Knowledge, which entails developing teachers' knowledge in relation to knowing how ICTs can afford or restrict particular pedagogical methods, influence the nature of teaching and learning, and the interaction between teacher and learner. Developing this knowledge area also entails knowing how ICTs can be used in relation to different teaching and learning contexts, and purposes (Koehler et al., 2013; Koehler et al., 2014).

2.10.1.2.6 Teaching subject and phase specific

Teachers should develop their Technological Knowledge, Technological Content Knowledge, and Technological Pedagogical Knowledge in relation to their teaching subject and teaching phase. The framework proposed that a teacher's teaching subject and phase can influence the type of ICT knowledge that they require in the classroom.

2.10.1.2.7 Teacher input

The focus of the content that teachers learn, in relation to the various knowledge areas (Technological Knowledge, Technological Content Knowledge and Technological Pedagogical Knowledge), should be driven by teachers' input. Considering teachers input would allow the training received and the ICT knowledge area that is developed to be relevant to teachers' needs, concerns, and problem areas.

2.10.1.2.8 Lecture- and practical-based

When teachers receive knowledge in relation to the content areas of focus, it should be lecture- and practical-based. Lecture-based will allow important concepts, content and terminology to be transferred to teachers. However, a practical-based component will also allow teachers to gain hands-on experience, which will facilitate the process of teachers' implementing their ICT knowledge and using ICTs in the teaching and learning process.

2.10.1.3 School principal's role

Another important dimension that contributes to teachers' level of ICT readiness is the support received by the school principal. The framework proposed that school principals

should play various roles so as to contribute to teachers' ICT readiness. These roles include providing ICT devices (ICT supplier), ensuring that teachers have access to the devices and software (ICT manager), giving teachers opportunities to attend ICT training (ICT training provider), encouraging the use of ICTs in the classroom (ICT motivator), and ensuring that teachers effectively use and implement ICTs in the teaching and learning process (ICT monitor).

2.11 Chapter summary

In this chapter, literature relevant to this research study was reviewed in relation to various themes that included the integration of ICTs, the role of ICT policy, the affordances of ICTs, teachers' ICT readiness, teachers' ICT knowledge, teacher attitude towards ICT integration, teacher ICT training, and the role of school principals in contributing to teachers' ICT readiness. In addition, the theoretical framework that underpinned and informed this study was presented. The theoretical framework and the reviewed literature provided a useful foundation and analytical lens through which understanding of all the dimensions pertinent to teachers' ICT readiness was gained. The next chapter explores the research methodology and design used to conduct the research study.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

The previous chapter reviewed literature and presented the theoretical framework relevant to this study. This chapter is aimed at exploring the approach used to conduct the research study. In selecting the most suitable approach, various theoretical considerations were taken into account. These theoretical considerations include the research paradigm, design, methodology, population, pilot phase, and data generation and analysis methods, all of which are discussed in this chapter. In addition, issues of trustworthiness in qualitative research, ethical issues, and the limitations of the study are explored.

3.2 Research paradigm

A research paradigm is described as “a general orientation about the world and the nature of research that a researcher holds” (Creswell, 2009). A researcher may choose between various research paradigms, such as positivism, interpretivism, pragmatism, critical theory, or postmodernism (Mackenzie & Knipe, 2006). These research paradigms are often discussed in relation to their epistemology, ontology, and methodology (Tubey, Rotich, & Bengat, 2015), as different paradigms have various perspectives on how knowledge is constructed and assessed, and ultimately what constitutes reality. Consequently, this had implications for this research study in relation to how the obtained knowledge was studied and interpreted. The research paradigm adopted for this research study was interpretivism, which is explored in relation to its epistemology, ontology and methodology.

3.2.1 Epistemology

Epistemology refers to how knowledge is created (Burton, Brundrett, & Jones, 2008), and according to the interpretivist paradigm, knowledge-building is considered a democratic process whereby knowledge is socially constructed (Burton et al., 2008). Through social construction, individuals create subjective accounts and meanings of their experiences thus allowing for various perspectives to be acknowledged (Creswell, 2009). In this research study, data was extracted from teachers, as participants of this study, by interacting with them and determining their perception of their level of ICT knowledge, their attitude towards ICT integration, as well as gaining their accounts of how they were prepared and supported during

the ICT integration process. In addition, data was also obtained from school principals by interacting with them and gaining their accounts of the role that they played in preparing and supporting teachers in their school. This process of gaining knowledge can be considered a democratic process as all the participants' accounts were acknowledged and given credit in order to gain knowledge and more insight into the status of teachers' readiness to integrate ICTs into their classroom.

3.2.2 Ontology

Next, ontology is understood as what defines reality; according to the interpretivist paradigm, reality is considered a construct that is continuously changing and that has various dimensions (Burton et al., 2008). In this research study, reality was considered a product of teachers' and school principals' accounts of their own personal experiences, which gave insight into teachers' ICT readiness. In other words, teachers and principals who were the selected participants of this study, gave meaning to a particular situation, and the researcher, who was also an active meaning maker, made sense and interpreted their accounts to gain understanding of reality.

3.2.3 Methodology

Lastly, methodology refers to the practices used to gain knowledge (Krauss, 2005). Within the interpretivist paradigm, knowledge is predominately gained by means of interacting with individuals and asking them open-ended questions (Creswell, 2009), essentially to gain qualitative data (Burton et al., 2008). In this research study, the researcher interacted with the research participants to gain knowledge about teachers' ICT knowledge and attitude, as well as the preparation and support given and received. Conducting interviews with the research participants was the predominant approach through which knowledge was gained, which entailed open-ended questions, and resulted in qualitative data. Through gaining qualitative data, the subjective experiences and views of the research sample offered useful insight into the journey and challenges entailed in the integration of ICTs into the teaching and learning process.

3.3 Research design

A research design can be described as the, "procedures for collecting, analysing, and reporting research" (Creswell, 2012, p. 627). There are various research designs, such as case studies, surveys, experimental designs, ethnography and ethnographic research designs,

grounded theory designs, and narrative designs (Bell, 2010), as well as correlational, mixed methods and action research designs (Creswell, 2012). The research design selected for this study was a case study approach, which is described “as an in-depth, multifaceted investigation...of a single social phenomenon” (Feagin, Orum, & Sjoberg, 1991, p. 2). There are various types of case study designs which include the single case study, the collective case study (also known as a multiple case study), and the intrinsic case study (Creswell, 2013).

The single case study is focused on investigating a particular phenomenon and uses one individual case to illustrate and explore the selected phenomenon (Creswell, 2013). A single case study can also be used to test a particular theory in relation to verifying, challenging or expanding it (Yin, 2013). Next, the collective case study also selects a particular phenomenon to investigate, but uses various case studies to explore the phenomenon. The case studies selected can take place either within a single research site or various research sites (Creswell, 2013). By using various cases, a collective case study is considered more time consuming and demanding (Yin, 2013). The intention of a collective case study is usually to extend a particular theory, but also to make comparisons between cases (Fouché, 2005). Lastly, the intrinsic case study is where the researcher focuses specifically on the case usually because it presents a unique and interesting case (Creswell, 2013). Essentially, this can be with the purpose of revealing information and gaining more insight about the specific case. It is evident that each of the case study designs has a different purpose, which should be considered in relation to the purpose and goals of each unique research study.

This research study adopted a collective case study approach, as two case studies were used to explore a particular phenomenon. The case in this research study was targeted at exploring ten teachers overall readiness to integrate ICTs into the teaching and learning process, which was the main purpose of this research study. These ten teachers consisted of four teachers ranging from grade 1-7 in a primary school and four teachers ranging from grade 8-12 in a high school, which are both situated in Gauteng. The case in this research was focused on teachers from both a primary and high school as it gave insight into teachers’ ICT readiness across both schools and essentially across high school and primary school teachers. The case in this research was focused on exploring teachers’ ICT readiness by focusing on four areas. The first area focused on assessing the selected teachers’ level of TPACK knowledge which gave insight into how competent they considered themselves to use ICTs. The second area

focused on exploring the selected teachers' attitude towards ICT integration into the teaching and learning process. The third area focused on exploring the type of training that the selected teachers received to acquire the requisite ICT knowledge. The last area focused on exploring the role played by the school principal in the selected primary and high school to gain insight into how school leadership contributed to ensuring that the teachers in their school were ICT ready. Understanding the specific case in this research gives light to some of the spatial and temporal boundaries associated with this research study. The spatial boundaries were that only eight teachers, two school principals and two schools (a primary and high school) were part of this research study. This meant that the study was small scale and was limited to a very small number of teachers, school principals and schools in comparison to the broad and complex Gauteng education system. In addition, the temporal boundaries were that this research study was limited to a timeframe, which meant that the data collection period and research process was not an ongoing process but needed to be completed to meet certain deadlines.

Despite the spatial and temporal boundaries, the purpose for adopting a collective case study approach was that firstly, through the use of two case studies, the researcher could gain more insight into the extent to which teachers were ready. Secondly, comparisons could be made between the two cases as one case was focused on a primary school and the other a high school. Thirdly, an underlying motivation for this study was to explore the Department of Education's (2004) policy goal that all teachers were to be ICT capable by 2013. By having both government primary and high school teachers as participants of this study, the achievement of the policy goal could be explored on a larger scope. Lastly, a case study approach also made it possible to explore the research area using a variety of research methods (qualitative and quantitative) (Thomas, 2010; Fouché, 2005), which was discussed in more depth in the next section.

3.4 Research methodology

A research methodology is described as “a way to systematically solve the research problem” (Kothari, 2004, p. 8) in relation to the “forms of data collection, analysis and interpretation that researchers propose for their studies” (Creswell, 2009, p. 233). Approaches to solving the research problem are mainly explained in relation to qualitative, quantitative or mixed methodological research approaches. Qualitative research is explained as research that aims to investigate human action from the researcher's perspective (Babbie & Mouton, 2009).

Whereas, quantitative research is explained as research “that examines the relationships between variables by collecting and analysing numeric data expressed in numbers or scores” (Clark & Ivankova, 2016, p. 4). The final approach, a mixed methodology, is defined as research that “combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration” (Johnson, Onwuegbuzie, & Turner, 2007, p. 123). Within this research study, a qualitative research approach was adopted, and is explained in more detail below.

Qualitative research entails “research that elicits participant accounts of meaning, experience or perception. It also produces descriptive data in the participant’s own written or spoken words” (Fouché & Delport, 2005, p. 74). Through gaining descriptive data, the focus is on describing the research phenomenon under investigation and then aiming to understand the phenomenon (Babbie & Mouton, 2009). Through description and understanding, qualitative research aims create a holistic account of a research phenomenon based on the research participants’ accounts of reality (Creswell, 2009). Clark and Ivankova (2016) argue that the researcher’s purpose for conducting a study should directly influence the decisions a researcher makes about the selected methods of the study. A qualitative research methodology was relevant to this study, as a key aim of this study was to create a holistic account of teachers’ ICT readiness. A holistic account was created by gaining multiple perspectives (from teachers and principals) and gaining insight into various factors pertinent to the research area (teachers’ ICT knowledge and attitude, ICT training received and the role of school principals). In order to gain insight into teachers’ ICT readiness, this study focused on the research participants’ accounts of their experiences and perceptions regarding ICTs, which described and gave meaning to the research phenomenon.

The research study adopted a qualitative research approach. However, Silverman (2010) argues that the researcher should adopt a pragmatic approach when conducting research by choosing relevant approaches to the research study. By choosing a relevant approach, the nature and aim of the research should guide the researcher’s decisions, especially in relation to generating relevant data for the research study (Silverman, 2010). In relation to data generation methods which is discussed below, the researcher has decided not only to use a qualitative data generation method, but also a predominately quantitative data generation method (a questionnaire). The study was still qualitative rather than a mixed methods study,

as the study only used numeric data to support qualitative data relevant to two research questions. Bazeley (2004) argues that a mixed methodology study is considered to extend beyond simply the methods adopted in a study, but also relates to the type of study, the aim of the study, the sort of reasoning used, the approach to analysis, the method of explaining and the research paradigm adopted for the study.

3.5 Research Sampling

Sampling refers to the method of selecting the sample, which in qualitative research is also signified as the selected participants for the research study (Kothari, 2004). The sample relates to a subdivision of the target population, which the researcher intends to investigate with the intention of better understanding the target population (Creswell, 2012). A researcher can choose between two main types of sampling strategies: probability sampling, which entails randomisation, and non-probability sampling, which does not entail randomisation (Burton et al., 2008; Strydom, 2005). Probability sampling can entail random sampling, stratified sampling, (Burton et al., 2008), systematic sampling, cluster sampling, and panel sampling (Strydom, 2005), whereas non-probability sampling can entail purposive sampling, quota sampling, snowball sampling (Burton et al., 2008; Strydom, 2005), accidental sampling, target sampling, spatial sampling, and dimensional sampling (Strydom, 2005). It is evident that there are various sampling strategies from which to choose, and within this study purposive sampling was selected.

Purposive sampling can be explained as intentionally selecting a research sample, due to the sample having criteria suitable to the research questions, and based on being the bearers of useful data that is needed for a study (Creswell & Plano Clark, 2006). By intentionally selecting a sample, the judgement of the researcher is largely influential (Burton et al., 2008; Strydom, 2005). It is influential as the researcher selects a sample that he/she thinks is representative of the target population (Strydom, 2005) and who have particular characteristics needed for the research study (Burton et al., 2008). Understanding what is meant by purposive sampling helps in exploring the relevance of purposive sampling to this research study.

Within this study, two Gauteng schools – one a primary school and the other a high school – were chosen to participate in the research study. These two schools were located in Johannesburg (a city in Gauteng) and were selected on the basis of having implemented ICTs

into their teaching and learning practices. These schools were also selected on the basis of having teachers who have received ICT training, and which were within easy travel distance for the researcher, in order to gather the relevant data required for the study. Selecting schools that had these characteristics was necessary due to the purpose of the research, which was targeted at exploring teachers' ICT readiness. This meant that schools that were actively using ICTs and that had teachers that were exposed to ICT training was key. In addition, from each school five teachers who taught different grades (i.e., grades one to seven in the primary school and grades eight to twelve in the high school) were selected. The teachers from the primary and high school were selected on the basis of having conversations with a few teachers from each school and gaining insight about various factors. These factors included each teacher's exposure to ICT devices, their competencies in using ICT devices for personal uses, their competencies in using ICTs for teaching and learning purposes, their willingness to learn about ICT devices, their attitude towards the integration of ICTs into the teaching and learning process and their willingness to participate in the research study. Once some insight was gained, five teachers from each school were selected based on having different ICT competency levels, different exposure to ICT devices, different approaches to learning about ICT devices, different attitudes towards the ICT integration process and different views on their willingness to integrate ICTs into the teaching and learning process. Selecting the research sample on this basis allowed the researcher to gain useful insight into what factors inhibited and what factors contributed to teachers' ICT readiness.

These teachers were also selected so as to have a research sample comprising of a mix of genders, age ranges, races, qualifications, teaching experience and teaching subjects to take part in the study. The purpose of choosing a mix of teachers with mixed characteristics was that it revealed useful information and relationships between the above-mentioned dimensions and teachers' ICT readiness. In addition, it allowed the researcher to get a sample that was as representative of the target population, which was government high school and primary school teachers in Gauteng. Selecting these teachers as representatives was important as the policy goal that was explored in this study stated that all teachers were to be ICT competent, which entailed that the target population consisted of *all* teachers of different teaching phases, races, cultures, genders, ages, and ICT competencies (among others). Apart from teachers, the school principal from each school was also selected, so as to gain valuable insight about the role he/she has played in contributing towards ensuring teacher ICT readiness. Selecting these schools along with the teachers and school principals allowed the

researcher to explore cases that have useful and abundant information pertaining to the particular research area and ultimately the research purpose (Thomas, 2010).

3.6 Data generation methods

Data generation can be explained as a process of “gathering information by administering instruments through asking people questions or observing their behaviours” (Creswell, 2012, p. 618). Alternatively stated, data generation can be understood as the process of gathering data from the research sample, by means of either qualitative or quantitative data generation methods. Some of the qualitative data generation methods that may be used include observations, interviews, analysing qualitative documents, or audio and visual materials (Creswell, 2012). In contrast, quantitative data generation methods include questionnaires, checklists, indexes, and scales (Delpont, 2005). Bell (2010) argues that there are cases where qualitative researchers use quantitative data generation methods, as a result of the data required for the study. Within this study, both quantitative and qualitative data generation methods were employed: questionnaires (a quantitative method, as described above) were used to support semi-structured interviews (a qualitative method). These methods are explored in more depth in the sections that follow.

3.6.1 Questionnaires

Questionnaires entail a set of fixed questions or statements (Walliman, 2005) that can be used to gather facts and standardised information about a particular phenomenon (Delpont, 2005). Although data was generated from teachers completing the administered questionnaires, reference was made to the term research participant and not research respondent, as a qualitative research methodology was adopted in this study. The format of a questionnaire is considered as important as its contents (Delpont, 2005). The questionnaire used (see Appendix A pg.129) was divided into three sections. Section A entailed questions that enabled the researcher to gain a profile of each research participant in relation to their age, gender, qualification/s, and experience working with ICTs, among other factors. Gaining an understanding of each research participant allowed the researcher to draw useful relationships across the data, and assisted in the interpretation of the generated data. Section B entailed statements that were targeted at identifying teachers’ attitude towards ICTs, which was informed by a revised version of a Technology Readiness Index (TRI) questionnaire established by Parasuraman and Colby (2015). Section B had statements that related to the various dimensions of the TRI, which included optimism, innovativeness, insecurity, and

discomfort. The last section, Section C entailed various statements that were informed by a questionnaire established by Schmidt, Baran, Thompson, Koehler, Mishra, and Shin (2009), which was targeted at exploring teachers' TPACK knowledge in relation to the knowledge dimensions that form part of the TPACK model. Section C entailed statements that focused on three knowledge types central to the TPACK model, which included Technological Knowledge, Technological Content Knowledge and Technological Pedagogical Knowledge. Although, sections B and C were informed by established questionnaires, some of the questions were modified in relation to correcting the grammar where necessary, breaking up questions to ensure that each question focused on one idea, changing the wording in some cases to ensure that each question would relate to all teachers regardless of their teaching subject, and removing some questions that were not suitable to the aim of this research study.

Within the questionnaire, section B and C entailed various close-ended and scaled questions, which requested the participants to choose a response in relation to a rating scale (strongly disagree, disagree, undecided, agree and strongly agree). The questionnaires were delivered by the researcher to the ten teachers from the selected primary and high school. The questionnaire was explained to each participant and any questions and misunderstandings that the participants had were addressed. The participants gave their consent to disclose their identity to the researcher in the questionnaire for the purpose of analysing the data. The participants were given two weeks to complete the questionnaire, which was collected by the researcher. Concurrently, the researcher also engaged in the interview process, which is explained in the next section.

3.6.2 Semi-structured interviews

A semi-structured interview is explained as a formal discussion guided by a list of questions and topics, which still makes room for topical paths to be followed (Cohen & Crabtree, 2008). Conducting semi-structured interviews was useful, because they allowed the interviewed participants to give an in-depth explanation of what they wanted the researcher to capture, while still allowing room for the researcher to probe further and gain clarification (Scott & Morrison, 2005). Within this study, semi-structured interviews were carried out with the ten teachers from the researched primary and high schools, who also completed the questionnaires. In addition, semi-structured interviews were conducted with the principal from each school. Consequently, two interview schedules were designed; one for teachers (see Appendix B pg.135) and one for principals (see Appendix C pg.137). The teacher

interview schedule focused on extracting data related to teachers' ICT knowledge, ICT attitude, the ICT training that they had received and the role played by their school principal in supporting their ICT readiness. The principal interview schedule was focused on exploring what action the principals had taken in their schools to contribute to and ensure the ICT readiness of their teachers. Essentially, as a data collection method, interviews were suitable to this study as they enabled the researcher to find correlations between the questionnaire and interview data and dig deeper regarding teachers' ICT readiness.

The interviews that were conducted (twelve in total) ranged from 30–45 minutes in length and were all audiotaped by the researcher. It was considered necessary to audiotape the interviews as the interview time needed to be used effectively to gather relevant data, without pausing and wasting time to write down the responses from the participants. Audiotaping ensured that the nature of the interviews remained conversational by engaging with the participant and solely focusing on what was being said.

3.7 Pilot phase

As part of the research process, a pilot phase was conducted. A pilot phase can be understood as a procedure whereby the researcher tests the effectiveness of the research instruments (in this case the questionnaire and interview schedules) on a small-scale basis (Devlin, 2006; Kruger, de Vos, Fouché & Venter, 2005). The questionnaire used in this study was distributed to five teachers, who were exposed to ICTs and integrated them into their classroom. The five teachers who were selected to be part of the pilot phase were representative of the research sample, as the researcher made sure that they were in-service teachers, and that they had variations in gender, age, teaching subject, and competency levels in ICT use. In addition, the teachers were given a similar timeframe to complete the questionnaires (two weeks), so as to ensure that the pilot phase was similar and representative of the actual study. The teacher interview schedule was tested on five teachers and the principal interview schedule was tested on one principal. The purpose for testing both the questionnaire and interview schedules was mainly to identify any deficiencies in the data generation instruments (Strydom, 2005). Within the pilot phase, there were a number of deficiencies identified by the teachers and principal. The first deficiency identified was that some questions on the questionnaire and interview schedule were considered vague and needed to be clarified or rephrased. For example the following question in the questionnaire, "I know how to solve my own technical problems", was considered vague and consequently

was made clearer by listing possible technical problems that teachers could experience. The question was changed to the following: “I know how to solve my own technical problems (difficulty locating my files/folders, smart board/projector not connecting, difficulty connecting to the internet etc.)”. The second deficiency identified was that the length of the questionnaire was considered too long and needed to be more focused. The questionnaire was considered too long as it was identified that the same questions were being asked in different ways. For example, the researcher wanted to gain insight about the impact that technology had on teachers teaching, the following questions were targeted at this, “ICTs make me more productive” and “Technology improves my teaching”. These questions were considered repetitive and were narrowed down to the following question, “Technology makes me more efficient in my occupation”, to make the questionnaire shorter and more focused. A number of other questions in the questionnaire that were considered repetitive were removed and narrowed down to one question. A third deficiency identified was that Section A on the questionnaire (the profile section) needed checkboxes where the participants could easily tick the correct answer (e.g., male or female). Lastly, it was considered that some questions on the interview schedule were not organised logically and needed to be rearranged. For example, in the principal interview schedule it was identified that all questions relating to the school principal needed to be asked first before more in-depth questions about how teachers were trained to become ICT competent were asked. All input and concerns were taken into account and the necessary changes were made to ensure more accurate and effective research instruments were used in the study.

3.8 Data analysis

Data analysis can be described as the process of categorising, ordering, manipulating and summarising the data received, so as to gain meaning and move towards answering the research questions (Kruger et al., 2005). The data analysis process involved both interview and questionnaire data.

3.8.1 Interview data analysis

The interviews conducted were audiotaped, and the first data analysis step carried out was to transcribe the data. Transcribing the data entailed changing the audiotaped recordings of the interviews into written/taped-out data (Creswell, 2012). Once the data was transcribed, the researcher engaged in a process of thematic analysis, which is described as a “method for identifying, analysing and reporting patterns (themes) within data.” (Braun & Clarke, 2006,

p. 6). The purpose of thematic analysis is considered to provide detailed information about particular themes, instead of providing large amounts of unorganised general information when discussing and presenting the collected data. There are several types of themes that can be identified in qualitative data. These themes include ordinary themes, which relates to information that is expected to be captured about a particular phenomenon; unexpected themes, which relates to an area/topic that the interviewed participants bring up that is attention-grabbing; major themes, which entails information that relates to a major idea pertinent to the research; minor themes, which relates to information that supports major themes identified in the data; and themes related to an area/topic that the interviewed participants bring up most frequently (Creswell, 2012).

For this research study, thematic analysis was useful as it reduced the voluminous heaps of transcribed data into manageable themes that could be better analysed. Through identifying themes, the data was organised according to the different research questions part of the study, which facilitated the process of answering the main research question. Consequently, themes were identified in relation to the following research areas: teachers' level of ICT knowledge, teachers' ICT attitude, the ICT training that teachers received, and the role of school principals in ensuring teachers' ICT readiness. Exploring the research participants' input regarding these areas resulted in a more focused and useful way to organise and present the captured data, so as to answer the research question.

3.8.2 Questionnaire data analysis

To analyse the questionnaire data captured, a statistical programme called Statistical Package for the Social Sciences (SPSS) was used. The first step the researcher carried out was to code the questionnaire responses received. Coding entails a process of assigning numbers to captured data, so as to cluster key information and move towards understanding the data and drawing conclusions (Bell, 2010). The coded data was entered into an Excel spreadsheet, which was entered into the SPSS programme. The entered data was then analysed by means of calculating a grouped frequency distribution for various groups of statements, which related to the different dimensions explored in the questionnaire. Statements were grouped according to the following dimensions: Technological Knowledge, Technological Content Knowledge, and Technological Pedagogical Knowledge, which are knowledge dimensions that form part of the TPACK model. In addition, statements were also grouped according to

the dimensions of the TRI, which included optimism, innovativeness, discomfort and insecurity.

A grouped frequency distribution allowed the researcher to condense the data generated into class intervals (which in this study were grouped questions in relation to each dimension) (Spatz, 2007). In relation to each set of grouped questions, the researcher was able to identify how many times each research participant selected a particular response (Strongly Agree, Agree, Undecided, Disagree, or Strongly Disagree). Identifying how many times a participant selected a particular response in a set of grouped questions allowed the researcher to determine if a teacher had majority of his or her responses ranging in the Strongly Agree and Agree categories, the Undecided category or the Disagree and Strongly Disagree categories. Teachers who had majority of their responses ranging in the Strongly Agree and Agree categories indicated some level of ICT knowledge in the relevant ICT knowledge dimension (TK, TCK or TPK). Teachers who had majority of their responses ranging in the Strongly Disagree and Disagree categories indicated a lack of ICT knowledge in the relevant ICT knowledge dimension (TK, TCK and TPK). In addition, teachers who had majority of their responses ranging in the Undecided category indicated uncertainty regarding their level of ICT knowledge in the relevant ICT knowledge dimension (TK, TCK and TPK).

The researcher was also able to determine a teacher's attitude towards the ICT integration process. If a teacher had responses that mainly ranged in the Agree and Strongly Agree categories, in relation to each TRI dimension (optimism, innovativeness, discomfort, insecurity), this indicated that he/she considered himself/herself as being optimistic, innovative, insecure or uncomfortable regarding the use and integration of ICTs. In contrast, if a teacher had responses that mainly ranged in the Disagree and Strongly Disagree categories, in relation to each TRI dimension (optimism, innovativeness, discomfort, insecurity), this indicated that he/she considered himself/herself as not being optimistic, innovative, insecure or uncomfortable regarding the use and integration of ICTs. If a teacher had responses that mainly ranged in the Undecided category, in relation to each TRI dimension (optimism, innovativeness, discomfort, insecurity), this indicated uncertainty regarding whether he/she considered himself/herself as being optimistic, innovative, insecure or uncomfortable regarding the use and integration of ICTs.

3.9 Trustworthiness of the study

Lincoln and Guba (1985) argue that qualitative research that is of a good quality, and that has findings that are neutral, is based on the principle of trustworthiness. Lincoln and Guba (1985) present criteria that should be considered by researchers to ensure that their research is trustworthy. These criteria, which were considered in this research study, entail ensuring that qualitative research is credible, transferable, dependable, confirmable (Lincoln & Guba, 1985), and authentic (Lincoln & Guba, 2000). These concepts (credibility, transferability, dependability, confirmability and authenticity) are discussed below in relation to this research study.

3.9.1 Credibility

Credibility of a study refers to the researcher's ensuring that he/she paints an accurate picture of the research phenomenon being studied (Shenton, 2004). An accurate picture entails ensuring that the participants' account of reality is properly reflected in the research study (Babbie & Mouton, 2009). Providing an in-depth description of the setting, complexities, population and other parameters that are considered applicable is an approach to ensure that an accurate picture is painted (De Vos, 2005). The researcher ensured that the data generation methods (interviews and questionnaires) made room for gaining additional background information from the research participants. This additional information was in relation to gaining insight into their exposure to ICTs, the school context in which they teach and are expected to integrate ICTs, and their ICT qualifications, among other information. Gaining additional background information allowed the researcher to present the conditions and context within which the research participants operate, which allowed for a more accurate picture to be painted regarding teachers' ICT readiness.

In addition, in order to ensure credible information, Shenton (2004) proposes that efforts should be made to ensure that the data received from the participants is accurate. Within this study, the researcher ensured that the research participants voluntarily agreed to take part in the interview and questionnaire process, were informed that they are not obligated to respond to all questions, and were assured that their responses would be kept confidential. These approaches helped in ensuring that the research participants felt comfortable to share their true accounts and experiences without feeling threatened. These approaches also prevented participants' feeling obliged to answer questions that they did not want to and consequently providing inaccurate information. The researcher also ensured that during the interviews the

participants' responses were constantly rephrased, so as to ensure that their responses were properly captured. Rephrasing participants' responses during the interview allowed the participants to clarify their responses, correct the researcher's interpretation of the data, and ensured authenticity of the data captured.

In relation to ensuring that the data received was accurate, the researcher also ensured that the research instruments (interview schedule and questionnaire) yielded the required and correct data for the study. The interview schedules and the questionnaire used in the study were checked by informed and experienced researchers (supervisor and co-supervisor), as well as by teachers and a school principal (as part of the pilot phase). Through this process, valuable insight was offered regarding whether the questions included would yield the insight that was targeted. Those questions that were deemed not fit were removed. In addition, questions that were considered unclear were reworded to ensure that the participants understood what was being asked, and questions were also separated to ensure that each question focused on only one idea/concept. Essentially, the researcher gained the targeted data by ensuring that the interview schedules and the questionnaire used were designed effectively, the questions asked were clear and direct and the participants clearly understood what was asked of them.

Triangulation was another important approach that was adopted to ensure that the study was credible. Triangulation refers to the process of using various data collection methods, research participants and types of data to corroborate (confirm) research findings (Creswell, 2012). In this study, two types of participants (teachers and principals) and two data collection methods (questionnaires and interviews) were used to gain data relating to teachers' ICT readiness. Two data collection methods were used to ensure that the findings gained about teachers' overall readiness for ICT integration in the teaching and learning process were similar, and consequently valid.

3.9.2 Transferability

Transferability can be understood as the extent to which the findings of one research study can be applicable to other settings (De Vos, 2005). It is considered that in qualitative research, transferability is considered more problematic than in the case of quantitative research, due to the notion that different settings have unique contexts (De Vos, 2005; Shenton, 2004). In other words, qualitative research is often carried out in a particular context, with particular participants, which places limitations on the applicability of a study

to other settings. However, De Vos (2005) and Shenton (2004) propose certain approaches that can be taken within research to help other researchers determine the extent to which research findings are applicable to their studies. These approaches were adopted in this research study and are now explained. Within this study, the researcher ensured that descriptions were given regarding how many schools participated in this research study, and where these two schools were located. In addition, the researcher ensured that information was given regarding the participants that were to be involved in the study, in relation to how many participants and what characteristics these participants needed to have that were key to the purpose of the study. Not only were the participants discussed, but the interview and questionnaire process were discussed in depth in relation to the interview schedules and questionnaires that were used, the number of interviews conducted and questionnaires completed. Through these descriptions, the researcher ensured that other researchers would be able to clearly understand the nature of the study, which would facilitate in the process of assessing the transferability of the study to their own contexts. In addition, De Vos (2005) argues that if a study uses various participants, various data generation methods and more than one case study, as this study has done, then this is likely to enhance the utility of this study to other settings.

3.9.3 Dependability

Dependability refers to the stability of the research study and findings in different conditions and across a period of time (Elo, Kääriäinen, Kanste, Pölkki, Utriainen, & Kyngäs, 2014). In other words, dependability relates to the idea that if the research study were to be repeated with the same or similar research participants and context then similar findings would be generated (Babbie & Mouton, 2009). In qualitative research, the social world is always changing and constantly needs to be constructed (Strydom & Delpont, 2005), therefore ensuring that the study is dependable is not as easy as is in the case of quantitative research. However, it is considered that the concepts credibility and dependability are very closely linked and ensuring that research is credible is likely to influence how dependable the research is (Babbie & Mouton, 2009). Apart from the approaches that were adopted in the research study to ensure credibility and essentially dependability of the study (see the discussion under Credibility above), the researcher also adopted what is termed an inquiry audit. An inquiry audit entailed persons more knowledgeable (in this case the supervisor and co-supervisor) assessing the dependability of the study in relation to the interpretation of the data, the findings drawn, and the recommendations presented. The researcher ensured that the

supervisor and co-supervisor checked that these aspects (interpretation of data, conclusions drawn and recommendations presented) were informed by and directly in relation to the generated data.

In addition, the researcher ensured that the questionnaire and the various items in the questionnaire consistently measured teachers' ICT attitude and knowledge. The questionnaire was measured in relation to Cronbach's alpha, which is a measure of internal consistency, portrayed as a number between 0 and 1 (Devlin, 2006). A dependable questionnaire is considered to score between 0.70 to 0.95 (Tavakol & Dennick, 2011). The average score of all the items in the questionnaire used in this study was 0.948 (see Appendix E pg.142), which suggested that the questionnaire yielded consistent data and was a reliable research instrument.

3.9.4 Confirmability

Confirmability relates to whether the findings of a research study reflect the real experiences of the research participants, instead of the researcher's personal bias and preferences (Shenton, 2004). In ensuring confirmability, the researcher made sure that his/her voice was clearly distinguished from that of the research participants. In order to ensure that the distinction is clear, the researcher used quotations when presenting the collected data to show the research participants' direct views. In addition, the researcher ensured that more experienced researchers (supervisor and co-supervisor) checked the accuracy of the research to ensure that the researcher's personal bias did not interfere with the findings and conclusions drawn in the study.

3.9.5 Authenticity

Authenticity refers to how worthwhile and beneficial the conducted research is to the research participants and to the wider social community (Given, 2008). An important principle part of ensuring authenticity is considered fairness, which entails the participants' having an active and equal role to play in the research process (Given, 2008). Within this research, the researcher ensured that the research participants were given a platform to share their voices actively. This platform was not only during the completion of questionnaires and during the interviews that were conducted, but throughout the entire process. The researcher allowed the participants to give feedback and ask questions before, during, and after the research process. The type of feedback that was asked of participants included their input on

aspects such as what they think ICT training should focus on, which largely informed the theoretical framework designed for this study (see Chapter Two). Input was also gained on how the research process and instruments could be improved (especially during the pilot phase), which was used to improve the research study. Giving the research participants a platform allowed them to contribute authentically to the knowledge-building process and have their input represented in the research.

The next two principles, which were relevant and considered to increase the authenticity of research is ontological and educative authenticity (Given, 2008). Ontological authenticity refers to the extent to which the research participants better understand the research phenomenon and social context being studied, and educative authenticity refers to the extent to which the researchers are better informed about themselves and other stakeholders (Given, 2008). Within this study, these two principles were considered by getting input from the research participants (school principals) regarding how the teachers within their school perceive ICT integration into teaching and learning. By getting the principals' input regarding this area, the research could encourage other heads of schools (who are instrumental in the ICT integration process in schools) to reflect on the teachers who are part of their school, and their overall inclination to ICT use. Getting principals to reflect and be more aware of teachers' ICT attitudes could promote others in their position to take action, which could lead to better ICT integration within their schools. In addition, as part of the research process, the completed research report was made available to the schools selected to take part in the study, as well as the Department of Education. Consequently, this could result in informing the relevant stakeholders, and providing insight into the ICT integration process in schools, as well as what efforts can be made to enable teachers to integrate ICTs effectively in the classroom.

3.10 Ethical issues

Research ethics entails the researcher's being open and direct about the nature of the research agreement between the researcher and the research participants (Blaxter, Hughes, & Tight, 2006). The agreement can be in relation to gaining consent and reaching consensus on how the research data was to be used and reported (Blaxter et al., 2006). In order to have a better understanding of this agreement, there are various professional ethics and standards of conduct that should be considered (Bell, 2010; Burton et al., 2008), governed by ethical principles, especially when human beings are the object of study (Strydom, 2005). Ethical

codes of practice are also mandated by educational institutions (Bell, 2010), which leads to the researcher's journey in taking ethical considerations into account. The first step the researcher engaged in was to gain ethical clearance from the Research Office at the University of the Witwatersrand. Obtaining ethical clearance involved the researcher's submitting various documents and the research proposal to the Research Office, which informed the Research Committee of research intentions in relation to the selected participants, research methodology, data generation and analysis methods, and research timeframe, among other considerations. Once the Research Office reviewed all the relevant information, the researcher was granted ethical clearance (see Appendix E pg.142), which verified that the research to be conducted was appropriate and acceptable and would not harm the selected participants in any way. Thereafter, the researcher applied for permission from the Gauteng Department of Education, who granted the researcher permission to conduct the research at the selected government high school and primary school (see Appendix F pg.143). Being granted permission from the Department of Education allowed the researcher to move to the next step, which was to engage directly with the selected schools.

This direct engagement with the schools meant that the researcher needed to take additional ethical principles into account, which included respect for persons, beneficence, and justice (Blaxter et al., 2006; Strydom, 2005). These principles were essential in ensuring that the researcher carried out the research in an ethical manner. The first principle is respect for persons, which refers to safeguarding the autonomy and guaranteeing informed and voluntary participation (Strydom, 2005). In relation to this principle, the researcher gained permission from the school principals concerning conducting research in their schools, as well as requesting their participation in the research (see Appendix G pg.145). In addition, the researcher also requested participation and gained permission from the selected teachers in each school (see Appendix H pg.149). In gaining principals' and teachers' permission, the researcher ensured that the research participants were fully informed regarding the nature and purpose of the study, the anticipated time requirements, the interview and questionnaire process, and how the research data was to be used. In addition, the research participants were informed and assured that their identity and the identity of their school would be kept confidential at all times and in all academic writing about the study. Confidentiality was maintained through the use of pseudonyms. Finally, the participants were informed that their participation in the research was voluntary and consequently they were invited to participate and give their consent to complete the questionnaire and engage in an interview that was to

be audiotaped. In relation to the audiotaped interviews, the research participants were informed that the audio recordings were to be stored on a password-protected laptop and were going to be destroyed after they had been transcribed. Through considering these ethical issues, the researcher ensured that the autonomy of the research participants was protected and that informed and voluntary participation was achieved.

The next two principles were beneficence, which refers to not mistreating the participants in any way, building on the benefits, and reducing the risks involved in participating in the research (Blaxter et al., 2006); and justice, which entails ensuring that the research risks and benefits are justly and fairly spread (Strydom, 2005). Within this research, the purpose was largely to explore teachers' ICT readiness, focusing specifically on the areas of ICT knowledge, attitudes and training, as well the support that teachers had received from their school principal. The researcher considered the principles of beneficence and justice as these research areas and the associated questions to gain insight into these areas were not considered harmful in any way to the research participants. The biggest risk that was incurred in participating in this research was that time needed to be sacrificed to engage in the research process. However, the researcher ensured that the interview and questionnaire process was conducted at the convenience of the participants. Not only was the possible risk incurred of a minor nature (sacrifice of time), but the benefits to the research participants and schools (even ICT training programmes) were potentially far more valuable and included a greater understanding of teachers' ICT knowledge, attitude and ultimately readiness levels to integrate ICTs into the teaching and learning process.

3.11 Limitations of the study

Limitations of a research study can be understood as some of the drawbacks of a study that can have implications on the findings and conclusions drawn (MacFarlane, Veach, & LeRoy, 2014). Within the research process there were considered to be various limitations (Fouché, 2005). It can be considered important to highlight the limitations of a research study, as this could encourage the researcher, as well as future researchers to reflect on how to manage and overcome certain limitations. This could result in more valid research. Within this research study, time constraints were a major limitation, as this meant that certain deadlines had to be met, which placed limitations on the sample size that was selected for the study and ultimately the chance to gain more in-depth insight into the research area. However, the researcher aimed to keep the study as focused as possible to ensure that a reasonable sample

size could be selected and that the purpose of the research could still be achieved, so as to offer useful insight into the research area.

Another limitation was that the study relied on self-reported data. Relying on self-reported data meant that in the questionnaires and interviews, participants were expected to give their own personal insight relating to teacher readiness to integrate ICTs. The accuracy of the responses received could not always be guaranteed. However, the researcher adopted various approaches, such as triangulation (aimed at corroborating findings), rephrasing (aimed at clarifying responses), and probing (aimed at getting deeper explanations) to ensure that the research participants' responses were as accurate as possible. The next limitation was that using a case study approach meant that the study was small-scale and, although it provided an interesting account into teacher readiness to integrate ICTs, it was limited and could not be generalised across contexts. However, even though this research study was small-scale, it could still provide valuable information about the targeted population. As a result of these limitations, it will be beneficial to conduct further research into this research area. Further research can provide a more extensive and complete picture of whether teachers are ready or not to integrate ICTs into the teaching and learning process.

3.12 Chapter summary

This chapter explored the research design and methodology that was used to conduct the study. In exploring the design and methodology, various components were discussed, including the research paradigm, design, methodology, population, pilot phase, data generation, and data analysis methods. In addition, issues of trustworthiness, ethical considerations, and the limitations of the study were explored. The next chapter presents and analyses the data that was generated from the two researched schools.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

The previous chapter explored the research design and methodology that governed how the study was conducted. The study was conducted primarily by using interviews and questionnaires (to support qualitative findings) to gain the required data. This chapter presents a discussion and analysis of the generated data in relation to the research questions and identified themes. The data that is presented in relation to each research question, is analysed by interweaving the theoretical foundations that underpinned the study (explored in Chapter One), existing literature related to the research topic, and the established theoretical framework (both explored in Chapter Two). These components were used as an analytical lens to gain a deeper understanding of all the dimensions pertinent to teachers' readiness for the integration of ICTs into teaching and learning.

4.2 Data presentation and analysis

The data generated from the research study is presented in relation to the following research areas: (1) Teachers' level of ICT knowledge; (2) Teachers' attitudes towards ICT integration into the teaching and learning process; (3) The type of ICT training that in-service teachers have received to acquire the requisite ICT knowledge; and (4) The role played by school principals in contributing towards teachers' ICT readiness. Before the data is presented, it is important to provide findings regarding the profile of each of the researched schools and research participants. This is in order to establish a context in which the generated data can be better interpreted. Further, in line with ethical principles of anonymity, the names of all participants (including the names of the schools) used in this study and the discussion below are pseudonyms.

4.2.1 Profile of the researched schools

Table 1 below presents a profile of the researched schools that participated in the research study in relation to various categories.

Table 1: Profile of the researched schools

	Hout River Primary	Zora Secondary School
Type of school	Government primary school	Government high school
School location	Situated in Gauteng Province	Situated in Gauteng Province
School enrolment and background of learners attending the school	About 1300 multicultural learners mainly from urban areas	About 1700 multicultural learners mainly from urban areas
Main source of funding	Fee-paying school and government subsidy	Fee-paying school and government subsidy
School performance	Well performing school	Well performing school
ICT school resources and facilities	ICT resources and facilities are readily available and internally provided.	ICT resources and facilities are readily available and internally provided.

The two selected schools were largely similar in relation to some of the categories (location, learner background, funding, school performance, and ICT resources and facilities) discussed. The major difference between the two schools was that one was a high school and the other was a primary school. Having generated data from schools that have largely similar school contexts and capacity enabled the researcher to better analyse the data. The data was better analysed by comparing and contrasting approaches adopted by each school, which contributed to facilitating teachers' ICT readiness.

4.2.2 Profile of the research participants

Table 2 below presents a profile of each of the research participants part of the research study. The participants included ten teachers, which constituted five teachers from Hout River Primary School and five teachers from Zora Secondary School. In addition, the school principal from each school also participated in the study, making a total of twelve participants.

Table 2: Profile of the research participants

Participant	Gender	Race	Age Range	Year of Teaching Qualification	ICT Qualification	School Type	Position	Teaching Subject/s	Teaching Grade/s	No. of years of Teaching Experience
Mrs. Woldman	Female	White	51-60	1985	No	Primary School	Teacher	Maths English Afrikaans LifeSkills	Grade 3	31
Miss Stanfield	Female	White	20-30	2010	No	Primary School	Teacher	Maths	Grade 4	4
Mrs. Pather	Female	Indian	41-50	1993	Yes	Primary School	Teacher	Natural Science	Grade 7	23
Mrs. Chetty	Female	Indian	31-40	2000	Yes	Primary School	Teacher	Natural Science Technology	Grade 5	16
Miss Augustus	Female	Coloured	20-30	2013	No	Primary School	Teacher	Social Science	Grade 5 Grade 6	3
Mr. Ephraim	Male	Coloured	41-50	1995	No	High School	Teacher	Mathematical Literacy	Grade 10 Grade 11 Grade 12	21
Mrs. Singh	Female	Indian	31-40	2015	No	High School	Teacher	Physical science	Grade 11 Grade 12	9
Ms. Dangazile	Female	Black	20-30	2012	No	High School	Teacher	Physical science	Grade 8 Grade 9 Grade 10	4
Mrs. Asmal	Female	Indian	31-40	2013	No	High School	Teacher	Lifesience	Grade 10 Grade 11 Grade 12	14
Mr. Kairuz	Male	White	20-30	2006	Yes	High School	Teacher	Computer technology	Grade 8 Grade 9	5
Mr. Klaasen	Male	White	51-60	1984	Yes	Primary school	Principal	X	X	32
Mrs. Marques	Female	White	51-60	1980	No	High school	Principal	X	X	43

The selected research participants possessed varying demographic characteristics, which contributed useful insights when exploring the level of ICT knowledge and ICT attitudes held by the teachers. In addition, understanding the profile of each school principal gave insight into the role that was adopted when managing ICT integration in their schools.

4.2.3 Teachers' level of ICT knowledge

The data captured relating to three ICT knowledge dimensions (Technological Knowledge, Technological Content Knowledge, and Technological Pedagogical Knowledge) is explored in the following sections.

4.2.3.1 Technological Knowledge

All of the teachers interviewed (ten in total), from both schools (Hout River Primary and Zora Secondary School), mentioned some form of exposure to ICT devices within their schools. The teachers' exposure to ICT devices included old as well as the latest technological devices, such as projectors, laptops, tablets, smartboards, smartphones, the Mimio interactive touch projector, the Mobi View handheld interactive whiteboard, and the iBox. Mrs Chetty (a teacher at Hout River Primary) explained her exposure to technological devices by saying:

The school is also very technologically advanced. We have got the white boards in the class, we have the projectors, we have got the Mimios. (Mrs Chetty)

Similarly, Ms Stansfield, another teacher from Hout River Primary, confirmed the school's exposure to technological devices when she said:

We have interactive whiteboards in all our classes and then we have two computer labs fully functional. So, we are fortunate, we are at an advantaged school. It has the resources. We are fully technological. (Ms Stansfield)

Likewise, Mr Ephraim, a teacher from Zora Secondary School, also made known the technological devices available when he said:

I've got my Samsung Galaxy Smartphone, then I have my iPad, two laptops, a tablet which I have for six years now, then I have a small Lenovo PC, then I've got my main PC, then I've got that box that I use. (Mr Ephraim)

Not only did the teachers indicate their exposure to ICT devices, but all ten teachers indicated some understanding of particular technological devices. It is evident in

Table 2 (which shows the profile of each research participant) that some teachers (namely Mrs Pather, Mrs Chetty, Mr Ephraim, and Mr Kairuz) hold an ICT qualification, which contributed to their knowledge relating to ICT devices. The remaining teachers mainly gained their knowledge from their family members and their own experimentation with ICT devices. This knowledge pertained to knowing certain aspects about the hardware and software of the device. Mrs Weldeman, a teacher from Hout River Primary, explained certain aspects about the hardware of the Mimio interactive touch projector by saying:

It's a little white device that we put into our laptop and then we can use that bit of it (pointing at the device). It even has lines so we can do handwriting. You see that white thing there (pointing at the device) it has got a pen on the left, we can even do handwriting on the board. (Mrs Weldeman)

Likewise, Mr Ephraim, a teacher from Zora Secondary School, also provided an understanding of some technological devices. However, he spoke about the software of the Mobi View ICT device by saying:

I use the Mobi View, they have got their own software. Then you have got your smart software. Then you have got your modelling software. All three do the same thing, but it has different programmes. But I see that the smart one is the easiest to link and to touch, there are not many things to worry about. You right-click, you cut and paste from one place to another, it integrates and you move on. (Mr Ephraim)

His colleague from Zora Secondary School, Mrs Singh, also shared her understanding of technological devices by saying:

I think I have a fair amount of knowledge with regards to like how computers work, like I can connect my computer and the projector and all of that. (Mrs Singh)

It was noted that despite all ten teachers revealing some understanding of technological devices in relation to their hardware or software, all ten teachers (even those with ICT qualifications) also spoke about how they lacked technological knowledge in certain areas. Considering Mr Ephraim's response above, it is evident that he showed extensive understanding of the software related to the Mobi View hand-held interactive whiteboard. However, when it came to actually using the software, a different picture was painted; he seemed frustrated at this point and said:

But to me, that Mobi View was horrible. I was computer literate, but then I sat in front of that software and I felt like an idiot basically. You don't know what to do with it. The things are not there. (Mr Ephraim)

Similarly, Mrs Asmal, also from Zora Secondary School, showed frustration by saying:

Every single thing I am so backwards in that. I wouldn't know how to start. How to put on my computer firstly. Secondly, I wouldn't know how to transfer the content. Nothing, besides putting my laptop on and connecting my projector to it, that's the only thing I know. (Mrs Asmal)

The same frustration was experienced by teachers in the primary school, as evidenced by the response from Miss Stansfield, a teacher from Hout River Primary, who said:

I didn't know anything about Excel. Nothing. And I got here and it was like I was thrown into the deep end. (Miss Stansfield)

The teachers' levels of Technological Knowledge were further examined in the questionnaire completed by all ten teachers. Some of the statements in the questionnaire that were targeted at better understanding teachers' level of Technological Knowledge (see Appendix A pg.129, Section C) included: *I know how to solve my own technical problems (difficulty locating my files/folders, smart board/projector not connecting, difficulty connecting to the internet etc.); I keep up to date with important new technological devices and I have the ability to use technical software*; among other statements. Teachers were expected to rate their level of agreement ranging from Strongly Disagree to Strongly Agree for each of these statements. Once this was done, the various statements were grouped to determine each teacher's overall response in these grouped statements. Table 3 below presents the ten teachers' responses.

Table 3: Technological Knowledge Frequency Distribution

Technological Knowledge Frequency (f) Distribution (Question 1-10)												
Participant	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree		Total	Total
	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	%	Count
Mrs Weldon		0%	5	50%	2	20%	3	30%		0%	100%	10
Miss Stansfield	4	40%	2	20%	2	20%	1	10%	1	10%	100%	10
Mrs Pather		0%	1	10%		0%	7	70%	2	20%	100%	10
Mrs Chetty		0%	3	30%	1	10%	5	50%	1	10%	100%	10
Miss Augustus	2	20%	4	40%		0%	4	40%		0%	100%	10
Mr Ephraim		0%	1	10%	1	10%	8	80%		0%	100%	10
Mrs Singh		0%	3	30%		0%	7	70%		0%	100%	10
Ms Dangazele	3	30%	3	30%	1	10%	3	30%		0%	100%	10
Mrs Asmal	3	30%	3	30%		0%	4	40%		0%	100%	10
Mr Kairuz		0%		0%		0%	10	100%		0%	100%	10

The data summarised above indicated that 50% of the teachers (five teachers in total), had majority of their responses ranging in the Strongly Disagree and Disagree categories. Responses that ranged mainly in the Disagree and Strongly Disagree categories indicated a lack of Technological Knowledge. In contrast, the remaining 50% of the teachers (five in total) had majority of their responses ranging in the Strongly Agree and Agree categories. Responses that ranged mainly in the Agree and Strongly Agree categories indicated some level of Technological Knowledge. However, since the teachers who proved to show more competence in technology related skills had responses that ranged mainly in the Agree, rather than Strongly Agree category, it can be deduced that they had a moderate rather than high level of Technological Knowledge. The findings showed an even split between teachers who considered themselves able to perform certain technologically-related functions and those who were unable to perform those functions.

4.2.3.2 Technological Content Knowledge

Not only was data generated about teachers' Technological Knowledge, but also about their level of Technological Content Knowledge. The majority of the selected teachers (six in total, which comprised of four teachers from Hout River Primary and two from Zora Secondary School) gave examples of how they used ICT devices to support the teaching of their subject content. These examples referred to different teaching subjects (Science, Biology, Geography, Computer Technology, and English) and topics within the different subjects. Mrs Pather, a teacher from Hout River Primary, gave an example of how she used ICTs and their associated software to support teaching Natural Science by saying:

In Term One when we spoke about Biodiversity and fertilisation and we spoke about plants and animals, I showed them videos of how it actually occurs and they could see. I showed them PowerPoints and that visual perspective remains in the learners' heads. Oh, I saw this, I saw what the bee was doing on the plant and the pollen and how it transfers the pollen as it flies across. So, they could relate to that and they were able to explain it, the content, from the visual perspective.

(Mrs Pather)

Another teacher, Miss Augustus, also from Hout River Primary, gave her account of how she used ICTs to support the teaching of geography in her classroom by saying:

I will have a physical map, but I also have a 3D map on the board straight from the internet. It's very interactive, especially with our smart boards. You can turn it, you can bring in a ruler and a protractor and do it together. (Miss Augustus)

Mr Kairuz, a teacher from Zora Secondary School, also used ICTs to enhance teaching his subject (computer technology) by saying:

If I am doing a formula in Excel, I can put in a data range that they have on their worksheets and I can show them how it looks. And I can show them how the formulas work and in that way, it's not unfamiliar territory to them. They can see me doing it. (Mr Kairuz)

In contrast, some teachers (the remaining 4) did not have a clear understanding of how to use ICTs to enhance their subject content. Instead, they made reference to what appeared as using technology in the classroom simply for the purpose of integrating it and not essentially enhancing the teaching and learning process. This was evident in the response given by Mrs Asmal, a teacher from Zora Secondary School:

I just use YouTube things that I find and I don't know how effective it is for the kids. (Mrs Asmal)

Another teacher from Zora Secondary School, Ms Dangazele, also indicated that she did not have a clear understanding of how to use ICTs to enhance her subject content when she said:

I have got this thing, I have the desire to use it, but merging the content and the technology is proving challenging at this point. (Ms Dangazele)

Teachers' levels of Technological Content Knowledge were further explored in the questionnaire. Some of the statements related to understanding teachers' levels of Technological Content Knowledge (see Appendix A pg.129, Section C) included: *I can choose technologies that enhance the learning of particular subject content for a lesson; I can evaluate and select new information, resources and technological innovations based on their appropriateness to specific tasks related to the subject content that I teach; and I can use tools specific to the subject content that I teach (e.g., software, simulation, environmental probes, graphing calculators, exploratory environments, web tools) to support learning and research.* Teachers were expected to rate their level of agreement ranging from Strongly Disagree to Strongly Agree for each of these statements. Once this was done, the various

statements were grouped to determine each teacher's overall response in these grouped statements. Table 4 below presents the ten teachers' responses.

Table 4: Technological Content Knowledge Frequency Distribution

Technological Content Knowledge Frequency (f) Distribution (Question 1-3)												
Participant	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree		Total	Total
	f	%	f	%	f	%	f	%	f	%	%	Count
Mrs Weldman		0%		0%	3	100%		0%		0%	100%	3
Miss Stansfield		0%		0%	2	67%	1	33%		0%	100%	3
Mrs Pather		0%		0%	1	33%	2	67%		0%	100%	3
Mrs Chetty		0%		0%	2	67%	1	33%		0%	100%	3
Miss Augustus		0%		0%		0%	3	100%		0%	100%	3
Mr Ephraim		0%		0%		0%	1	33%	2	67%	100%	3
Mrs Singh		0%		0%	1	33%	2	67%		0%	100%	3
Ms Dangazele		0%		0%	2	67%	1	33%		0%	100%	3
Mrs Asmal	1	33%	2	67%		0%		0%		0%	100%	3
Mr Kairuz		0%		0%		0%	1	33%	2	67%	100%	3

The data summarised above indicated that 40% of the teachers (four teachers) had responses that ranged mainly in the Undecided category. This showed that 40% of the teachers were unable to determine if they had Technological Content Knowledge. In other words, they were unable to determine if they were indeed effectively using ICTs as tools to support the teaching of their subject content. In addition, 10% of the teachers (one teacher) had responses that ranged mainly in the Strongly Disagree and Disagree categories, which indicated a lack of Technological Content Knowledge. Furthermore, 50% of the teachers (5 teachers) had responses that ranged mainly in the Strongly Agree and Agree categories, which indicated that majority of the teachers had some level of Technological Content Knowledge. In other words, majority of the teachers (50%) considered themselves able to use ICTs to enhance the teaching of their subject content. However, these teachers had most of their responses ranging in the Agree rather than Strongly Agree category, which suggested that they had a moderate rather than high level of Technological Content Knowledge.

4.2.3.3 Technological Pedagogical Knowledge

Another important dimension that was explored was teachers' levels of Technological Pedagogical Knowledge. From the interviews conducted, nine out of the ten teachers from both schools (Hout River Primary and Zora Secondary School) showed awareness that the

integration of ICTs has an influence on their pedagogy. Miss Stansfield, a teacher from Hout River Primary, showed awareness by saying:

And also with the technology I think there are different learners. So, you need to approach your learners in different ways. If it's visual, if it's audio, you just need to reach every learner. (Miss Stansfield)

Another teacher, Mrs Asmal, also from Zora Secondary School, showed awareness by saying:

Technology is such a new thing in the classroom, well for us. I think the teaching methods would need to be adapted slightly. (Ms Asmal)

Of the nine teachers who showed understanding of the impact that ICTs can have on their teaching and learning approaches, three of these teachers gave an actual example of the impact. Miss Stansfield, a teacher from Hout River Primary, gave the following example:

You can push content through, you can have different activities for different levels of the learners. So, the learners that are really struggling, you push the content through to their tablets. For the learners that are doing well, you give them more complex work. (Miss Stansfield)

Another example was provided by Mr Ephraim, a teacher from Zora Secondary School, who said:

You have a PowerPoint and a 10-minute question session where the learners are given clickers, they are all assigned one. We give ten-minutes before and ten-minutes after. What I like about the one system is that if I do a baseline test and there's something not answered, immediately before the lesson I have an intermission with my learners, where they struggle, where they don't struggle. And then, I can adapt my lesson accordingly. And at the end, I can do a post test, and then I can see how effective I was by comparing the two scores. (Mr Ephraim)

What was striking to note was that the majority of the interviewed teachers (eight in total) highlighted the need to learn more about how to integrate ICTs effectively into their classroom. Their need was in relation to how to use ICTs as tools that can enhance the

teaching and learning approaches adopted in their classroom. This is evident by considering this Zora Secondary School teacher's (Ms Dangazele's) response:

Yeah, I am using the iBox currently. It's a combination of a projector and a PC. At this point, I'm mainly using it as a PowerPoint presentation for like diagrams that aren't in the textbook. It's just so that the children can just, you know, get that visual stimulation. But I find it, in terms of the information in there, not very useful, because then they don't listen. Instead, they are just reading. And then you talking, and they are not listening. And then they are not understanding what they are writing anyway, so I'm having trouble using that effectively. But in terms of the simulations, with one or two classes, I ran simulations and half weren't interested, the other half were interested. So, I'm having trouble in using it in such a way that I get each and every child, at least 90% of the children interested.
(Ms Dangazele)

Another teacher from Zora Secondary School, Mrs Singh, showcased her need for learning more about how to integrate ICTs into her teaching effectively, by saying:

Different topics require different approaches, and how I use technology in a topic in Term One won't necessarily work for the topic in Term Two. So, I might need ideas, bounce ideas off someone, or guidance in how to change the angle that I am approaching it by. (Mrs Singh)

The teachers' levels of Technological Pedagogical Knowledge were further examined in the completed questionnaires. Some of the statements that were targeted at better understanding teachers' levels of Technological Pedagogical Knowledge (see Appendix A pg.129, Section C) included: *I can choose technologies that enhance the teaching approaches that I select for a lesson; I can adapt the use of the technologies to different teaching activities; and I know how to use technology to facilitate effective learning according to my learner's needs, misconceptions, prior knowledge, background etc.* among others. Teachers were expected to rate their level of agreement ranging from Strongly Disagree to Strongly Agree for each of these statements. Once this was done, the various statements were grouped to determine each teacher's overall response in these grouped statements. Table 5 below presents the ten teachers' responses.

Table 5: Technological Pedagogical Knowledge Frequency Distribution

Technological Pedagogical Knowledge Frequency (f) Distribution (Question 1-7)												
Participant	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree		Total	Total
	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	%	Count
Mrs Weldeman		0%	1	14%	1	14%	5	71%		0%	100%	7
Miss Stansfield		0%		0%	5	71%	2	29%		0%	100%	7
Mrs Pather		0%	3	43%		0%	4	57%		0%	100%	7
Mrs Chetty		0%	2	29%		0%	5	71%		0%	100%	7
Miss Augustus		0%	5	71%		0%	2	29%		0%	100%	7
Mr Ephraim		0%		0%	1	14%	6	86%		0%	100%	7
Mrs Singh	1	14%	2	29%		0%	4	57%		0%	100%	7
Ms Dangazele		0%	5	71%	2	29%		0%		0%	100%	7
Mrs Asmal	2	29%	4	57%		0%	1	14%		0%	100%	7
Mr Kairuz		0%	1	14%		0%	6	86%		0%	100%	7

The data summarised above showed that 10% of the teachers (one teacher) had responses that ranged mainly in the Undecided category. This indicated that one teacher was unsure of their level of Technological Pedagogical Knowledge. In addition, 30% of the teachers (3 teachers) had responses that ranged mainly in the Strongly Disagree and Disagree categories. This showed that 30% of the teachers had a lack of Technological Pedagogical Knowledge. Furthermore, 60% of the teachers (6 teachers) had responses that ranged mainly in the Agree and Strongly Agree categories. This showed that the majority of teachers (60%) had some level of Technological Pedagogical Knowledge. In other words, they considered themselves able to use ICTs as tools to support the teaching and learning approaches used in their classroom. The majority of teachers (60%) had all of their responses ranging in the Agree rather than Strongly Agree category, which suggested that these teachers had a moderate rather than high level of Technological Pedagogical Knowledge.

4.2.3.4 Analysis of data presented

The teachers of both Hout River Primary and Zora Secondary School were fortunate to have access to ICT devices, and in both cases the latest technological advancements. Phase One of the Department of Education's (2004) policy implementation plan focused largely on providing schools (including Gauteng schools) with access to ICT devices. It is striking to note that the provision of ICT devices to teachers who were part of Hout River Primary and Zora Secondary School were made at a school level, which meant that the Department of Education's (2004) efforts to provide schools with access to ICT devices did not reach the interviewed schools. ICT devices were largely provided personally by school teachers and

internally by the school. The researcher's underlying assumption was that if conditions in Phase One of the implementation plan were not met, then what guarantee is there that additional conditions in the other phases (Phase Two and Phase Three) were met. Failing to carry out certain conditions can have a major implication on the achievement of stated policy goals, such as teachers being ICT capable and ready for the ICT integration process. However, simply having access to ICT devices did not necessarily mean that teachers were able to use them effectively. Instead, their level of ICT knowledge appeared to be a large influence on how they used the devices that they had available.

In exploring teachers' levels of ICT knowledge, three dimensions central to Mishra and Koehler's (2006) TPACK model were explored. These dimensions were Technological Knowledge (TK), Technological Content Knowledge (TCK), and Technological Pedagogical Knowledge (TPK). Mishra and Koehler (2006) argue that teachers need to have understanding of these knowledge dimensions and should be able to apply their theoretical underpinnings when integrating ICTs into the classroom. It is necessary and important that teachers have knowledge of Mishra and Koehler's (2006) ICT knowledge dimensions, as simply having access to ICT devices does not mean that they will be used effectively. Instead, teachers need to have an in-depth understanding of how to use ICT devices, and more importantly how to use the devices as tools that can enhance teaching and learning.

It is evident from the data presented that there were variations in the research participants' levels of ICT knowledge. In relation to teachers' levels of Technological Knowledge, it appeared that all ten (100%) of the interviewed teachers had some level of understanding of certain ICT devices, either in relation to their hardware, software, or both of these areas. However, at the same time, all ten teachers (100%) showed knowledge gaps regarding certain ICT devices (hardware and software) but seemed eager to remedy this and learn more about the devices. The teachers' eagerness to learn highlighted their willingness to bridge their knowledge gaps and become more informed about the devices that can enhance their teaching. Among other factors, teachers' ICT knowledge gaps can be attributed to the fast pace at which technological devices are advancing, and consequently contributed to their need for constant development of their ICT knowledge.

The data captured from the questionnaires seemed to echo the concerns that the teachers raised in the interviews, being that they had some Technological Knowledge yet still

highlighted the need to develop this knowledge. The questionnaire data showed that 50% of the teachers (5 teachers) appeared to have moderate levels of Technological Knowledge, whereas the remaining 50% (5 teachers) seemed to have a lack of Technological Knowledge. It was concerning that a large percentage of teachers (50%) seemed to have a lack of Technological Knowledge. The concern was in relation to the theoretical underpinning of Mishra and Koehler's (2006) TPACK model. The TPACK model proposes that if teachers are to integrate ICTs into the teaching and learning process effectively, they would need to have knowledge of ICT devices (hardware and software), the affordances and constraints of the device, knowledge of how to use the device, and knowledge of how to solve their technical problems. The literature (Department of Education, 2004; Department of Education, 2007; Ertmer & Ottenbreit-Leftwich, 2010; Hew & Brush, 2007; Inan & Lowther, 2010; Ouma et al., 2013) also makes reference to some of these knowledge areas as forming part of the required knowledge needed by teachers. However, there appears to be a gap in the listed literature and the theoretical underpinning of Mishra and Koehler's (2006) TPACK model. The gap is that focus is placed on the required ICT knowledge areas, without much focus on the factors that contribute to teachers' having adequate or inadequate levels of knowledge in these areas. The researcher proposed that simply listing the required knowledge areas is not enough, but that more emphasis should rather be placed on what constrains and facilitates teachers' development of these knowledge areas. This additional insight can lead to better approaches to preparing teachers and ensuring that they have the requisite ICT knowledge to integrate ICTs into their classroom.

In relation to the next dimension, it also appeared that at least half of the teachers (50%) have moderate levels of Technological Content Knowledge. However, it was surprising to note that a large portion of teachers (40%) were unsure whether they were able to use ICTs to enhance the teaching of their subject content. These findings seemed to concur with the findings gained during the interviews, where four of the interviewed teachers (40%) showed that they did not have a clear understanding of how to integrate ICTs as tools to enhance their teaching subject. Teachers' lack of clarity highlighted the need for a baseline assessment or monitoring system that is able to evaluate how teachers use and integrate ICTs into the teaching and learning process. The established theoretical framework (see Chapter Two) proposed that through a baseline assessment, insight can be gained regarding what teachers know, what knowledge gaps they have, and essentially what level of ICT training they

require. Understanding teachers' ICT needs, problem areas, and strengths can allow for more focused and relevant ICT preparation.

Teachers' lack of clarity regarding their Technological Content Knowledge suggested that these teachers lack knowledge relating to how ICTs can be used to represent, enhance and even restrict their subject content (Koehler et al., 2013; Koehler et al., 2014). Teachers' uncertainty regarding their Technological Content Knowledge (in this case 40% of the teachers) also suggested that the training that these teachers have received has not adequately prepared them to use ICTs for teaching and learning purposes. Consequently, ICT training programmes and even school principals should ensure that teachers are being prepared appropriately for the ICT integration process. Being prepared appropriately would entail developing knowledge areas (such as TCK), which would inform teachers how to use ICTs in ways that can enhance teaching and learning.

When exploring the last dimension (TPK), the questionnaire data showed that a larger percentage of teachers (60%) considered themselves able to use ICTs to support their pedagogy (teaching and learning methods). In the interview data, an even larger percentage of teachers (90%) demonstrated understanding of the impact that ICTs have on their pedagogy. Finding that majority of the teachers (60% in the questionnaire data and 90% during the interviews) have some understanding of Technological Pedagogical Knowledge was beneficial, as Mishra and Koehler's (2006) TPACK model and other literature (Ertmer & Ottenbreit-Leftwich, 2010; Hew & Brush, 2007; Mndzebele, 2013; Shaffer et al., 2015) also consider this a requisite knowledge area. Even though majority of the teachers have knowledge and demonstrated an understanding of using ICTs to support their pedagogy, the interview data showed that eight teachers (80%) felt that they still needed to develop this knowledge dimension. Once again there appeared to be a cycle where teachers demonstrated some level of ICT understanding, but never having enough ICT knowledge. This cycle drew attention to teachers' need for continuous development in all ICT knowledge dimensions.

The questionnaire data showed that only three out of ten teachers were found to have moderate levels of knowledge in all three of Mishra and Koehler's (2006) ICT knowledge dimensions that were explored (TK, TCK and TPK). In addition, two out of the ten teachers were found to have moderate levels of knowledge in two ICT knowledge areas (TK and TPK). Of these five teachers, three of them had an ICT qualification as indicated in

Table 2. This finding suggested that gaining expertise in the field of ICT can influence the level of ICT knowledge that teachers have. It was also noted that these five teachers fell into different age ranges, which suggested that age did not play a role in the level of ICT knowledge that these teachers had. The overall finding was that despite teachers' age and having an ICT qualification, the majority of the teachers who participated in the study (70%) did not have all of the requisite ICT knowledge areas proposed by Mishra and Koehler (2006). The researcher argued that the influencing factor was the ICT preparation and training that teachers had received, which did not provide them with sufficient knowledge, and consequently needs to be revised.

Some of the findings gained from this study relating to teachers' level of ICT knowledge concurred with findings from previous studies conducted. These other studies were mainly international studies, as there is limited research relating to exploring Gauteng teachers' level of ICT knowledge. Nonetheless, one relevant study was by Buabeng-Andoh (2012), in which it was found that Ghanaian teachers were moderately proficient in some ICT skills and less proficient in others. Another study conducted by Aremu and Adediran (2011) found that 250 Nigerian teachers (54%) had below average ICT knowledge, with the remaining 220 teachers (46%) having above average knowledge. In a study conducted by Alazam et al. (2013) it was found that a majority of Malaysian teachers (the exact percentage is not stated) had moderate levels of ICT skills. Finally, a study conducted by Hakkarainen et al. (2001) found that majority of Finnish teachers (the exact percentage is also not stated) did not have adequate ICT skills. The findings gained in the other studies concurred with the findings gained in this study, that there exist mixed levels of knowledge regarding different teachers and different ICT areas of knowledge. In this study, a mixed level of knowledge was found in relation to the three knowledge areas that were explored (TK, TCK and TPK). Some teachers were found to be proficient in some ICT knowledge areas, some teachers had moderate levels of ICT knowledge, some had a lack of ICT knowledge, some needed to develop their existing knowledge, and some needed to gain new knowledge. The variation in the research participants' levels of knowledge can be linked to the notion that teachers have mixed expertise (also known as the knowledge divide), whereby there appeared to be a divide between those who were more ICT knowledgeable and those who were less ICT knowledgeable. Howie and Blignaut (2009) identified the knowledge divide as a problem that is experienced in South Africa and the findings in this study relating to teachers from the Gauteng province seemed to support their claim.

It was surprising to note that despite different studies adopting different approaches to measuring teachers' level of ICT knowledge, there was still some agreement among the findings. The agreement across the literature and the findings of this study suggested that teachers have exposure to different ICT devices, have different ICT experiences, and have attended different ICT training in relation to its content focus and form. In other words, it was implied that teachers have developed their ICT knowledge differently and consequently have different levels of ICT knowledge. A shortcoming identified across the literature and in Mishra and Koehler's (2006) TPACK model is the lack of clarity in relation to the level of ICT knowledge that teachers were expected to have. This lack of clarity can have implications when designing ICT preparation models in terms of the type and level of ICT knowledge that teachers should have to integrate ICTs effectively. Teachers' current ICT knowledge gaps should be bridged by ICT training to allow for expected levels of ICT knowledge.

It has been highlighted that teachers have a primary role to play in the ICT integration process and have a huge impact on the success or failure of the integration process (Kumar et al., 2008). The research participants demonstrated that they were actively using ICTs in their classroom in some way. However, at times they questioned the effectiveness of their integration approach and demonstrated the need to develop these knowledge dimensions. The fact that some teachers have knowledge and some (teachers) do not have knowledge in certain areas suggested that some teachers were more ready for the ICT integration than others, as knowledge is considered a determining factor of ICT readiness (Aremu & Adediran, 2011; Inan & Lowther, 2010; Ouma et al., 2013). Some of the teachers' lack of knowledge in certain areas and their need for more knowledge may be inhibiting the ICT integration process, and consequently would need to be addressed.

The theoretical framework designed for this study (see Chapter Two) proposed that the three knowledge dimensions explored (TK, TCK and TPK) should be the content focus that teachers develop during their ICT preparation. The ICT knowledge dimensions should be developed at different levels (basic, intermediate, and advanced) in accordance with teachers' current level of knowledge. Through a continuous process of development, the target is ultimately for all teachers to reach an advanced level. In addition, through a continuous process of development the framework proposed that teachers would be able to update their knowledge base constantly and close any ICT knowledge gaps. By focusing on these

knowledge areas, the framework proposed that teachers would be able to combine their knowledge of ICT devices, their subject content, and their pedagogy successfully to allow for effective integration of ICTs into the teaching and learning process.

4.2.4 Teachers' attitudes towards ICT integration into the teaching and learning process

Data was also gathered about teachers' attitudes towards ICT integration in the teaching and learning process. All ten teachers from both schools spoke about the importance of integrating ICTs into teaching and learning. When the participants made reference to the importance of ICTs it was identified that their responses related to three key areas. The first area, about which four of the ten teachers spoke, was related to the idea that integrating ICTs into the teaching and learning process was necessary due to the current generation of learners that they are teaching. Mrs Chetty, a teacher from Hout River Primary, said:

I think technology is useful and it can really help. With the kids, sometimes you teaching something and you not entertaining enough or your energy is low. Once you put on something technological, then they listen. And you know this is what their generation is all about. Either you get on board or you get left behind. (Mrs Chetty)

Another teacher, Ms Dangazele, from Zora Secondary School, considered integrating ICTs relevant to the current generation of learners by saying:

The child is changing so the teacher must change. (Ms Dangazele)

Mrs Asmal, also from Zora Secondary School, explained the importance by saying:

I do think technology is very important for the success of teaching and learning. Everything is going the technology route. We need to be on par with it otherwise we just going to get frustrated. We will get frustrated with our teaching, with our kids because we don't understand them, we have to be on their level. (Mrs Asmal)

The second key area identified was that seven out of the ten teachers interviewed considered the integration of ICTs into the teaching and learning process useful on the basis of the benefits that ICTs offer. These benefits included flexibility, increased control, increased efficiency, and easier access to information. Mr Ephraim, a teacher from Zora Secondary School, spoke specifically about ICTs offering him increased control by saying that:

I'm much more relaxed, my children are much more controllable, usually people would sit and fight with one and other. In my class, because of technology I don't have that. I have that discipline. (Mr Ephraim)

Mr Kairuz, also from Zora Secondary School, made mention of increased control as well, along with some of the other benefits listed by saying:

I definitely believe that technology makes your life easier. And largely much more control and efficiency in the classroom and even in your personal life. I mean, we wouldn't be where we are without technology. (Mr Kairuz)

The third area that was identified was that all ten teachers considered the integration of ICTs able to enhance the teaching and learning process. Mrs Pather, a teacher from Hout River Primary, explained how ICT integration was able to enhance teaching and learning by saying:

I think technology is very important. It's valid. All learners could learn just content without having a picture in their mind or in front of them of what they are learning. But the moment you present them with various ways of which it can be done it contributes to the learners' learning. I have had learners who sat here and failed the subject in Term One and by the time they got to Term Three they passed it because they say, "Ma'am, I remembered the song! That's how I remembered the question in the cycle test!" So, it enhances their learning. (Mrs Pather)

Another teacher from Hout River Primary, Miss Augustus, explained how ICT integration enhanced teaching and learning for her learners by saying:

I love videos. Short video clips just for the kids to see what's going on. To hear what it sounds like. To see everything. I've done assessments before and after a video, and you get your learners that are visual and that are practical. And the ones that are visual did much better, you can see the difference in the tasks. (Miss Augustus)

Overall, all ten teachers viewed the integration of ICTs into the teaching and learning process as important. However, only six of the ten teachers interviewed had a positive attitude towards integrating ICTs into their own classroom. Mrs Pather, a teacher from Hout River Primary, said:

I am positive, very positive about technology. I think it's a good thing. I mean I have spoken so much about it from the very beginning when we started about how good it is in teaching, and learning and understanding. (Mrs Pather)

Another teacher, Mrs Singh, from Zora Secondary School, expressed her positive view towards integrating ICTs in her classroom by saying:

I have a positive view of technology. I am not against technology, I am definitely for technology and I would like to incorporate more technology into my classroom. (Mrs Singh)

In contrast, some of the interviewed teachers (4 in total) did not share the same view. These three teachers, although recognising the usefulness and importance of ICT integration, were not as positive about integrating ICTs into their classroom. Mrs Asmal, a teacher from Zora Secondary School, admitted:

I don't think I can have a positive view on technology right now without knowing what it all offers me. (Mrs Asmal)

It was interesting to note that when these four teachers expressed their attitude towards ICT integration in their classroom, they highlighted some of their concerns, which influenced their attitude. Considering Mrs Asmal's response above, she implied that she does not know the full potential of ICTs in the classroom. In addition, she also expressed her view towards ICT integration in her class by saying:

It is tedious though because I have to carry everything with me all the time, and therefore it's a schlep [a chore/effort]. Sometimes the technology doesn't work, and then the speakers don't work. All of these problems disrupt the class, so yes, there are a lot of hiccups. (Mrs Asmal)

Mrs Weldeman from Hout River Primary was also not as positive, and expressed her concerns by saying:

Uhm, I am a little weary of doing things because I am a little scared of making a mistake. I think that's my biggest problem. So, I just rather sit back and wait, I don't want to try and go into something and then I'm so scared I will crash something or go into something I shouldn't. I'm not confident because you know,

I didn't grow up with it. I didn't use it as a child or as a young person. I was a lot older. (Mrs Weldeman)

Similarly, another teacher from Hout River Primary, Miss Augustus, expressed her concern by saying:

Like you have your laptops. They have their failures. It's not perfect. And now you have your important Skype meeting and everything shuts down. What happens now. That's my only thing. (Miss Augustus)

Teachers' attitudes towards ICT integration in the teaching and learning process was further examined in the questionnaire completed by all ten teachers. In relation to better understanding teachers' ICT attitude, four dimensions (optimism, innovativeness, discomfort, and insecurity) part of Parasuraman's (2000) Technology Readiness Index were explored. Some of the statements that were targeted at exploring whether teachers were optimistic about the use and integration of ICTs into teaching and learning (see Appendix A pg.129, Section B) included: *Technology gives people more control; Technology allows me to tailor things to fit my own needs; and Technology makes me more efficient in my occupation.* Teachers were expected to rate their level of agreement ranging from Strongly Disagree to Strongly Agree for each of these statements. Once this was done, the various statements were grouped to determine each teacher's overall response in these grouped statements. The data gained relating to the first dimension (optimism) is presented in the table below.

Table 6: Optimism Frequency Distribution

Optimism Frequency (f) Distribution (Question 1-3)												
Participant	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree		Total	Total
	f	%	f	%	f	%	f	%	f	%	%	Count
Mrs Weldeman		0%		0%	1	33%	1	33%	1	33%	100%	3
Miss Stansfield		0%		0%		0%	1	33%	2	67%	100%	3
Mrs Pather		0%	1	33%		0%		0%	2	67%	100%	3
Mrs Chetty		0%		0%	1	33%		0%	2	67%	100%	3
Miss Augustus		0%		0%		0%	1	33%	2	67%	100%	3
Mr Ephraim		0%		0%		0%	1	33%	2	67%	100%	3
Mrs Singh		0%	1	33%		0%	1	33%	1	33%	100%	3
Ms Dangazele		0%		0%		0%	1	33%	2	67%	100%	3
Mrs Asmal		0%		0%		0%	3	100%		0%	100%	3
Mr Kairuz		0%		0%		0%		0%	3	100%	100%	3

The data summarised above showed that all ten teachers (100%) had majority of their responses ranging in the Strongly Agree and Agree categories. Responses that ranged mainly in the Agree and Strongly Agree categories indicated an inclination towards being optimistic about the integration and use of ICTs in teaching and learning. Majority of the teachers (seven in total) had most or all of their responses in the Strongly Agree category, which suggested that these teachers were extremely positive about the use and integration of ICTs in relation to the potential that they offered.

The second dimension that was explored was innovativeness. Some of the statements that were targeted at exploring whether teachers considered themselves as being innovative in the use and integration of ICTs included (see Appendix A pg.129, Section B): *Other people come to me for advice on new technologies; I can usually figure out new high-tech products and services without help from others; and I keep up with the latest technological developments in my areas of interest*; among others. Teachers were expected to rate their level of agreement ranging from Strongly Disagree to Strongly Agree for each of these statements. Once this was done, the various statements were grouped to determine each teacher's overall response in these grouped statements. The data gained relating to the second dimension (innovativeness) is presented in the table below.

Table 7: Innovativeness Frequency Distribution

Innovativeness Frequency (f) Distribution (Question 1-5)												
Participant	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree		Total	Total
	f	%	f	%	f	%	f	%	f	%	%	Count
Mrs Weldeman		0%	4	80%	1	20%		0%		0%	100%	5
Miss Stansfield		0%	4	80%		0%	1	20%		0%	100%	5
Mrs Pather		0%	3	60%	1	20%	1	20%		0%	100%	5
Mrs Chetty		0%	3	60%	2	40%		0%		0%	100%	5
Miss Augustus	4	80%		0%	1	20%		0%		0%	100%	5
Mr Ephraim		0%		0%		0%	1	20%	4	80%	100%	5
Mrs Singh		0%	4	80%	1	20%		0%		0%	100%	5
Ms Dangazele	4	80%	1	20%		0%		0%		0%	100%	5
Mrs Asmal	2	40%	3	60%		0%		0%		0%	100%	5
Mr Kairuz		0%		0%	1	20%	1	20%	3	60%	100%	5

The data presented above indicated that 20% of the teachers (2 teachers) had responses that ranged mainly in the Agree and Strongly Agree categories. This finding showed that 20% of the teachers (2 teachers) did consider themselves as being innovative when using and

integrating ICTs into teaching and learning. In contrast, 80% of the teachers (8 teachers) had responses that ranged mainly in the Disagree and Strongly Disagree categories. This finding showed that majority of the teachers (80%) did not consider themselves to be innovative when using and integrating ICTs into the teaching and learning process.

The third dimension that was explored was discomfort. Some of the statements that were targeted at exploring whether teachers considered themselves as being uncomfortable about the use and integration of ICTs (see Appendix A pg.129, Section B) included: *It is embarrassing when I have trouble with a high-tech gadget while people are watching; Technology always seems to fail at the worst possible time; and Sometimes I think that technology systems are not designed for use by ordinary people;* among others. Teachers were expected to rate their level of agreement ranging from Strongly Disagree to Strongly Agree for each of these statements. Once this was done, the various statements were grouped to determine each teacher's overall response in these grouped statements. The data gained relating to the third dimension (discomfort) is presented in the table below.

Table 8: Discomfort Frequency Distribution

Discomfort Frequency (f) Distribution (Question 1-9)												
Participant	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree		Total	Total
	f	%	f	%	f	%	f	%	f	%	%	Count
Mrs Weldeman		0%	1	11%	3	33%	5	56%		0%	100%	9
Miss Stansfield	7	78%		0%	2	22%		0%		0%	100%	9
Mrs Pather		0%	7	78%		0%	2	22%		0%	100%	9
Mrs Chetty	5	56%	2	22%	2	22%		0%		0%	100%	9
Miss Augustus	1	11%	1	11%		0%	3	33%	4	44%	100%	9
Mr Ephraim	1	11%	5	56%	3	33%		0%		0%	100%	9
Mrs Singh		0%	6	67%	1	11%	2	22%		0%	100%	9
Ms Dangazele		0%		0%	2	22%	7	78%		0%	100%	9
Mrs Asmal		0%		0%	3	33%	6	67%		0%	100%	9
Mr Kairuz	1	11%	7	78%	1	11%		0%		0%	100%	9

The data presented above indicated that 40% of the teachers (4 teachers) had majority of their responses ranging in the Strongly Agree and Agree categories. This finding showed that 40% of the teachers considered themselves as being uncomfortable with the use and integration of ICTs into teaching and learning. In contrast, 60% of the teachers (6 teachers) had majority of their responses ranging in the Strongly Disagree and Disagree categories. This finding

showed that majority of the teachers (60%) considered themselves as being comfortable with the use and integration of ICTs into teaching and learning.

The final dimension that was explored was insecurity. Some of the statements that were targeted at exploring whether teachers considered themselves as being insecure about the use and integration of ICTs (see Appendix A pg.129, Section B) included: *Too much technology distracts people to a point that is harmful*; *Technology lowers the quality of relationships by reducing personal interaction*; and *I worry that information I make available over the internet may be misused by others*; among other statements. Teachers were expected to rate their level of agreement ranging from Strongly Disagree to Strongly Agree for each of these statements. Once this was done, the various statements were grouped to determine each teacher's overall response in these grouped statements. The data gained relating to the final dimension (insecurity) is presented in the table below.

Table 9: Insecurity Frequency Distribution

Insecurity Frequency (f) Distribution (Question 1-4)												
Participant	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree		Total	Total
	f	%	f	%	f	%	f	%	f	%	%	Count
Mrs Weldeman		0%		0%		0%	3	75%	1	25%	100%	4
Miss Stansfield	1	25%	3	75%		0%		0%		0%	100%	4
Mrs Pather		0%	3	75%	1	25%		0%		0%	100%	4
Mrs Chetty	1	25%	3	75%		0%		0%		0%	100%	4
Miss Augustus		0%		0%		0%	1	25%	3	75%	100%	4
Mr Ephraim	1	25%	3	75%		0%		0%		0%	100%	4
Mrs Singh		0%	3	75%	1	25%		0%		0%	100%	4
Ms Dangazele		0%	1	25%		0%	1	25%	2	50%	100%	4
Mrs Asmal		0%	1	25%	2	50%	1	25%		0%	100%	4
Mr Kairuz	2	50%	2	50%		0%		0%		0%	100%	4

The data presented above indicated that 30% of the teachers (3 teachers) had majority of their responses ranging in the Strongly Agree and Agree categories. This finding showed that 30% of the teachers (3 teachers) felt insecure about the use and integration of ICTs. In contrast, six teachers (60%) had majority of their responses ranging in the Strongly Disagree and Disagree categories. This finding showed that majority of the teachers (60%) did not consider themselves as being insecure about the use and integration of ICTs. Furthermore, 10% of the teachers (1 teacher) had majority of their responses ranging in the Undecided category. This

finding showed that 10% of the teachers (1 teacher) felt undecided as to whether she was insecure or not regarding the use and integration of ICTs into teaching and learning.

4.2.4.1 Analysis of data presented

From the data presented, it was evident that all ten (100%) of the interviewed teachers acknowledged the importance of integrating ICTs into the teaching and learning process. What was interesting to note was that when the teachers spoke about the importance of ICT integration into the classroom, 70% of the teachers, which constituted the majority, made reference to the benefits of ICTs. These benefits related to Gibson's (1986) concept of affordances, which ICTs offer the teaching and learning process. The teachers made reference to certain affordances such as accessibility (easier access and different means of accessing continuously growing information) (Conole & Dyke, 2004; Department of Education, 2010) and flexibility (related to the notion that teaching and learning can occur at any time and place and not be confined to the classroom) (Clark & Luckin, 2013; Department of Education, 2007; Laurillard, 2007). By making reference to the affordances of ICTs, a majority of the teachers acknowledged the direct benefit of ICTs to the teaching and learning process. When acknowledging the direct benefit, teachers seemed to express a positive attitude towards the ICT integration process. The theoretical framework (see Chapter Two) proposed that teachers' ICT attitude is a key factor that influences their level of ICT readiness. The more positive teachers are, the more willing they will be to develop their ICT knowledge and integrate ICTs into their classroom.

Conole and Dyke (2004) consider that not much is understood by teachers regarding how the affordances of ICTs can be exploited in their classroom. In this study, the majority of teachers (70%) acknowledged the affordances; however, the remaining 30% did not make reference to the affordances of ICTs. Linked to the potential offered by ICTs, it is considered that one of the major reasons for the push towards ICT integration into the classroom is the ability that ICTs have to enhance the quality of teaching and learning (Department of Education, 2004; Department of Education, 2007; Department of Education, 2010; Isaacs et al., 2012; SchoolNet SA, 2015; Shaffer et al., 2015; Summak et al., 2010). All ten teachers (100%) acknowledged the usefulness of ICTs in relation to being able to enhance their teaching and learning, and some teachers gave practical examples of how ICTs enhanced teaching and learning in their own classroom. The finding that all ten teachers recognised the usefulness of ICTs and acknowledged their ability to enhance teaching and learning,

concurred with the findings gained from the questionnaire, namely that all ten teachers were found to be optimistic about ICT integration in education. Parasuraman's (2000) Technology Readiness Index (TRI) considers optimism as being a driver of teacher's technology readiness. In addition, Parasuraman (2000) explains optimism as having a positive view of technology and a belief that technology provides individuals with greater control, flexibility and effectiveness. The theoretical framework (see Chapter Two) proposed that if teachers are exposed to and know more about the potential that ICTs offer and their ability to enhance teaching and learning, they would have a more positive attitude towards ICT integration. This idea was reinforced by a research participant, who stated that she is unable to have a positive view on technology without knowing what ICTs can offer her. Through developing teachers' TK, TCK and TPK, the potential of ICTs can be exposed, and is likely to influence teachers to reap the benefits that ICTs offer teaching and learning.

The questionnaire data also showed that 20% of the teachers considered themselves to be innovators in the ICT integration process, which Parasuraman (2000) refers to as an inclination towards being a technology innovator and leader. These two teachers, Mr Ephraim and Mr Kairuz, were both from Zora Secondary School, and were actively involved in leading the ICT training in their schools (which is explored in more detail in the next section). Parasuraman (2000) also considers innovativeness to be a driver of technology readiness, and encompasses a positive attitude towards ICT integration. The active role taken by Mr Ephraim and Mr Kairuz implied that some teachers were more ICT skilled than others. Consequently, they were more willing and excited to ensure that their schools were at the forefront of education development through preparing other teachers to integrate ICTs into teaching and learning processes.

The questionnaire data showed that 100% of the teachers were found to be optimistic, and 20% of the teachers were found to be innovators. The interview data did not match the questionnaire data, as only 60% of the teachers spoke directly about their positive view towards integrating ICTs into their classroom. The discrepancy in the findings could be attributed to the notion that teachers have still not fully onboarded to the ICT integration process, and consequently are nervous or reluctant to commit to the success of integrating ICTs into the classroom.

The discrepancy in the findings can also be related to the other dimensions' (discomfort and insecurity) part of Parasuraman's (2000) TRI. In the interviews, only 60% of the teachers directly spoke about their positive attitude towards ICT integration. The remaining percentage (40%) of teachers who in the interviews did not directly express a positive attitude towards ICT integration was in agreement with the 40% of teachers who in the questionnaire data were found to be uncomfortable using ICTs. This could also be attributed to the 30% of teachers who in the questionnaire data were found to be insecure about some areas of the ICT integration process. A sense of discomfort is explained by Parasuraman (2000) as having a lack of control over technology and a sense of being overwhelmed by it, and a sense of insecurity is explained as distrusting technology and being sceptical about its potential to work properly. Both discomfort and insecurity encompass a more negative attitude towards technology and are considered inhibitors of technology readiness. The teachers who were found to be uncomfortable and insecure fell into different age ranges, as can be seen in Table 2, the profile of participants. Age did not seem to influence teachers' attitude towards ICTs. This finding discredited the commonly held view of older professionals' being unfamiliar with new age technologies, and as a result uncomfortable and reluctant to engage with these technologies.

Teachers' age did not have an influence on their negative attitude towards the ICT integration process. However, during the interview 40% of the teachers spoke about their negative ICT attitude, and insight was gained into what influenced their attitude. A contributing factor seemed to be that teachers could not always rely on technology because it has its failures. Another contributing factor was that teachers were scared to experiment with technology in case they make a mistake. These factors implied that some teachers find technology adoption too risky to allow into the teaching and learning process. This notion could be avoided with appropriate ICT preparation entailing ICT knowledge development, ICT training and the provision of support during the ICT integration process.

Despite some teachers' having a negative ICT attitude, the overall majority of teachers had a positive view towards the integration of ICTs into teaching and learning. These findings concurred with previous studies also targeted at exploring teachers' attitude towards the use of ICTs (see Aremu & Adediran, 2011; Badri et al., 2013; Hart & Laher, 2015; Ouma et al., 2013; Summak et al., 2010). The findings of this study agreed with previous studies conducted, even though there were variations in the approach adopted to explore teachers'

ICT attitude, such as Selwyn's (1997) Computer Attitude Scale; the Technology Acceptance Model (TAM) by Davis et al (1989); and an adapted version of Parasuraman's (2000) Technology Readiness Index (TRI). The agreement in the findings implied that a majority of teachers acknowledged the potential that ICTs have for teaching and learning. Teachers' positive attitude showed that, despite the challenges experienced, such as inadequate ICT knowledge, teachers were still willing to adopt and integrate ICTs into their classroom. Teachers' positive attitude should be exploited by ICT training providers, school principals, and even the Department of Education to influence other teachers and drive the effective integration of ICTs into schools.

Badri et al. (2013) and Kumar, Rose, and D' Silva (2008) argue that if ICTs are to be integrated effectively, teachers need to view the ICT integration process positively. Teachers need to view ICTs positively because findings show that successful ICT implementation in the teaching and learning process occurs through a positive attitude and willingness from teachers (Nsele, 2014). Consequently, the 40% of teachers who expressed negative attitudes would need to be targeted and, as Ertmer and Ottenbreit-Leftwich (2010) suggest, teachers need to change their existing beliefs and engage in activities that challenge these beliefs.

The theoretical framework designed for this study (see Chapter Two) proposed a manner in which teachers can change their existing ICT beliefs. The theoretical framework acknowledged that teachers have a particular attitude towards the ICT integration process, which can be categorised as being largely positive (optimism and innovative) or largely negative (discomfort and insecurity). The research framework stressed that with a continuous process of ICT preparation, teachers (such as the 40% identified in this study) can change their ICT attitude from being negative to largely positive. A continuous process of ICT preparation should entail teachers' continuously developing their ICT knowledge and receiving appropriate ICT training and support. Through this process teachers would be informed about the potential affordances of ICTs, knowledge on how to use their devices, and knowledge on how to solve their technical problems. In addition, they should be exposed and informed regarding how ICTs can support their pedagogy and subject content to allow for more enhanced teaching and learning. The theoretical framework proposed that by developing these knowledge areas and receiving appropriate training and support, teachers are likely to understand the potential that ICTs offer teaching and learning. Understanding the potential that ICTs have for education is considered to change teachers' mindset and allow

them to view ICTs positively (Badri et al., 2013; Department of Education, 2004; Hu et al., 2003; Kumar et al., 2008). Consequently, teachers' attitudes can be gradually transformed to allow for a more positive outlook, which can essentially lead to a more effective ICT integration process.

4.2.5 The type of training that teachers attended to acquire the requisite ICT knowledge

Another important dimension explored was the type of ICT training that teachers from both schools (Hout River Primary and Zora Secondary School) received. When engaging in discussion about the training, it was found that majority of teachers (nine in total) had received some sort of ICT training. The type of training received was grouped into two main categories: training received from the school and training received from the Department of Education. Four out of the five teachers interviewed from Hout River Primary received training from their school, which was provided by three key sources: their school principal, a staff member of the school who is in charge of the ICT facilities and training at the school, and external ICT training providers organised by the school. Mrs Weldeman, a teacher from Hout River Primary, made reference to the school principal providing her with ICT training by saying:

Every Tuesday afternoon, our school principal helps us. We go there and he teaches us something about technology. Bit by bit, he is getting us more advanced, which is great. So, we have a lot of support which is great. (Mrs Weldeman)

Another teacher, Mrs Chetty, also from Hout River Primary, made reference to an external training provider, as well as a staff member of the school who provided her with training:

We were lucky that two years ago, we went for that Google training course. We also had in-service training when the computer teacher did training in the afternoons. He taught us how to be computer literate and also how to use the technology. He is also available during his free periods to assist us. (Mrs Chetty)

All five teachers interviewed from Zora Secondary School were also offered ICT training by their school. The source of the training that they received was from two teachers at their school, who also happened to be research participants of this study. One of the teachers, Mr Ephraim, who provided ICT training to the teachers at his school, reported:

Like I say, I'm the one that initiates the training at this school. If I don't sit and fight about technology at this school, it's not going to happen, because they were sitting and waiting for something to happen. (Mr Ephraim)

Apart from internal training offered to teachers by Hout River Primary and Zora Secondary School, only three teachers made mention of receiving training from the Department of Education. Miss Stansfield from Hout River Primary said:

Well the department, I think it was two years back when the tablets just came out, they had an afternoon when it was tablet training. (Miss Stansfield)

Mr Ephraim, a teacher from Zora Secondary School, also made reference to ICT training from the Department of Education by saying that:

You get your fly-back training from the department which comes in three to four hours. It was basically a lecture about the iBox regarding what it can and cannot do. (Mr Ephraim)

Apart from the three teachers who acknowledged receiving ICT training from the Department of Education, the remaining seven teachers spoke about the department having only provided them with training regarding their subject content knowledge. However, they were still waiting for the department to approach them to offer ICT training. Mrs Welderman, a teacher from Hout River Primary, said:

I would say no support from them. I would say that it is maybe one day going to come but not now. (Mrs Welderman)

Once insight was gained regarding the source of training, the next area explored was the focus of the ICT training received. From the responses received it was evident that the focus of the ICT training was mainly in relation to three categories: how to use ICTs for administration tasks, exposure to ICT devices, and how to use ICT devices in relation to their hardware and software. In relation to how to use ICTs for administration tasks, Mrs Welderman, a teacher from Hout River Primary, described the training that she had received:

He will show us all the different things we can do on the internet, like we had to make our own name badge thing and just how to use things. He also showed us

how to use the internet properly, how to use it in the class and how to use it to communicate with parents. (Mrs Welderman)

A teacher from Zora Secondary School, Ms Dangazele, also received training on how to use ICTs for administration tasks. She explained the training received by saying:

We were working on Excel the whole time, for marks and all of that, but you don't know what you can do. Like there was things you were doing repetitively, and he's like no you can link pages, and you like what! You just do it on the one page and it gets done on all the other pages, you know. And it saves a lot of time. (Ms Dangazele)

The two teachers from Zora Secondary School who provided training to the other teachers at their school, explained the focus of the training they offered. Mr Ephraim said:

At this point, it's just how to digitise your work basically and not go into too much detail into what it does. (Mr Ephraim)

The other teacher who provided ICT training, Mr Kairuz, also explained the focus of the training by saying:

Teaching them how to do electronic mark books. We also show them how to use programmes like Edupac, which is our main database system that we use here at school. (Mr Kairuz)

In relation to the next category, exposure to ICT devices, the focus was on making teachers aware of the different ICT devices available. Ms Dangazele, a teacher from Zora Secondary School, explained the type of training she had received:

No, this course I'm talking about, was the only thing. They were actually selling the iBox to us. They weren't actually teaching us how to use it. There is this wonderful gadget, it's called the iBox, this is what you could do with it, but they didn't actually teach us how to use it. (Ms Dangazele)

In relation to the next category, how to use ICT devices, only one teacher made reference to this category. Miss Stansfield from Hout River Primary was making reference to the tablet training offered by the Department of Education, when she said:

When it was tablet training, we learnt how to switch it on and off, very basic.
(Miss Stansfield)

The majority of the teachers (6 in total) relied on their own efforts for learning how to use ICT devices by depending on family members and their own experiential learning. Mrs Weldeman, a teacher from Hout River Primary, explained how she relied on her children:

My own children have been fabulous. And they [are] very knowledgeable, all three of them are very good. So, I have used them to a large degree to show me how to use technology. (Mrs Weldeman)

Another teacher, Mrs Singh from Zora Secondary School, explained how she relied on her husband by saying:

My husband is in the field, he has got his degree in computer science, so a lot of what I know is from him. He taught me how to use a computer and create my formulas and stuff. (Mrs Singh)

Mr Ephraim, also from Zora Secondary School, explained how he taught himself to type on a computer by saying:

I was a Maths teacher and some people could type, they had the power over me. Then I realised buying and teaching yourself how to use a computer is important.
(Mr Ephraim)

In relation to the training received, the teachers interviewed also made reference to the quality of the ICT training that they had received. Only one of the interviewed teachers considered the training that she had received from her school to be of a good quality. Mrs Weldeman, from Hout River Primary, explained the training received from her school principal by saying:

It is excellent. There is not a large group of us. There might be eight of us or ten of us at a time. So, he might come around and ask us what we wanted to know. So, he also interacts with us and takes what we need. It's very one on one, we walk around and we have our laptops and we work. And the actual physical using of it is so much more effective for me. Because looking at something and using something, you do so much more on the practical side. (Mrs Weldeman)

All of the other teachers who had received ICT training (eight in total), who form the majority, were not as impressed with the quality of the ICT training that they had received. Mrs Chetty from Hout River Primary commented on the quality of the training that she had received by saying:

I have been for most of the courses and I think to myself, 'Why am I here?' I'm eager to go because I want to learn more as technology changes but when I get there I'm often, 'Why did I come here?' And sometimes I get impatient and being a mother and having kids and I'm sitting to do this workshop when I should have been there. So sometimes it is a bit frustrating. It is very basic but it is necessary for those teachers who need it. (Mrs Chetty)

Another teacher, Mr Kairuz from Zora Secondary School, explained the quality of the training he received by saying:

Very low standard. Poor standard. We always make fun of the training, they have got monkeys running their IT. So, it's of a very poor standard. And I think for most of the teachers that are quite fluent with technology and use technology in their classrooms I think they actually get quite frustrated at those workshops because it's actually very, very dumb teaching. (Mr Kairuz)

When the teachers interviewed explained the ICT training that they had received, they made remarks regarding how the quality of ICT training can be improved. Some of the teachers (five in total) spoke about the need for continuous training. The need for continuous training was evidenced by Mrs Pather, a teacher from Hout River Primary, when she suggested:

I think training needs to be continuous. You know, the reason why continuous is because technology is changing all the time. So, teachers need to be updated and need to know what's happening and what the changes are and know how to adapt and change their teaching methodology. If teachers aren't going to continuously professionally be developed, the teachers are going to lag behind and technology is going to go forward continuously. And that gap is not going to be bridged if there is not continuous development. (Mrs Pather)

Some teachers (four in total) spoke about the need for ICT training to be segmented according to knowledge level. Ms Dangazele, from Zora Secondary School, explained the need for training to be segmented by saying:

Well they had people, representatives from Mimio itself that came in. And if it was done to teachers who know nothing about the computer, those teachers would be lost. Because the words they used were technological words and teachers who do not know anything about technology would not understand what they were talking about. So, I would say teachers in that training needed to be separated according to their levels of technological knowledge before they could be trained. But it was just done once-off and everyone had to learn the same thing even if you knew what they were doing. (Ms Dangazele)

Some teachers (seven in total) felt that ICT training needed to be relevant to teachers. Mrs Singh, a teacher from Zora Secondary School, expressed the need for training to be relevant to teachers by gaining teachers' input, when she said:

You see they never really ask us anything they just go ahead and do it. The facilitators they pick up problems and they say right you do this workshop on this and so on and so forth. But training has to be stimulating and a lot of teachers don't buy into training because they take our personal time. Get the teachers to decide what they want. Let them tell you. And that's when you're going to get the best results, is when the teachers buy into the idea, and if they know, okay wait at the end of this, I will be able to learn all of this stuff, then yes, I want to go for this training for myself. (Mrs Singh)

In addition, Mrs Singh went on to explain that training needed to be relevant by being practical to teachers, she said:

Yeah, I think it's fine to go for a course and then know how to use it. But you must actually know how to deliver a lesson. When it comes to science-specific programmes, how do I do that? So, like, there's a simulation that can show vertical projectile motions but I need to know how do I change this to make the projectile go higher or you know, that kind of thing, that kind of software. (Mrs Singh)

4.2.5.1 Analysis of data presented

It was positive to note that 90% of the teachers who participated in the study had received ICT training, as training is considered critical to the ICT integration process (Aremu & Adediran, 2011; Carbová & Betáková, 2013; Department of Education, 2004; Ertmer & Ottenbreit-Leftwich, 2010; Mndzebele, 2013; SchoolNet SA, 2015; Shaffer et al., 2015). The main source of the training received in the two schools were categorised into internal training received from the school and external training received from the Department of Education. It was evident that sufficient training is critical to the success of the ICT integration process.

It was disappointing then to learn that only 30% of the teachers received training from the Department of Education. This was alarming since it was stated in the White Paper on e-Education policy document that in Phase One of the implementation plan the Department of Education (2004) was to ensure that teachers had access to basic ICT training. All teachers were therefore meant to have received at least some basic level of training in Phase One, which has been shown not to be the case. Failing to meet initial policy conditions (such as the provision of training) jeopardises the achievement of forthcoming policy conditions and the achievement of stated policy goals. In addition, in Phase Two it was expected that 50% of teachers would have received training on the basic integration of ICTs into the teaching and learning process. Phase One and Phase Two were to take place from year 2004–2010, yet 70% of the teachers in this study had in 2016 still not received any ICT training from the Department. It can be said that these teachers were not included in the efforts made by the Department of Education, which is believed to account for 70% of teacher development activities (Department of Education, 2010). The largest contributor to teacher development did not fulfil this role, and consequently this raised major concern. The concern pertained to the quality, source, and extent to which teachers are receiving training and being prepared elsewhere to ensure that teachers are ready for the integration process.

In the case of this research study, despite the lack of ICT training received from the Department of Education, the teachers at Hout River Primary and Zora Secondary School did receive training from other sources. Hout River Primary provided their teachers with some external training, but most of the training received by staff at the two schools was provided internally by school staff members. Within Hout River Primary, the school principal and an ICT facilitator within the school provided the training. In contrast, at Zora Secondary School, two teachers who were part of the school were pivotal in providing ICT training. It was

evident that within the school, these stakeholders (the school principal, the ICT facilitator and the two teachers) adopted a change facilitator role as they were knowledgeable people who were aware of the change being made and were able to offer appropriate support, knowledge, and skills to help others with the transition (Hall & Hord, 1987). It was clear that both schools recognised ICT training as important and made efforts to take charge and provide training to their teachers. The researcher considered that it is not always practical for teachers to provide ICT training to their schools, as they have a copious amount of their own teaching, learning, and administrative duties to perform. In addition, it is also not always practical to expect school principals to provide ICT training, as they have a wealth of other tasks to perform. For both teachers and principals, their priority focus should be on teaching and learning, and not the provision of training. If their focus is on training, teaching and learning may take a back seat and the quality of the training that is provided could be jeopardised due to having insufficient time.

In relation to the provision of training by various stakeholders, it was found that the training provided was mainly focused on how to use ICTs for administrative tasks, exposing teachers to ICT devices, and teaching them how to use ICT devices in relation to their hardware and software. It is argued by Shaffer, Nash, and Ruis (2015) that when training teachers in the integration of ICTs into teaching and learning, the nature of teacher preparation needs to change. This change should encompass a focus on technology, specifically targeting the use and integration of ICTs into the classroom. An essential component to knowing how to integrate ICTs into the classroom is knowing how to use ICT devices. Training provided did focus on this aspect; however, only one teacher mentioned receiving training regarding how to use ICT devices, whereas other teachers relied on their family and experiential learning. The implication of some teachers' having received such training and others not implied that there is no standardisation in the type of training that teachers receive, which could result in added disparity in teachers' ICT knowledge, and ultimately their readiness for the ICT integration process.

It was striking to note that apart from the focus on how to use the device, the focus was also on how to use ICTs for administrative purposes, consequently neglecting to address how to use the device as a teaching and learning tool. Similar findings were made in Jegede's (2009) study, which explored Nigerian training institutions and found no focus on how to use ICTs to support teaching and learning. In addition, the same problem was identified when

exploring the Microsoft ICT training courseware (Microsoft in Education, n.d.). This similarity in the findings suggested that ICT training for schools is failing to serve its purpose. The researcher argued that the purpose of training should be to equip teachers with requisite ICT knowledge needed to integrate ICTs effectively into teaching and learning. If teachers are not being prepared on how to use ICTs as a teaching and learning tool, then it cannot be expected that ICTs will be integrated effectively or that teachers are even ready for the integration process.

Another problem area seemed to be the quality of training that the teachers from both schools received. The majority of the teachers (80%) considered the training that they had received to be of a poor quality. Despite teachers having mentioned that they were eager to learn and willing to attend training, they often ended up being frustrated when they did not find the training beneficial to them. By focusing, however, on the one teacher who did find the training she received to be beneficial, certain qualities can be highlighted when looking at her description of the nature of the training she received. These qualities include a smaller group being trained at a time, the trainer asking for teacher input, and the training having a practical element. Some of these qualities were mentioned when teachers raised their training needs and what they would like ICT training to encompass. The majority of teachers (70%) spoke about the need for training to be relevant in terms of what teachers need, being practical, and being applicable to their teaching subject. Some teachers (40%) spoke about the need for training to be divided in relation to teachers' abilities and level of ICT knowledge. In addition to these concerns, some teachers (50%) also spoke about the need for training to be continuous. The literature (Department of Education, 2004; Department of Education, 2007) suggests that continuous training is necessary as technology is constantly advancing and teachers therefore need to keep up to date with new trends and integrate these into the teaching and learning process.

These concerns tie in with Sackstein's (2014) view that training should not adopt a one-size-fits-all approach, as well as the view by Shaffer et al. (2015) that training should not overwhelm teachers. The views presented by Sackstein (2014) and Shaffer et al. (2015) are particularly relevant in a diverse society such as South Africa. In this country, the level of exposure to and usage of ICTs among teachers differs drastically from none to high levels of interaction. In developing and providing ICT training, it is important to not paint all teachers

with the same brush; that is, it is important to develop training that is relevant and adapted to the diverse needs of the group involved.

The theoretical framework (see Chapter Two) developed for this research study proposed a model for ICT training for teachers, which could assist in combating some of the ICT training problems identified by the teachers in Hout River Primary and Zora Secondary School. The framework suggested that there should be a baseline assessment to assess teachers' current level of ICT knowledge in relation to a particular area. The particular content area in which teachers are to be trained (e.g., a particular ICT device or a particular technological knowledge area) should be informed by teachers' needs and input. Understanding a teacher's level of knowledge in a certain area would then assist in the process of allocating teachers to various training levels (basic, intermediate, or advanced). Various training levels would allow for segmented training, as was suggested necessary by 40% of the teachers interviewed. Essentially, teachers would then be able to attend training directly in relation to their level of knowledge.

In addition, it was evident that the training received by teachers in Hout River Primary and Zora Secondary School did not focus on how to integrate ICTs into teaching and learning. The theoretical framework proposed that the training that teachers should receive should focus on three key knowledge areas, which is informed by Mishra and Koehler's (2006) TPACK model. These areas include learning about ICT devices in relation to their hardware and software (Technological Knowledge), learning about how to use ICTs to support the teaching of subject content (Technological Content Knowledge), and learning about how to use ICTs to support a teacher's pedagogy (Technological Pedagogical Knowledge). Focusing on these knowledge areas shows a direct correlation to the teaching and learning process. This would make the training received more relevant and practical to teachers, which 70% of the interviewed teachers considered necessary. In addition to making the training relevant and practical to teachers, training should be subject-specific. Making training subject-specific means that teachers would be divided according to their teaching subjects and teaching phases, so that the training received, the examples given, the ICT software to which teachers are exposed, the content focused on, and the pedagogy explored, among other factors, are all relevant to what teachers would need in their classrooms. Making training relevant means that teachers would be able to gain practical knowledge that they would be able to implement in their own classrooms.

The framework proposed that the nature of training should be continuous, so that teachers are constantly developing their knowledge base in relation to technological advancements, needs, and problem areas. The framework also proposed that the nature of training should be lecture-based and practical to allow for knowledge to be transferred to teachers, whilst allowing for practical, hands-on experience. The theoretical framework presented an ICT preparation model, which could contribute useful insight to the current training approaches that teachers receive, which 80% of the teachers considered to be of a poor quality.

4.2.6 The role of school principals in contributing towards teachers' ICT readiness

In relation to exploring teachers' ICT readiness, another important dimension was to look at the role school principals played in helping to ensure that teachers were ready for the integration process. In exploring the role of school principals, input was gained from the ten teachers interviewed, along with the school principal from Hout River Primary and Zora Secondary School. During the interviews, the school principals were asked to explain their expertise in the field of educational technology. Mrs Marques, the principal of Zora Secondary School, explained her expertise by saying:

I must be honest with you, I have not grown up with technology and I have not been trained in the use of technology. I'm nervous of it because I'm not that computer literate. I am getting someone to try and train me, but we can never find the suitable time. But I am trying. (Mrs Marques)

On the other hand, Mr Klassen, the principal from Hout River Primary, explained his expertise by saying:

Remember I trained in the very olden days. So, there was no mention of ICT. What I did was, my wife was involved in the council. So, she started teaching me how to programme. (Mr Klassen)

Mr Klassen went further to explain his expertise by saying:

I think I am very confident. I would rate myself a 9 out of 10. I don't want to be adamant. I rate myself a 9 out of 10 because there is nothing I can't do. I introduce video clips. I write videos. I sit and I write a curriculum. So, say for instance we doing drugs in life orientation grade 7. I would write the videos,

show the children the effects, what they shouldn't do and what they should do. And those videos play in their classrooms. (Mr Klaasen)

The principals' accounts of their expertise seemed to concur with the descriptions teachers gave of their school principals during the teacher interviews. Mr Ephraim, a teacher from Hout River Primary explained his school principal's (Mrs Marques') level of expertise by saying:

She is not technologically advanced. She likes her pieces of papers and stuff. It works for her. She is still old school, they were teaching in chalk, and for her to go and learn technology, is a useless exercise. We are there to support and to run the technology training for her. (Mr Ephraim)

In contrast, Mrs Pather, a teacher from Hout River Primary, explained her principal's (Mrs Klaasen's) level of expertise by saying:

We have our principal who is very supportive of technology. He is also very knowledgeable, so he leads the process. And also, he is the one who gets the SGB [School Governing Body] to provide all the classes with technology. Something that I know when I started here six years ago, there was only like a few classes that had interactive white boards and now every single class has it. And I think he is the brain behind it. He is the one, he has a lot of passion for it, he is the one who gets the technology going. (Mrs Pather)

In relation to the school principals' expertise in the field of educational technology, the role that these principals adopted in leading the ICT integration process in their schools was also explored. When the ten interviewed teachers were asked about the role that their respective school principal played in ICT integration, various responses were given. These responses were grouped into four main categories. The first category, mentioned by eight of the ten interviewed teachers, was that they considered that their school principal made funds available to provide access to ICT devices. Mrs Asmal from Zora Secondary School explained her school principal's willingness to provide ICT devices by saying:

Well whenever we ask for certain equipment or whenever we say that we do require certain things she does try, like I must say with the projectors and things,

she budgeted it in for each department, so she does try for each department, try and make our lives easier with the technology. (Mrs Asmal)

The second category was that the five teachers from Hout River Primary mentioned that their school principal also provided them with updated software needed to run the various ICT devices. Mrs Welderman from Hout River Primary explained the provision of updated software by saying:

Okay well providing us with constant updates and updated programmes and whatever he thinks will keep us at the front. (Mrs Welderman)

The third category related to the school principals' encouraging and motivating teachers to integrate ICT devices in their classrooms and learn more about ICTs. Seven of the interviewed teachers acknowledged their school principals as encouraging the staff during the ICT integration process. Mrs Stansfield, a teacher from Hout River Primary, said:

He is very supportive. He is pushing it more because he is very positive towards moving towards technology and he wants to incorporate it and he wants to enhance learners' learning and he is very positive, he is motivating us. (Miss Stansfield)

A teacher from Hout River Primary, Mrs Singh, explained that the principal motivated her to learn more about ICTs by saying:

With regards to the principal, she is very supportive with regards to anything that we want. She always motivates us to go for the training that the other teachers provide at the school so that we can learn more about technology and how to use it in our classroom. (Mrs Singh)

The fourth category identified was that the interviewed teachers considered their principals to play a role in allowing a platform for ICT training to take place. This category was acknowledged by four of the interviewed teachers (two teachers from Hout River Primary and two teachers from Zora Secondary School). Mr Kairuz from Zora Secondary School explained his principal's role in allowing a platform for training by saying:

She has been very open minded. She has provided us with a facility and the equipment to do technology-related workshops. (Mr Kairuz)

However, when it came to the principal of Hout River Primary, it was acknowledged that the principal did more than simply provide a platform and was directly and personally involved in providing training to some of the teachers. This was confirmed when Mr Klaasen, the principal at Hout River Primary, reported:

So, we have also said if you have a problem come to us and we will train you separately. So, you will get pockets of people who would say we want to be trained on a different day, and it's the four of us. (Mr Klaasen)

The last category was that teachers (three in total) from Hout River Primary acknowledged that their principal also monitored their use of ICTs in the classroom. Miss Augustus explained how the principal monitored their ICT use in the classroom by saying:

The school can monitor how often you use your computer. When it switches on, they can tell you exactly on their system. Because we all connected, our Wi-Fi is connected and everything. They can see how much you use it for work purposes because it is not for personal uses. Here on the school premises, the school principal can see how much you work with it. They monitor it, they encourage us to use it and not to waste it because the principal always says that other schools don't have it. (Miss Augustus)

The school principal from Hout River Primary, Mr Klassen, confirmed his role in monitoring ICT integration by saying:

We also have a monitoring system, so that I can monitor the use of the system and what is coming out of the system. (Mr Klassen)

The teachers' view of the role played by their school principal in the ICT integration process in their school seemed to concur with the school principals' description of their role. Mrs Marques, the principal at Zora Secondary School, explained her role by saying:

Look, although if I can say to you I'm backward in technology, I do promote it and try and buy the stuff, facilitate the workshops, put everything in its place. And look, my biggest problem is time, like even now I'm anxious, I've got to do this I've got to do that, so time is a huge factor. So, if I had the time, you know, so yah, we are trying to improve it. (Mrs Marques)

Mr Klaasen, the principal from Hout River Primary, explained his role by saying:

Essentially my role was to ensure that teachers had what was needed to become a school that was actively using and integrating technology. (Mr Klaasen)

A majority of the teachers (8 in total) considered the role played by their school principal vital to the success of the ICT integration process. Ms Dangazele, a teacher from Zora Secondary School, acknowledged the importance of the school principal by saying:

The school principal plays an important role. She makes sure everything is in place and offers us support. There is no point introducing something, if you are not going to be there to support it when it actually grows. It will fall apart if there is no support. (Ms Dangazele)

Another teacher, Mrs Pather from Hout River Primary, explained the importance of the school principal by saying:

We always look up to leadership, just as the learners look up to us. So, it's vital, it's very important that the principal sees the value of technology in education and teaching. He needs to ensure that he supports us and that we are professionally trained and he will only allow that if he himself knows how well and good technology is for an institution. (Mrs Pather)

4.2.6.1 Analysis of data presented

The two principals were asked to explain their expertise in the field of educational technology. It was evident from their responses that neither principal was exposed to technology during his or her training as a teacher and principal. ICT integration into schools is a new trend, and many school principals in South Africa were therefore trained as teachers and school principals before this trend emerged. The fact that these principals were expected to lead and manage the ICT integration process despite not having received ICT training can be considered problematic. The problem was largely that principals need ICT skills, knowledge and expertise to enable them to make decisions and lead the ICT integration process effectively in their schools (Yuen et al., 2003). Despite both principals' lack of exposure to technology during their training as educators, it appeared that they have different levels of expertise. The principal from Zora Secondary School was not as technologically inclined as the principal from Hout River Primary. It can be said that this difference was

largely attributed to the principal from Hout River Primary gaining exposure to technology through other avenues, personal interest, and experience working with technology, which was largely a result of the support received by his wife.

While these principals have differences in expertise, they were equally required to take on a leadership role and lead the ICT integration process in their schools. It is argued by Yuen et al. (2003) that when principals are expected to take on leadership responsibilities in a field in which they have not received training or with which they are unfamiliar, this can lead to these leaders feeling overwhelmed. It was evident that the principal from Zora Secondary School seemed to be quite overwhelmed by revealing that she is nervous of technology as she is not computer literate. Consequently, she seemed to adopt a delegatory approach by relying on teachers within her school (specifically Mr Ephraim and Mr Kairuz) to help lead the ICT training within the school. School principals relying on others more knowledgeable to help them lead the ICT integration process in their schools was also found in the study conducted by Schiller (2003). The researcher considered that having the school principal lead the ICT integration process is a preferred method, as this way the principal is able to set clear direction and clear expectations of his/her teachers. The principal is then able to evaluate teachers' progress and make calculated decisions regarding implementation timelines and the integration of ICTs into the classroom. The leadership role played by the principal is likely to ensure that both the school and the teachers are ready for the ICT integration process.

The theoretical framework developed in this study (see Chapter Two) proposed various roles that school principals should adopt in order to support teachers and help prepare them for the ICT integration process. These roles include ICT supplier and manager, ICT training provider, ICT motivator, and ICT monitor. In relation to being an ICT supplier and manager, the principals from Hout River Primary and Zora Secondary School took charge and were willing to provide the ICT devices to teachers within their school. The principal from Hout River Primary went further than just providing the devices, but also ensured that the software was updated and available for use on the devices. It is argued by Yuen et al. (2003) that the role of school principals should go beyond simply providing the required resources, instead leading ICTs and ensuring that teachers are ready for the integration process requires the principal to play a multidimensional role. This research agreed that school principals should play a bigger role than simply providing the device; school principals should be engaged and actively involved in the preparation of teachers. The reason for this involvement is because

school principals are accountable for all the activities that take place in their school, and consequently the success or failure of these activities. The school principal should be the ultimate decision-maker on the implementation and integration of ICTs into the teaching and learning process to ensure that it is successful.

The principal from Hout River Primary and Zora Secondary School seemed to go beyond simply providing ICT resources; instead they played a much more influential role in the ICT integration process. They also seemed to adopt the role of an ICT motivator, as both principals motivated teachers to use ICTs in their classroom, which Kumar et al. (2008) consider key to supporting teachers in the ICT integration process. Part of this motivation entailed encouraging teachers to attend training, which is believed to increase the chances of teachers using ICTs in their classroom (Schiller, 2003). Not only did principals motivate teachers to attend training but they adopted the role of ICT training provider, as they enabled a platform for ICT training to take place, which is also considered another essential role that principals need to perform in the ICT integration process (Department of Education, 2007; Kumar et al., 2008; Yuen et al., 2003). It is considered that if principals are to lead teachers to use ICTs in the teaching and learning process successfully then they need to ensure that opportunities are available for teachers to gain the required ICT knowledge and skills (Yuen et al., 2003). It was found that the principal at Hout River Primary took a more direct approach and was actively involved in providing the ICT training. However, it was noted that not all five of the teachers from Hout River Primary received the training provided by the school principal, which highlighted the need for principals to make training accessible to teachers (Kumar et al., 2008). The principal at Hout River Primary additionally adopted the role of an ICT monitor as he acknowledged the need to monitor teachers' use of ICT in the classroom. Monitoring can be considered an essential way to gauge the effectiveness of ICT training by identifying whether teachers are actively implementing what was learnt and consequently effectively using ICTs in the classroom (Kumar et al., 2008).

The majority of teachers (80%) from Hout River Primary and Zora Secondary School acknowledged the importance of the support that their principal provided during the ICT integration process. In Inan and Lowther's (2010) study, it was found that support had the second largest effect on teacher's readiness to integrate technology. The implication is that leadership should continuously check that efforts are being made to ensure that teachers within their schools receive the required support. This is so as to ensure that teachers are able

to gain the required ICT knowledge and positively view the integration of ICTs into teaching and learning. Within Zora Secondary School and Hout River Primary, the school principals seemed to play a fundamental role in leading the ICT integration process (in their schools), which is essential for effective ICT adoption and integration. Similarly, Isaacs et al. (2012) argue that a lack of leadership and its associated support is considered a factor that can inhibit the integration of ICTs. Therefore, school principals should play a key role in contributing towards teachers' level of ICT readiness, so as to ensure a successful ICT integration process in their schools.

4.3 Chapter summary

This chapter presented the data generated from the research participants in relation to the interviews conducted and the questionnaires that were distributed and completed. The data was presented in relation to the various research questions of the study and then analysed by using theoretical underpinnings (literature reviewed, theoretical foundations, and theoretical framework) to interpret the data. The data that was presented and analysed in this chapter is used in the next chapter to draw the main findings, recommendations, implications, and conclusions of the study.

CHAPTER FIVE

STUDY SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND IMPLICATIONS FOR FURTHER RESEARCH

5.1 Introduction

The previous chapter presented and analysed the data generated from the research study. The final chapter presents a summary of the entire study and presents conclusions that were drawn from the presented and analysed data in the previous chapter. The conclusions are presented as responses to each of the four sub-research questions (as posed in 1.6.1), followed by a response to the primary research question formulated in 1.6. Thereafter, recommendations informed by the conclusions and the implications of the study are presented. The recommendations and implications were aimed at informing practitioners and future practice and research regarding teachers' ICT readiness for the integration of ICTs into teaching and learning.

5.2 Study summary

Chapter One introduced the research study by providing a background to the study and discussing the problem statement within which the research was located. The purpose, rationale, significance, and aims of the study were also explored. In addition, the research questions around which the study was centred were presented and the theoretical foundations that served as the theoretical underpinning of the study were introduced. Lastly, Chapter One presented the delimitations and an outline of the overall study. Discussing these components gave insights into what informed the study, as well as what the researcher intended to achieve by conducting the study.

Chapter Two presented existing literature in relation to various themes that played a significant role in better understanding the dimensions pertinent to teachers' ICT readiness. These themes included the integration of ICTs, the affordances of ICTs, the role of ICT policy, teachers' ICT readiness, teachers' ICT knowledge, teachers' attitudes towards ICT integration, the state of ICT teacher development, and the role of school principals in contributing towards teachers' ICT readiness. In addition, the established theoretical framework was introduced and explained. The theoretical framework and the reviewed

literature provided a useful foundation and analytical lens through which to gain in-depth insight into the research area.

Chapter Three discussed the research design and qualitative approach used to conduct the research study. In discussing the approach, various theoretical considerations were taken into account in relation to the research paradigm, design, methodology, population, pilot phase, and data generation and analysis methods. In addition, issues of trustworthiness, ethical issues, and the limitations of the study were explored.

Chapter Four presented the data generated from the interviews that were conducted, and the questionnaires that were distributed and completed. The data was presented in relation to themes that emerged relating to each of the research questions. The presented data was also analysed by interweaving existing literature, the theoretical foundations and the established theoretical framework, so as to interpret and add meaning to the collected data.

Chapter Five is intended to conclude the research study by presenting an overview of each of the research chapters, and drawing conclusions based on the data that was presented and analysed in Chapter Four. In addition, recommendations and implications of the study and for further research are discussed.

5.3 Conclusions

This research study aimed to explore the extent to which teachers at the two selected schools were ready to integrate ICTs into the teaching and learning process. In order to determine the extent to which these teachers were ICT ready, four areas upon which to focus, were chosen. These areas, which formed the basis of the study's research questions, included teachers' level of ICT knowledge, teachers' ICT attitudes, the ICT training received, and the role school principals have played in ensuring that teachers were ICT ready. The conclusions drawn from the data that was presented and analysed in relation to the various research questions are presented below. The conclusions drawn in each sub-research question were used as a basis to answer the primary research question.

5.3.1 Teachers' level of ICT knowledge

In relation to exploring teachers' level of ICT knowledge, three knowledge dimensions central to Mishra and Koehler's (2006) TPACK model were explored. These dimensions

were Technological Knowledge (TK), Technological Content Knowledge (TCK), and Technological Pedagogical Knowledge (TPK). These knowledge dimensions included teachers' being able to use ICT devices (hardware and software), being able to use ICTs to enhance the teaching of their subject content, and being able to use ICTs to support their pedagogy. These areas were considered requisite knowledge areas needed to integrate ICTs successfully into teaching and learning. The overall finding was that teachers have mixed expertise in these three knowledge dimensions. Findings showed that some teachers had a moderate understanding of a particular knowledge dimension, while others had a lack of understanding of a particular knowledge dimension, and others still were even undecided regarding their levels of knowledge in these dimensions. Within all of these dimensions, there was no expression of teachers' having outright high levels or even moderate levels of knowledge in a particular dimension, as they clearly expressed their need to grow their knowledge base and become more proficient in certain knowledge areas. It was found that only three teachers had moderate levels of knowledge in all three dimensions. The researcher argues that successful ICT integration in teaching and learning requires proficient knowledge in all three knowledge areas of Technological Knowledge, Technological Content Knowledge, and Technological Pedagogical Knowledge. It is concluded that majority of the teachers who were participants of this study do not have adequate levels of knowledge in all of the required ICT knowledge dimensions. Consequently, this has a huge impact on the participants' level of readiness to integrate ICTs into the teaching and learning process.

5.3.2 Teachers' attitudes towards ICT integration

Teachers' attitude towards ICT integration into teaching and learning was explored in relation to Parasuraman's (2000) Technology Readiness Index. The overall finding was that the majority of the research participants were found to have a positive attitude towards ICT integration in the classroom. Teachers were found to be largely positive as all ten teachers were found to be optimistic about the integration of ICTs into teaching and learning. In addition, teachers found that ICTs have great potential for the teaching and learning process in relation to the affordances it offers teaching and learning and its ability to enhance teaching and learning. Teachers' optimism towards ICT integration is an important condition that is likely to facilitate the ICT preparation process, entailing the development of ICT knowledge, attending training, and being open to the provision of support. Teachers who have been adequately prepared will result in teachers who are more ready to integrate ICTs into teaching and learning, and consequently a more effective ICT integration process.

There were some teachers, who formed the minority, who were found to be insecure and uncomfortable with the use of ICTs in the classroom, and consequently expressed a more negative attitude towards the ICT integration process. This insecurity and discomfort seems to be associated with teachers' lack of understanding and knowledge of ICTs, which could be overcome with the provision of support and relevant ICT training. However, overall the majority of the participants were positive and eager to use ICTs in teaching and learning, which positively influenced their readiness for the ICT integration process.

5.3.3 Teacher ICT training

The ICT training that the research participants received was also explored. It was found that the training received was predominantly provided internally by the researched schools, as it would appear that the Department of Education (2004) did not deliver on their ICT policy implementation plan to provide ICT training to the two government schools that participated in the study. One of the major problems regarding the training received was the quality of the training, in terms of both the content and form of the training. In relation to the content of the training, there appeared to be hardly any focus on how to use ICTs specifically to support the teaching and learning process, which should essentially be the core focus when preparing teachers to integrate ICTs into teaching and learning. In addition, the form of training was not considered effective to the majority of the research participants, as the training received was not considered relevant or practical. In other words, the training was not informed by teachers' needs and input, it did not relate to their teaching subject and it was not in relation to teachers' ICT abilities and level of knowledge. Another major problem was that there did not appear to be any standardisation in the type of training received by the research participants, which appeared to contribute to the large disparities among the teachers' ICT knowledge and expertise. It is thus concluded that the type of ICT training that the research participants received did not contribute to them feeling prepared and ultimately ready to integrate ICTs into their teaching and learning process. The provision of ICT training to teachers is a major source of acquiring ICT knowledge, confidence and expertise and consequently needs to be revised and improved.

5.3.4 The role of school principals in ICT integration

It was found that the school principals from both researched schools played a largely influential role in supporting their teachers who were fundamental in the ICT integration process. The teachers from both schools acknowledged their principals as playing various

roles that included ICT supplier and manager, ICT training provider, ICT motivator and ICT monitor. Even though the two principals had different levels of expertise and approaches to leading the ICT integration process, they both seemed to carry out similar roles which facilitated the ICT integration process in their schools. It is concluded that both school principals provided some of the necessary conditions and support needed by teachers, and consequently contributed to their ICT readiness and facilitated the ICT integration process. This research found that principals were essential to the successful implementation and integration of ICTs in schools, as they were required to lead the process, oversee the implementation and provide appropriate support to their teachers.

5.3.5 Teachers' ICT readiness

As a result of drawing main conclusions for each of the research sub-questions, the researcher is now in a position to answer the main research question. This research study was a case study targeted at exploring the extent to which teachers were ready to integrate ICTs into the teaching and learning process. The overall findings were that majority of the research participants did not have all of the required ICT-related knowledge needed to integrate ICTs effectively into teaching and learning. A possible contributing factor to the teachers' lack of ICT knowledge is the type of ICT training that they had received. The training received was mainly internally provided by the researched schools, as the Department of Education did not fulfil its policy plan to provide ICT training to these teachers. The training that the teachers from both schools received was not instrumental in providing teachers with the required ICT knowledge, and essentially adequate preparation to facilitate the effective integration of ICTs into the classroom. This is concerning as majority of the teachers had a positive attitude towards the integration of ICTs into teaching and learning, but were unable to integrate ICTs effectively due to insufficient training received. In contrast, these teachers had a good leadership influence which provided support and conditions, which are also essential in facilitating the ICT integration process. However, ICT knowledge and ICT training are pertinent to how knowledgeable and how prepared teachers are to integrate ICTs into teaching and learning. Based on these two areas (ICT knowledge and ICT training) serving to be problematic for majority of the research participants, it is concluded that the teachers at the researched schools were not adequately prepared and thus predominately not ready to integrate ICTs effectively into the teaching and learning process in their schools.

5.4 Recommendations

Based on the findings and conclusions of this study, the following recommendations are made:

5.4.1 Recommendation One

It was found that the majority of teachers from the researched schools had inadequate levels of knowledge in all of the required ICT knowledge dimensions (TK, TCK and TPK). It is expected that if the Department of Education (2004) planned to achieve its stated policy goal, which was that teachers were to be ICT capable, ensuring that teachers had the requisite ICT knowledge would have been a key focus area, especially due to the influence that knowledge is considered to have on teachers' level of ICT readiness (Aremu & Adediran, 2011; Inan & Lowther, 2010; Ouma et al., 2013). Having inadequate levels of ICT knowledge has a major impact on the effectiveness, the manner and extent to which ICTs are integrated into the classroom. Consequently, it is recommended that action is taken at various levels to address teachers' inadequate levels of ICT knowledge.

It is recommended that at a national level, the Department of Education should revise ICT-related policies that were not fully achieved (such as the White Paper on e-Education policy document) but that had a focus on developing teachers' ICT knowledge. In relation to revising such policies, the DoE should build upon strengths; address shortcomings; and set new, realistic targets. Most importantly, the expected ICT knowledge areas and levels of knowledge that need to be developed should be laid out clearly. It is recommended that the knowledge focus should specifically be on enabling teachers to use ICTs as teaching and learning tools and consequently the focus should be on developing teachers' Technological Knowledge, Technological Content Knowledge, and Technological Pedagogical Knowledge. In relation to developing teachers' ICT knowledge, it is recommended that the Department of Education should commit to the policies that they have established. In the case of this research, there was a lack of commitment from the Department of Education to the White Paper on e-Education policy. Commitment would entail making an active and continuous effort to ensure that policies are fully implemented so as to achieve their stated objectives. The lack of commitment to the policy (White Paper on e-Education) and failure to implement all the phases properly (Phase One, Phase Two, and Phase Three) resulted in the teachers from the researched schools having inadequate ICT knowledge. This is because the provision of ICT devices and training, which was the main source of developing teachers' ICT

knowledge, did not extend to the researched schools. In order to ensure that policies are properly implemented, it is recommended that the Department of Education has clear and in-depth insight into what is in reality taking place within their schools. This applies to whether the planned ICT training is indeed being provided to teachers, whether teachers are attending and have access to such training, if the training is targeting teachers' ICT knowledge gaps and requisite knowledge areas amongst other factors. Understanding the challenges, concerns, and needs that stakeholders have at a provincial, district, and school level will put them in a position to set realistic targets, revise the policy and provide the necessary resources and conditions to the policy implementers. Having realistic targets, the necessary resources, and conditions will better enable the realisation of policy goals, such as equipping teachers with ICT knowledge.

At a provincial and district level, it is recommended that continuous communication takes place between these two interfaces. Communication is essential to ensure that policy expectations are understood and that policy conditions are being met, such as any new efforts at developing teachers' ICT knowledge. Having a clear understanding of how teachers were supposed to or are to acquire the requisite ICT knowledge would allow officials at a provincial level to evaluate efforts made by district officials and monitor whether progress has been made in teachers' level of ICT knowledge. If no progress is being made and teachers are not acquiring the requisite ICT knowledge, as was the case in this study, it is then recommended that at a provincial level progress should be tracked and reported to the national Department of Education for corrective action to take place.

At a school level, school leadership (specifically the school principal) has the most influential and directive role in ensuring that teachers' have the requisite ICT knowledge to implement ICTs effectively in their schools. It is recommended that school principals take advantage of their leadership platform, their exposure to teachers, and their clear view of what is happening at a school level. It is recommended that school principals engage with their teachers and identify their ICT knowledge gaps and needs, so that they may find more effective ways of developing the teachers' ICT knowledge. In addition, it is recommended that school principals provide their teachers with opportunities to attend ICT training and integrate what they have learnt into their teaching. Through applying their knowledge, teachers and school principals can identify teachers' knowledge gaps. These gaps should be

communicated back up to the district, then the provincial department, and ultimately to the national department to ensure that these shortcomings are addressed at an early stage.

5.4.2 Recommendation Two

Regardless of some of the inherent challenges, such as teachers' inadequate levels of ICT knowledge, it was found that majority of the teachers from the two researched schools were positive about the integration of ICTs into teaching and learning. It is recommended that despite teachers' not being adequately prepared and consequently finding aspects of the ICT integration process challenging, they should focus on having a positive outlook towards ICTs in the classroom. Having a positive outlook is considered to influence how successful the integration of ICTs into teaching and learning is (Badri et al, 2013; Kumar et al., 2008; Nsele, 2014). It is recommended that if teachers are to have a positive outlook, they would need to expose themselves constantly to the affordances of integrating ICTs into their classroom, especially the ability of ICTs to enhance teaching and learning. Different approaches can be adopted by teachers to gain more insight into the potential that ICTs have for education, such as through experiential learning and being well acquainted with journal articles and case studies regarding ICT integration into teaching and learning. In addition, it is recommended that teachers form professional learning communities and share their ICT knowledge and expertise with their peers to allow for a continuous and supportive learning environment, which is likely to develop teachers' confidence and positivity regarding the use of ICTs in their classroom. In turn, teachers' positivity can greatly influence the effectiveness and extent to which they integrate ICTs into their classroom.

The above recommendations were targeted at teachers' own efforts at maintaining and establishing a positive outlook towards the ICT integration process. Apart from teachers' own efforts, there can be additional efforts made at a national, provincial, district, and school level. Policy is likely to focus largely on the integration of ICTs into schools in terms of ICT knowledge, ICT training, the provision of resources, and funding, amongst other factors. Teachers' ICT attitude is often not a focus area, as was found in the White Paper on e-Education policy. Teachers' ICT attitude should not be overlooked as it is considered to be a large influence on teachers' ICT readiness to integrate ICTs into the classroom (Aremu & Adediran, 2011; Department of Education, 2004; Farrell & Isaacs, 2007; Badri et al., 2013; Inan & Lowther, 2010; Kumar et al., 2008; Ouma et al., 2013; Summak et al., 2010). It is recommended that at all of these levels (national, provincial, district, and school) effort

should be made to provide incentives to teachers and even schools. Incentives can entail tangible rewards (monetary rewards or the provision of ICT devices), recognition (to teachers and schools), and even teachers' being accredited for developing their ICT knowledge or engaging in effective and creative ICT integration practices. Through the provision of incentives, teachers are likely to be more motivated about the ICT integration process, which has the potential to keep them positive and willing to integrate ICTs into their classroom.

5.4.3 Recommendation Three

Pivotal to teachers' ICT attitude and the development of their ICT knowledge is the ICT training that they have received. In this research study, it was found that a majority of the teachers in the researched schools considered their training to be of a poor quality. The quality of the training received can be related to the source, content, and form of the training provided. In the case of this research, it was found that training was mainly internally provided to the teachers at the two researched schools. It is recommended that the Department of Education should be responsible for organising the ICT training that is to be provided to schools. The Department of Education should organise a network of reliable and knowledgeable ICT training staff who can be outsourced to the different districts and provide training to teachers at various schools within that district. Through external training, these providers can focus solely on the provision of training. In addition, they would be in a better position to provide the training by having the time, expertise, and resources to organise the training, which can influence the quality of training provided. In the case of this research, teachers and principals took the initiative to provide training due to the lack of training provided to them by the Department of Education. These stakeholders (teachers and principals) have additional demands and duties to perform, which could have resulted in the poor-quality training provided. Consequently, the important role that should be played by the Department of Education to provide quality ICT training cannot be overemphasised.

The White Paper on e-Education policy document highlights the importance of providing training and the percentage of teachers that the Department expected to have trained by a certain date. However, the policy fails to provide an in-depth plan of what training was to be provided, how the training was to be provided, and by whom the training was to be provided. This lack of clarity poses additional challenges regarding the direction that should have been taken to provide training and essentially who was to be accountable if ICT training goals were not achieved. The failure to have an in-depth, well thought-out plan regarding the ICT

training that should have been provided is probably where the implementation and provision of such training to the researched schools fell short. Consequently, it is recommended that at a national, provincial, district, and school level workable plans are put in place and communicated at all levels regarding the approach to provide teachers with training. If all stakeholders are well informed regarding the policy expectations, then they can be sure to make certain that the investment in ICT training produces the desired outcome of quality training being provided to teachers.

In relation to the quality of ICT training that is provided, it was also found that the form and content of training was problematic. This is in relation to the knowledge that was transmitted and the approach to transmitting this knowledge, which was not entirely beneficial and relevant to teachers. Consequently, it is recommended that ICT training practitioners have more direct communication channels with teachers regarding their ICT training needs and concerns. These concerns and needs should be in relation to the type of training that should be received, what the focus of training should be and some of the central activities that should form part of the training offered. By ICT training practitioners having a better understanding of teachers' ICT training concerns and needs, more relevant and effective training can be provided. It is recommended that the impact, effectiveness, and goals of the ICT training should be regularly assessed by ICT training providers to ensure that the training offered is continuously improved and relevant to teachers.

5.4.4 Recommendation Four

In this study, it was found that the school principals from the researched schools played an instrumental role in the ICT integration process. School principals are considered key to the ICT integration process (Ertmer & Ottenbreit-Leftwich, 2010; Farrell & Isaacs, 2007; Isaacs et al., 2012; Kumar et al., 2008), and consequently it is recommended that they should not overlook the importance of their influence and leadership platform. This is especially because it was found that teachers consider the efforts made by school principals important and influential to their own attitude towards ICTs and their own ability and success in integrating ICTs. Even though the ICT readiness of principals was not the focus in this study, which could serve as a future research area, it is recommended that principals should also keep up to date with current trends in education. In this research study, the focus was the integration of ICTs into teaching and learning, which is considered a fast-growing trend in South African schools (Howie & Blignaut, 2009). If principals are to keep up to date with the integration of

ICTs into education, it is recommended that they also need to actively take charge and prepare themselves by receiving ICT training and improving their ICT knowledge base. By principals being more informed and knowledgeable this could result in a more effective, intensive and larger scale ICT integration process in their schools.

In relation to school principals' influence and leadership platform, it is recommended that efforts are made at a national, provincial, and district level to support principals. School principals have varying levels of expertise, as was found in this research study, and some are naturally less ICT capable than others. Consequently, efforts at a national, provincial, and district level need to ensure that there are programmes in place to bridge the ICT knowledge gaps of both new and currently serving principals. It is recommended that this support should include, among other topics, how to lead the ICT integration process, how to monitor teachers' use of ICTs in their schools, and how to encourage teachers to integrate ICTs in their classroom. In addition, school principals would need support regarding the provision of ICT devices in terms of the funding and management of ICT devices in their school. If principals received appropriate support they would be more equipped to make informed decisions, resulting in more effective ICT practices in their school.

5.5 Implications for further study

The implications of the study were highlighted in relation to key stakeholders that are central to teachers' ICT readiness to integrate ICTs into teaching and learning. These key stakeholders include policymakers, district offices, school principals and teachers.

5.5.1 Implication for policymakers

Policymakers, who can include officials at national, provincial, district, and school levels, are responsible for establishing feasible policies to achieve stated goals. Policies that have been established to drive the implementation of ICTs into teaching and learning are considered the basis for what action is to be taken, and consequently what progress takes place within schools. Should policymakers establish policies that are not properly formulated and implemented this can have harmful implications on the entire ICT integration process in schools. In this study, it was found that there was incongruence between policymaking and policy implementation regarding the White Paper on e-Education policy document. The incongruence was in relation to the implementation of the policy not being in line with the expectations laid out in the policy. The expectations applicable to this study were that ICT

devices and the infrastructure to use these devices would be made available to schools and that teachers in these schools would be provided with ICT training. These conditions were to be met by a certain deadline, and the entire policy was to be fully implemented and all goals achieved by the year 2013. The provision of these conditions and the achievement of the policy was not realised.

In relation to not achieving the stated goals and policy, it can be said that some of the bottlenecks included not having clearly formulated plans and direction on how the goals were to be achieved. In addition, there appeared to be a lack of communication between the various stakeholders, as teachers mentioned that they had not received any ICT training from the Department of Education and were still waiting to be contacted regarding such. Not having adequate direction and communication channels can harm the implementation of the policy and the faith that various stakeholders, such as teachers and principals, have in policymakers and policy implementers. As failure to provide the necessary conditions and failure to achieve goals can highlight the lack of commitment by leadership, which has the potential to filter down to all other policy implementers and key stakeholders. If policy implementers and key stakeholders do not see progress being made, improved practice and commitment by senior leaders of the Department of Education, then this will without a doubt impact the entire success of the integration of ICTs into schools.

5.5.2 Implication for district offices

In this research study, it was found that the majority of teachers from the researched schools were not adequately prepared to integrate ICTs into the teaching and learning process. It may therefore be stated that the Department of Education's (2004) stipulated goal for all teachers to be ICT capable by 2013 was not achieved. District officials are expected to ensure that schools function in accordance to policy stipulations and in accordance with what is expected by the Department of Education. In addition, district officials are required to support school principals, teachers, and schools to embrace and implement changes that are aimed at improving the performance of schools in their district. The integration of ICTs into teaching and learning was aimed at enhancing teaching and learning. Failing to monitor and ensure that the researched schools received the necessary support and conditions (ICT infrastructure, resources, and training) largely impacted the success of the ICT integration process within these schools. If district officials do not identify problem areas, take action and communicate these shortcomings to officials at a provincial and national level, this can have major

consequences. School principals may be reluctant to rely, trust, engage, and communicate with district officials, which is essential to ensuring that teaching and learning goals are being achieved, the quality of teaching and learning is maintained, and that schools are functioning as effectively as possible.

5.5.3 Implication for school principals

School principals play an influential role in leading and driving change in schools. If school principals fail to lead and drive the integration of ICTs into their schools effectively this can have major implications for education as a whole. The implication is that if principals fail to lead the ICT integration process effectively, this can result in school resources not being adequately utilised, key stakeholders (such as teachers) not being challenged and developed, and the teaching and learning process remaining unprogressive. If teaching and learning remains unprogressive, traditional and sometimes ineffective teaching and learning methods will thrive. This means that the education system will not be at the forefront of educational advancements, such as the implementation of ICTs into the classroom –teaching and learning practices that are essentially considered more relevant and effective.

5.5.4 Implication for teachers

Teachers have direct contact with learners who come from a generation that thrives and depends heavily on technological devices. If teachers fail to keep abreast of current trends they can become unrelatable to their learners, who still largely require their facilitation, support and mentorship. If teachers fail to connect and understand their learners, this can impact their efficacy as teachers in the classroom, their ability to achieve educational goals, and maintain a high-quality teaching and learning standard.

5.5.5 Implications of the study

This study was a small-scale study that involved two schools and a total of twelve research participants. Due to the study being small-scale it must be emphasised that the findings generated in this study cannot be generalised beyond the researched schools and research participants. However, the study does offer useful insight into better understanding pertinent factors (ICT knowledge, ICT attitude, ICT training, and the role of the school principal) that are central to teachers' ICT readiness. In order to gain more insight and evidence into these pertinent factors in relation to their influence, shortcomings, and approaches to improving these areas, it is recommended that the scope of the study be increased. The scope should be

increased to include more schools (government, township and private schools), research participants (more teachers and school principals) and even the type of research participants (ICT training practitioners, Department of Education officials, and learners). By increasing the scope of the study, it will be possible to gain more insight into the topic, which would better allow the researcher to understand the research problem, identify trends across the data, better understand the participants' accounts of reality, and have a stronger evidence base from which to draw conclusions regarding teachers' readiness to integrate ICTs into teaching and learning.

5.6 Overall summary of the study

This research study was aimed at exploring Gauteng teachers' readiness to integrate ICTs into the teaching and learning process. One of the fundamental concerns was that the Department of Education (2004) stipulated in the White Paper on e-Education that all teachers (including Gauteng teachers) were to be ICT capable by the year 2013. This research study was targeted at identifying the extent to which Gauteng teachers were actually ready for the ICT integration process by focusing on four areas. The first area was focused on exploring teachers' level of ICT knowledge, which was informed by Mishra and Koehler's (2006) Technological Pedagogical and Content Knowledge model. This model was used to explore teachers' level of knowledge in three key knowledge dimensions. These knowledge dimensions were Technological Knowledge, Technological Content Knowledge and Technological Pedagogical Knowledge. The second area focused on exploring teachers' attitude towards ICT integration, which was informed by Parasuraman's (2000) Technology Readiness Index (TRI). Parasuraman's (2000) TRI entailed four dimensions (optimism, innovativeness, discomfort and insecurity), which allowed the researcher to determine which dimension teachers were inclined towards, and ultimately whether they had a more positive or negative attitude towards integrating ICTs into teaching and learning. The third area was focused on exploring the ICT training that teachers received to gain the requisite ICT knowledge needed for the ICT integration process, and the final area focused on the role played by school principals in helping to prepare teachers during the ICT integration process. These areas were explored to get information into how teachers were prepared and if they were prepared, which gave insight into how ready they were for the ICT integration process. This research study found that the teachers at the researched schools were not adequately prepared and thus predominately not ready to integrate ICTs effectively into the teaching and learning process in their schools. Teachers were found to not be adequately prepared and thus

predominately not ready to integrate ICTs on the basis of the findings gained from each of the sub-research questions. Table 10 below summarises the overall research study in relation to the four sub-research questions, the main findings gained for each sub-research question and some recommendations that should be considered.

Table 10: Overall Summary of Study

Sub-Research Questions	Main Findings	Recommendations
1. What are teachers' level of Technological Knowledge, Technological Content Knowledge and Technological Pedagogical Knowledge?	- It was found that the majority of teachers from the researched schools had inadequate levels of knowledge in all of the required ICT knowledge dimensions (TK, TCK and TPK). - Teachers expressed their need to grow their knowledge base and become more proficient in certain knowledge areas.	- It is recommended that at a national level, the DoE should: - Revise ICT policies that were focused on developing teachers' ICT knowledge, but that were not fully achieved. Revising policies should entail building upon strengths; addressing shortcomings; and setting new, realistic targets. - Commit to established ICT policies by making an active and continuous effort to ensure that policies are fully implemented to achieve their stated objectives. - Have clear and in-depth insight into what is in reality taking place within their schools (i.e. is ICT training targeting teachers' ICT knowledge gaps and requisite knowledge areas). - At a provincial and district level, it is recommended that: -Continuous communication takes place between these two interfaces to ensure that policy expectations are understood and that policy conditions are being met. Having a clear understanding of how teachers were supposed to or are to acquire the requisite ICT knowledge would allow officials at a provincial level to evaluate efforts made by district officials monitor whether progress has been made in teachers' level of ICT knowledge and take corrective action. - At a school level it is recommended that school principals: -Engage with their teachers and identify their ICT

		knowledge gaps and needs, so that they may find more effective ways of developing their teachers' ICT knowledge. -Provide their teachers with opportunities to attend ICT training to develop their ICT knowledge and integrate what they have learnt into their teaching.
2. What are teachers' attitudes towards ICT integration into the teaching and learning process?	- Some teachers, who formed the minority, were found to be insecure and uncomfortable with the use of ICTs in the classroom, and consequently expressed a negative attitude towards the ICT integration process. - The overall finding was that the majority of the research participants were found to have a positive attitude towards ICT integration in the classroom.	- It is recommended that if teachers are to establish or maintain a positive outlook, they would need to: -Expose themselves to the affordances of integrating ICTs into their classroom, especially the ability of ICTs to enhance teaching and learning. This can be done through experiential learning and being well acquainted with journal articles and case studies regarding ICT integration into teaching and learning. -Form professional learning communities and share their ICT knowledge and expertise with their peers to allow for a continuous and supportive learning environment, which is likely to develop teachers' confidence and positivity regarding the use of ICTs in their classroom. - To establish or maintain teachers' positive outlook towards ICT integration it is also recommended that at a national, provincial, district, and school level, effort should be made to provide incentives to teachers and schools. Incentives can entail tangible rewards (monetary rewards or the provision of ICT devices), recognition (to teachers and schools), and even teachers' being accredited for developing their ICT knowledge or engaging in effective and creative ICT integration practices.
3. What type of training have in-service teachers received to acquire the	It was found that the training received was predominantly provided internally	The DoE should organise a network of reliable and knowledgeable ICT training staff who can be outsourced to the different school districts and provide training to teachers. Through external training, these providers

requisite ICT knowledge necessary to integrate ICTs into teaching and learning?	by the researched schools. • One of the major problems regarding the training received was the quality of the training, in terms of both the content and form of the training. • The type of ICT training that the research participants received did not contribute to them feeling prepared and ultimately ready to integrate ICTs into their teaching and learning process	would be in a better position to provide the training by having the time, expertise, and resources to organise the training, which can influence the quality of training provided. • It is recommended that at a national, provincial, district, and school level workable plans are put in place and communicated at all levels regarding the approach to provide teachers with training. If all stakeholders are well informed regarding the policy expectations, then they can be sure to make certain that the investment in ICT training produces the desired outcome of quality training being provided to teachers. • It is recommended that ICT training practitioners have more direct communication channels with teachers regarding their ICT training needs and concerns. These concerns and needs should be in relation to the type of training that should be received, what the focus of training should be and some of the central activities that should form part of the training offered to allow for the provision of more relevant and effective training. • It is recommended that the impact, effectiveness, and goals of the ICT training should be regularly assessed by ICT training providers to ensure that the training offered is continuously improved and relevant to teachers.
4. What role have the school principals played in contributing towards teachers' ICT readiness?	• It was found that the school principals from both researched schools played a largely influential role in supporting their teachers who were fundamental in the ICT integration process.	• It is recommended that school principals should not overlook the importance of their influence and leadership platform. This is especially because it was found that teachers consider the efforts made by school principals important and influential to their own attitude towards ICTs and their own ability and success in integrating ICTs. • It is recommended that principals should keep

	The teachers from both schools acknowledged their principals as playing various roles that included ICT supplier and manager, ICT training provider, ICT motivator and ICT monitor.	up to date with current trends in education. This would entail school principals taking charge and preparing themselves by receiving ICT training and improving their ICT knowledge base. By principals being more informed and knowledgeable this could result in a more effective, intensive and larger scale ICT integration process in their schools. - It is recommended that efforts are made at a national, provincial, and district level to support principals. efforts at a national, provincial, and district level need to ensure that there are programmes in place to bridge the ICT knowledge gaps of both new and currently serving principals. It is recommended that this support should include, among other topics: - The provision of ICT devices in terms of the funding and management of ICT devices in their school. -How to lead the ICT integration process. - How to monitor teachers' use of ICTs in their schools. -How to encourage teachers to integrate ICTs in their classroom.
--	---	--

Table 10 shows that majority of the teachers had a positive attitude towards ICT integration and had a good leadership influence which provided support and conditions essential in facilitating the ICT integration process. In addition, Table 10 shows that majority of the research participants did not have all of the required ICT-related knowledge needed to integrate ICTs effectively into teaching and learning. A possible contributing factor to the teachers' lack of ICT knowledge is the type of ICT training that they had received. On the basis of teachers' inadequate level of ICT knowledge and the poor quality ICT training that they have received the recommendations shown in Table 10 and presented in this study should be considered to move towards more successful practices to preparing and ensuring that teachers are ready to effectively integrate ICTs into their classroom. This is so as to reap the benefits of enhanced and future- forward teaching and learning.

5.7 Chapter summary

This chapter focused on presenting a summary of the overall study in relation to that upon which each chapter focused and aimed to achieve. In addition, the conclusions gained from the study were presented, which emanated from the presentation and analysis of generated data. Based on the conclusions drawn, various recommendations were presented in relation to possible approaches to improving the shortcomings identified in the study conclusions. Lastly, a few implications of the study in relation to various stakeholders and for further research were highlighted.

REFERENCES

- Alazam, A. O., Bakar, A. R., Hamzah, R., & Asmiran, S. (2013). Teachers' ICT skills and ICT integration in the classroom: The case of vocational and technical teachers in Malaysia *Creative Education*, 3(8), 70-76. doi: 10.4236/ce.2012.38b016
- Aremu, A., & Adediran, E. M. (2011). Teacher readiness to integrate information technology into teaching and learning processes in Nigerian secondary schools: A case study. *An International Multidisciplinary Journal*, 5(4), 178-190.
- Babbie, E., Mouton, J. (2009). *The practice of social research*. Cape Town: Oxford University Press Southern Africa.
- Badri, M., Al Rashedi, A., & Mohaidat, J. (2013, March). School teachers' technology readiness: An empirical study applying readiness factors and teacher type categorization. In *Proceedings of the 2013 International Conference on Information, Business and Education Technology (ICIBET 2013)*. Atlantis Press.
- Bazeley, P. (2004). Issues in mixing qualitative and quantitative approaches to research. In R. Buber, J. Gadner, & L. Richards (Eds.), *Applying qualitative methods to marketing management research* (pp. 141-156). UK: Palgrave Macmillan.
- Bell, J. (2010). *Doing your research project: A guide for first-time researchers in education, health and social science* (5th ed.). England: Open University Press.
- Blaxter, L., Hughes, C., & Tight, M. (2006). *How to research* (3rd ed.). Buckingham: Open University Press.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), 77-101.
- Buabeng-Andoh, C. (2012). An exploration of teachers' skills, perceptions and practices of ICT in teaching and learning in the Ghanaian second-cycle schools. *Contemporary Educational Technology*, 3(1), 36-49.
- Burton, N., Brundrett, M., & Jones, M. (2008). *Doing your education research project*. London: SAGE Publications.

- Bush, T., Joubert, R., Kiggundu, E., & Van Rooyen, J. (2010). Managing teaching and learning in South African schools. *International Journal of Educational Development*, 30(2), 162-168.
- Bovée, C., Voogt, J., & Meelissen, M. (2007). Computer attitudes of primary and secondary students in South Africa. *Computers in Human Behavior*, 23(4), 1762-1776.
- Carbová, A., & Betáková, L. (2013). Using tools for measuring technological pedagogical content knowledge of English language teachers. *Journal on Efficiency and Responsibility in Education and Science*, 6(4), 203-217.
- Clark, P. V. & Ivankova, N.V. (2016). *Mixed methods research: A guide to the field*. Los Angeles: SAGE Publications.
- Clark, W., & Luckin, R. (2013). What the research says- iPads in the classroom. London Knowledge Lab, 1-31. Retrieved June 7, 2015, from http://www.thepdfportal.com/ipads- in-the-classroom-report-lkl_61713.pdf
- Conole, G. & Dyke, M. (2004). What are the affordances of information and communications technologies? *Research in Learning Technology*, 12 (2), 113-124.
- Cohen, D., & Crabtree, B. (2006). Semi-structured Interviews. In *Qualitative Research Guidelines Project*. Retrieved from <http://www.qualres.org/HomeSemi-3629.html>
- Creswell, J.W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). London: SAGE Publications.
- Creswell, J. W. (2012). *Educational assessment: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Boston: Pearson Education.
- Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches* (3rd ed.). Los Angeles: SAGE Publications.
- Creswell, J. W., & Plano Clark, V. L. (2006). *Designing and conducting mixed methods research*. Thousand Oaks, CA: SAGE Publications.
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management science*, 35(8), 982-1003.

- Delport, C. (2005). Quantitative data- collection methods. In A.S. de Vos, H. Strydom, C. B. Fouché & C.S. Delport, *Research at grass roots: For the social sciences and human service professions* (3rd ed., pp.159-190). Pretoria: Van Schaik.
- Department of Education. (2004, September 2). *White Paper 7 on e-Education*. (Government Gazette, No. 26762). Retrieved from <http://www.education.gov.za/Resources/Legislation>
- Department of Education. (2007). *Guidelines for teacher training and professional development in ICT*. Retrieved from <http://www.thutong.doe.gov.za/ResourceDownload.aspx?id=359> 98.
- Department of Education. (2010, August 2). *Action Plan to 2014 Towards the realisation of Schooling 2025*. (Government Gazette, No.33434). Retrieved from <http://www.education.gov.za/Portals/0/Documents/Publications/Popular%20Version.pdf?ver=2010-12-17-114922-513>.
- Devlin, A. S. (2006). *Research methods: Planning, conducting and presenting research*. Singapore: Thomson Wadsworth.
- De Vos, A. (2005). Combined quantitative and qualitative approach. In A.S. de Vos, H. Strydom, C. B. Fouché & C.S. Delport, *Research at grass roots: For the social sciences and human service professions* (3rd ed., pp. 357-366). Pretoria: Van Schaik.
- Elo, S., Kääriäinen, M., Kanste, O., Pölkki, T., Utriainen, K., & Kyngäs, H. (2014). Qualitative content analysis: A focus on trustworthiness. *Sage Open*, 4(1), 1-10. doi:215824401452 2633.
- Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of research on Technology in Education*, 42(3), 255-284.
- Farrell, G., & Isaacs, S. (2007). Survey of ICT and education in Africa: A summary report based on 53 country surveys. Washington, DC: World Bank
- Feagin, J. R., Orum, A. M., & Sjoberg, G. (Eds.). (1991). *A case for the case study*. London: UNC Press Books.

- Fouché, C. (2005). Qualitative research designs. In A.S. de Vos, H. Strydom, C. B. Fouché & C.S. Delpont, *Research at grass roots: For the social sciences and human service professions* (3rd ed., pp.267-272). Pretoria: Van Schaik.
- Fouché, C., & Delpont, C. (2005). Introduction to the research process. In A.S. de Vos, H. Strydom, C. B. Fouché & C.S. Delpont, *Research at grass roots: For the social sciences and human service professions* (3rd ed., pp.71-85). Pretoria: Van Schaik.
- Fried, C. B. (2008). In-class laptop use and its effects on student learning. *Computers & Education*, 50(3), 906-914.
- Gibson, J. J. (1978). The ecological approach to the visual perception of pictures. *Leonardo*, 11(3), 227-235.
- Given, L. M. (Ed.). (2008). *The Sage encyclopedia of qualitative research methods*. London: SAGE Publications.
- Gursul, F., & Tozmaz, G. B. (2010). Which one is smarter? Teacher or Board. *Procedia-Social and Behavioral Sciences*, 2(2), 5731-5737.
- Hakkarainen, K., Muukkonen, H., Lipponen, L., Ilomäki, L., Rahikainen, M., & Lehtinen, E. (2001). Teachers' information and communication technology (ICT) skills and practices of using ICT and their pedagogical thinking. *Journal of Technology and Teacher Education*, 9(2), 181-197.
- Hall, G., & Hord, S. (1987). *Change in Schools: Facilitating the process*. New York: State Univeristy of New York Press.
- Hammond, M. (2010). What is an affordance and can it help us understand the use of ICT in education? *Education and Information Technologies*, 15(3), 205-217.
- Hart, S. A., & Laher, S. (2015). Perceived usefulness and culture as predictors of teachers attitudes towards educational technology in South Africa. *South African Journal of Education*, 35(4), 1-13.
- 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.

- Hermans, R., Tondeur, J., van Braak, J., & Valcke, M. (2008). The impact of primary school teachers' educational beliefs on the classroom use of computers. *Computers & Education*, 51(4), 1499-1509.
- Hlatshwayo, N. F. (2005). The readiness of teachers to integrate information and communication technology for learning in a selected school in the GautengOnline project (Doctoral thesis). Retrieved from <http://ujdigispace.uj.ac.za:8080/dspace/handle/10210/901>
- Howie, S. J., & Blignaut, A. S. (2009). South Africa's readiness to integrate ICT into mathematics and science pedagogy in secondary schools. *Education and Information Technologies*, 14(4), 345-363.
- Hu, P. J. H., Clark, T. H., & Ma, W. W. (2003). Examining technology acceptance by school teachers: A longitudinal study. *Information & management*, 41(2), 227-241.
- Hu, W. (2011, January 4). Math That Moves: Schools Embrace the iPad. The New York Times Online. Retrieved from <http://www.nytimes.com/2011/01/05/education/05tablets.html?r=0>
- Inan, F. A., & Lowther, D. L. (2010). Factors affecting technology integration in K-12 classrooms: A path model. *Educational Technology Research and Development*, 58(2), 137-154.
- Isaacs, S., Vosloo, S., & West, M. (2012). Mobile learning for teachers: In Africa and Middle East. (UNESCO Working Paper No. 216358). Paris: UNESCO.
- Jegede, P. O. (2009). Assessment of Nigerian teacher educators' ICT Training. *Issues in Informing Science and Information Technology*, 6, 415-420.
- Jegede, P. O., Dibu-Ojerinde, O. O., & Ilori, M. O. (2007). Relationships between ICT competence and attitude among some Nigerian tertiary institution lecturers. *Educational Research and Reviews*, 2(7), 172-175.
- John, P. & Sutherland, R. (2005). Affordance, opportunity and the pedagogical implications of ICT. *Educational Review*, 57(4), 406-413.
- Johnson, R. B., Onwuegbuzie, A. J., & Turner, L. A. (2007). Toward a definition of mixed methods research. *Journal of mixed methods research*, 1(2), 112-133.

- Koehler, M., Mishra, P., & Cain, W. (2013). What is technological pedagogical content knowledge (TPACK)? *Journal of Education*, 193(3), 13-19.
- Koehler, M. J., Mishra, P., Kereluik, K., Shin, T. S., & Graham, C. R. (2014). The technological pedagogical content knowledge framework. In *Handbook of research on educational communications and technology* (pp. 101-111). Springer New York.
- Kothari, C. R. (2004). *Research methodology: Methods and techniques* (2nd ed.). New Delhi: New Age International.
- Krauss, S. E. (2005). Research paradigms and meaning making: A primer. *The qualitative report*, 10(4), 758-770.
- Kruger, D., de Vos, A., Fouché, C., & Venter, L. (2005). Quantitative data analysis and interpretation. In A.S. de Vos, H. Strydom, C. B. Fouché & C.S. Delport, *Research at grass roots: For the social sciences and human service professions* (3rd ed., pp. 217-244). Pretoria: Van Schaik.
- Kumar, N., Rose, R. C., & D'Silva, J. L. (2008). Teachers' readiness to use technology in the classroom: An empirical study. *European Journal of Scientific Research*, 21(4), 603-616.
- Laurillard, D. (2007). Pedagogical forms of mobile learning: Framing research questions. In N. Pachler (Ed.), *Mobile learning: Towards a research agenda* (pp. 153–175). London: WLE Centre.
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. London: SAGE Publications.
- Lincoln, Y. S., & Guba, E. G. (2000). Paradigmatic controversies, contradictions, and emerging confluences. In N. K. Denzin & Y. S. Lincoln (Eds.), *The handbook of qualitative research* (2nd ed., pp. 163–188). Beverly Hills: SAGE Publications.
- MacFarlane, I. M., Veach, P. M., & LeRoy, B. (2014). *Genetic Counseling Research: A Practical Guide*. New York: Oxford University Press.
- Mackenzie, N., & Knipe, S. (2006). Research dilemmas: Paradigms, methods and methodology. *Issues in educational research*, 16(2), 193-205.
- Mantino, F. (2013). Why policies fail? An institutional model explaining success and failure factors of rural development policies in Europe. *ESRS Congress*, 25, 231-232.

- McConnell, A. (2010). Policy success, policy failure and grey areas in-between. *Journal of Public Policy*, 30(3), 345-362.
- Melhuish, K., & Falloon, G. (2010). Looking to the future: M-learning with the iPad. *Learning, Leading, Technology*, 22(3), 1-16.
- Mengtao, L. (2001). Teaching English with multimedia overhead projector. *Foreign Language World*, 3, 1-17.
- Microsoft in Education. (n.d.). ICT Skills for Teachers. In *Microsoft Partners in Learning*. Retrieved June 17, 2016 from <http://schoolnet.org.za/PILP/ict-skills-teachers/index.html>
- Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers college record*, 108(6), 10-17.
- Mndzebele, N. (2013). Teachers readiness in using ICT in the classroom: The case of a developing country. *International Journal of Information and Education Technology*, 3(4), 409-412.
- National Planning Commission. (2012). *National development plan 2030: Our future – make it work. Executive Summary*. Pretoria: National Planning Commission.
- Neumann, M. M. (2014). An examination of touch screen tablets and emergent literacy in Australian pre-school children. *Australian Journal of Education*, 58(2), 109-122.
- Nsele, A. (2014). The relationship between the digital identities of teacher trainers and their approaches to the use of ICT in teaching and learning: A case study at the University of the Witwatersrand (Doctoral thesis). Retrieved from <http://wiredspace.wits.ac.za/handle/10539/15879>
- Oliver, K. (2010). Evaluating teacher readiness for the implementation of one-to-one computing based on national educational technology standards. *Journal of Literacy and Technology*, 11(3), 40-76.
- Ouma, G. O., Awuor, F. M., & Kyambo, B. (2013). E-learning readiness in public secondary schools in Kenya. *European Journal of Open, Distance and E-learning*, 16(2), 97-110.
- Parasuraman, A. (2000). Technology Readiness Index (TRI) a multiple-item scale to measure readiness to embrace new technologies. *Journal of service research*, 2(4), 307-320.

- Parasuraman, A., & Colby, C. L. (2015). An updated and streamlined technology readiness index TRI 2.0. *Journal of service research*, 18(1), 59-74.
- Preston, C., & Mowbray, L. (2008). Use of Smart Boards for teaching, learning and assessment in kindergarten science. *Teaching Science*, 54(2), 50-53.
- Rafiki, M. (2015). *Pedagogical integration of the iPad to enhance teaching and learning of grade 10 life sciences* (Unpublished master's research report, University of the Witwatersrand, Johannesburg)
- Ramatseba, L. (2012). *An exploration of successful school leadership practices in challenging school context: Case studies of two secondary schools in soweto* (master's research report). Retrieved from <http://wiredspace.wits.ac.za/handle/10539/11972>
- Sackstein, S. (2014). Teachers' professional dispositions and orientation towards tablet technology: Towards a more nuanced understanding of teachers' adoption of technology in South African private secondary schools (Doctoral thesis). Retrieved from <http://wiredspace.wits.ac.za/handle/10539/15875>
- Schiller, J. (2003). The elementary school principal as a change facilitator in ICT integration. *The technology source*, 26(1), 12-22.
- Schmidt, D. A., Baran, E., Thompson, A. D., Koehler, M. J., Mishra, P., & Shin, T. (2009, September 1). *Survey of preservice teachers' knowledge of teaching and technology* (Version 1.1). Retrieved from http://www.academia.edu/2856892/Survey_of_Preservice_Teachers_Knowledge_of_Teaching_and_Technology
- SchoolNet SA (2015). *Capability 2015*. Retrieved from <http://www.schoolnet.org.za/wp-content/uploads/CAPABILITY-2015.pdf>
- Scott, D., & Morrison, M. (2005). *Key ideas in educational research*. London: Continuum International Publishing Group.
- Selwyn, N. (1997). Students' attitudes toward computers: Validation of a computer attitude scale for 16–19 education. *Computers & Education*, 28(1), 35-41.
- Shaffer, D. W., Nash, P., & Ruis, A. R. (2015). Technology and the new professionalization of teaching. *Teachers College Record*, 117(12), 1-30.

- Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for information*, 22(2), 63-75.
- Silverman, D. (2010). *Doing qualitative research* (3rd ed.). London: SAGE Publications.
- Simon, M. K. (2011). *Dissertation and scholarly research: Recipes for success* (2nd ed.). Seattle, WA: Dissertation Success, LLC.
- Spatz, C. (2007). *Basic statistics: Tales of distributions*. (9th ed). Australia: Thomson Wadsworth
- Strydom, H. (2005). The pilot study. In A.S. de Vos, H. Strydom, C. B. Fouché & C.S. Delpont, *Research at grass roots: For the social sciences and human service professions* (3rd ed., pp.205-215). Pretoria: Van Schaik.
- Strydom, H., & Delpont, C.S. (2005). Information collection: Document study and secondary analysis. In A.S. de Vos, H. Strydom, C. B. Fouché & C.S. Delpont, *Research at grass roots: For the social sciences and human service professions* (3rd ed., pp.314-325). Pretoria: Van Schaik.
- Summak, M. S., Bağlibel, M., & Samancıoğlu, M. (2010). Technology readiness of primary school teachers: A case study in Turkey. *Procedia-Social and Behavioral Sciences*, 2(2), 2671-2675.
- Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International journal of medical education*, 2, 53-55. doi: 10.5116/ijme.4dfb.8dfd
- Thomas, P.Y. (2010). *Towards developing a web-based blended learning environment at the University of Botswana* (Doctoral thesis). Retrieved from <http://uir.unisa.ac.za/handle/10500/4245>.
- Thornton, P., & Houser, C. (2004). Using mobile phones in education. Proceedings from *The 2nd IEEE International Workshop on Wireless and Mobile Technologies in Education, 2004*. (pp. 3–10). Washington, DC: IEEE. doi:10.1109/WMTTE.2004.1281326
- Tondeur, J., Van Keer, H., van Braak, J., & Valcke, M. (2008). ICT integration in the classroom: Challenging the potential of a school policy. *Computers & Education*, 51(1), 212-223.

- Torjman, S. (2005). *What is policy?* Canada: Caledon Institute of Social Policy.
- Tubey, R. J., Rotich, J. K., & Bengat, J. K. (2015). Research paradigms: Theory and practice. *Research on Humanities and Social Sciences*, 5(5), 224-228.
- Van Rensburg, S., Ankiewicz, P., & Myburgh, C. (1999). Assessing South Africa learners' attitudes towards technology by using the PATT (Pupils' Attitudes Towards Technology) questionnaire. *International Journal of Technology and Design Education*, 9(2), 137-151.
- Walker, W. E. (2000). Policy analysis: A systematic approach to supporting policymaking in the public sector. *Journal of Multicriteria Decision Analysis*, 9(1-3), 11-27.doi: 10.1002/1099-1360(200001/05)9:1/3<11::AID-MCDA264>3.0.CO;2-3
- Walliman, N. (2005). *Your research project* (2nd ed.). London: SAGE Publications.
- Walsh, J. I. (2006). Policy failure and policy change British security policy after the cold war. *Comparative Political Studies*, 39(4), 490-518.
- Yerushalmy, M., & Ben-Zaken, O. (2004). *Mobile phones in Education: The case of mathematics*. The Institute for Alternatives in Education, University of Haifa.
- Yin, R. K. (2013). *Case study research: Design and methods* (5th ed.). Los Angeles: SAGE Publications.
- Yuen, A. H., Law, N., & Wong, K. C. (2003). ICT implementation and school leadership: Case studies of ICT integration in teaching and learning. *Journal of Educational Administration*, 41(2), 158-170.

APPENDIX A:
QUESTIONNAIRE

Questionnaire

Technology is a broad concept that can mean a lot of different things. For the purpose of this questionnaire, technology is referring to digital technology/technologies. That is, the digital tools we use such as computers, laptops, tablets, handhelds, interactive whiteboards, software programmes, etc.

Thank you for taking time to complete this questionnaire. Your thoughtfulness and candid responses will be greatly appreciated. Your responses will be kept completely confidential. Please place an 'x' in the appropriate space.

Section A: Profile

Gender:	Male						Female					
Race:	Black		White		Coloured			Indian		Other		
										Please Specify:		
Age Range:	20-30		31-40		41-50		51-60		61-70		71+	
School:	High School						Primary School					
Main teaching subject:												
Teaching grade:	1	2	3	4	5	6	7	8	9	10	11	12

Number of years of teaching experience:										
Qualifications:	Diploma	Undergraduate degree			Postgraduate degree			Other		
	Please provide details on your qualification below (what type of degree, what area of specialisation is the degree in etc.)									
Do you have any qualification relating to technology?	Yes					No				
Have you received any technology training (internal/external) organised by your school?	Yes					No				
Do you have access to technological devices?	Yes					No				
How many years have you had experience working with a technological device?	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16+	

Which of the following devices are you familiar with using?	Personal Computer (PC)	Laptop	Tablet device	Smart-phone	Smart Board	Other
	If other, please list the technological devices that you are familiar with below.					
What end user computing skills do you have?	MS Word	MS Excel	PowerPoint	Outlook	Other	
	If other, please specify what other end user computing skills that you have below.					

Please answer each question to the best of your knowledge. Select one level of agreement for each statement. Place an “x” in the appropriate cell/box. SD = Strongly Disagree D = Disagree U = Undecided A = Agree SA = Strongly Agree

Section B: Teacher perception

Teacher Perception of Technology		SD	D	U	A	SA
1.	Technology gives people more control.					
2.	I like technologies that allow me to tailor things to fit my own needs.					
3.	Technology makes me more efficient in my occupation.					
4.	Other people come to me for advice on new technologies.					

5.	In general, I am among the first in my circle of friends to acquire new technology when it appears.					
6.	I can usually figure out new high-tech products and services without help from others.					
7.	I keep up with the latest technological developments in my areas of interest.					
8.	I find I have fewer problems than other people in making technology work for me.					
9.	When I get technical support from a provider of a high-tech product or service, I sometimes feel as if I am being taken advantage of by someone who knows more than I do.					
10.	Technical support lines are not helpful because they don't explain things in terms I understand.					
11.	Sometimes, I think that technology systems are not designed for use by ordinary people.					
12.	There is no such thing as a manual for a high-tech product or service that's written in plain language.					
13.	It is embarrassing when I have trouble with a high-tech gadget while people are watching.					
14.	It seems my friends are learning more about the newest technologies than I am.					
15.	There should be caution in replacing important people tasks with technology because new technology is not dependable.					
16.	Technology always seems to fail at the worst possible time.					
17.	If I buy a high-tech product or service, I prefer to have the basic model over one with a lot of extra features.					
18.	People are too dependent on technology to do things for them.					
19.	Too much technology distracts people to a point that is harmful.					
20.	Technology lowers the quality of relationships by reducing personal interaction.					

21.	I worry that information I make available over the internet may be misused by others.					
-----	---	--	--	--	--	--

Section C: Teacher ICT knowledge

Items for Measuring Technological Knowledge		SD	D	U	A	SA
1.	I know how to solve my own technical problems (difficulty locating my files/folders, smart board/projector not connecting, difficulty connecting to the internet etc.).					
2.	I can easily learn how to use technological devices.					
3.	I keep up to date with important new technological devices.					
4..	I frequently play around with technological devices.					
5.	I know about a lot of different technological devices.					
6.	I have the technical skills necessary to use technology.					
7.	I can use technology tools to process data and report results.					
8.	I have the ability to design webpages.					
9.	I have the ability to use technical software.					
10.	I understand the legal, ethical, cultural, and societal issues related to technology.					

Items for Measuring Technological Content Knowledge		SD	D	U	A	SA
1.	I can choose technologies that enhance the learning of					

	particular subject content for a lesson.					
2.	I can evaluate and select new information resources and technological innovations based on their appropriateness to specific tasks related to the subject content that I teach.					
3.	I can use tools specific to the subject content that I teach (e.g., software, simulation, environmental probes, graphing calculators, exploratory environments, Web tools) to support learning and research.					

Items for Measuring Technological Pedagogical Knowledge		SD	D	U	A	SA
1.	I can choose technologies that enhance the teaching approaches I select for a lesson.					
2.	I can choose technologies that enhance learners' learning for a lesson.					
4.	I can adapt the use of the technologies to different teaching activities.					
6.	I can use technology resources to facilitate higher order thinking skills, including problem solving, critical thinking, decision-making, knowledge and creative thinking.					
8.	I can infuse technology with different strategies of teaching according to different topics part of my subject.					
9.	I can use technology for more collaboration and communication among learners and teachers.					
10.	I know how to use technology to facilitate effective learning according to my learner's needs, misconceptions, prior-knowledge, background etc.					

Thank you for taking time to complete this questionnaire. Your input is greatly appreciated.

APPENDIX B:

TEACHER INTERVIEW SCHEDULE

General Information:

1. When did you qualify as a teacher?
2. Was ICTs part of your pre-service teacher training? Please explain.
3. Do you have any experience working with a technological intervention/ or technology in schools? Explain.
4. Explain your schools approach to using and adopting technology use.

Teacher Technology Knowledge:

5. Describe your ability and confidence in using technology for personal uses
6. Describe your ability and confidence in using technology for teaching and learning purposes.
7. Explain your use of technology in the classroom – how you use it to enhance teaching and learning
8. Have you received any sort of in-service technological training/preparation? If yes explain in detail who it was provided by (school/government), the focus of this training and what you have learnt, was it once off or continuous?
9. Do you think the training that you have received has adequately prepared you to integrate ICTs into the teaching and learning process? Explain
10. What effort has your school made to prepare you for the use of technology in the teaching and learning process?
11. What effort has the education department made in preparing you for the use of technology in the teaching and learning process?
12. Do you think you have all the necessary knowledge to use and integrate technology into your teaching and learning?
13. Which area of your knowledge is lacking and needs the most focus?
14. How do you think technology training should be changed in order to ensure teachers are actually prepared and able to use technology in the teaching and learning process?
15. Apart from the training you have received, explain the process you have engaged in to build your technological knowledge and skill base.

16. What role has your principal played in ensuring you have the necessary skills and knowledge to integrate ICTs?
17. How has your principal supported you during this process of integrating ICTs into the teaching and learning process?
18. What role do you think your school principal should have done that he/she didn't do in supporting you and ensuring you have the necessary skills to integrate technology.

Teacher Beliefs and Attitude Towards Technology:

19. Which of the following options suit you most?
 - Optimism: A positive view of technology and a belief that it offers people increased control, flexibility, and efficiency in their lives.
 - Innovativeness: A tendency to be a technology pioneer and thought leader.
 - Discomfort: A perceived lack of control over technology and a feeling of being overwhelmed by it.
 - Insecurity: Distrust of technology and scepticism about its ability to work properly.
20. Explain your attitude (positive/negative) towards technology and the integration of technology into the teaching and learning process in more detail? Is this positive or negative.
21. Do you think technology is a useful tool to aid and enhance the teaching and learning process and make it more effective?
22. How has the training you have received influenced your attitude on technology integration into the classroom?
23. How has your principal influenced your beliefs and attitude towards technology?
24. Do you have any questions or any additional input on teacher readiness to use technology in the teaching and learning process (particularly focusing on skills or knowledge)?

APPENDIX C:

PRINCIPAL INTERVIEW SCHEDULE

General Information:

1. Explain the context of your school in detail (culture, relationships, physical facilities, demographics of the school (teachers and learners) etc.)
2. What age range do you fall under?
3. How many years have you been a principal for?
4. Number of years of teaching experience
5. Was ICTs part of your pre-service teacher training? Please explain (Was it a huge focus in your teacher training, what was taught as part of this training, do you think this training effectively prepared you to use technology in your teaching)
6. Was ICTs part of your training as a principal?
7. Do you have any experience working with or managing a technological intervention/ or technology in schools? Explain.
8. Explain your schools approach to using and adopting technology use.

Teacher Technology Skills and Knowledge:

9. Describe your ability and confidence in using technology for personal uses
10. Describe your ability and confidence in using technology for school related uses.
11. Do you think the teachers in your school are ready to integrate ICTs in your school?
12. Have the teachers at your school received any sort of technology training (school/government), the focus of this training and what you have learnt, was it once off or continuous?)
13. How do you think technology training should be changed in order to ensure teachers are actually prepared and able to use technology in the teaching and learning process?
14. What role have you played in ensuring that teachers have the necessary skills and knowledge to integrate ICTs?
15. What effort has your school made to prepare you for the use of technology in the teaching and learning process?
16. What effort has the education department made in preparing you for the use of technology in the teaching and learning process?

17. What steps have you taken to ensure teachers have the necessary skills and knowledge to integrate ICTs?
18. Have you received any support or training to assist you in ensuring that your teachers are ready to integrate ICTs into the teaching and learning process?
19. Have you developed your own school policy aimed at teacher readiness to integrate ICTs into the teaching and learning process? What are the goals of this policy?

Teacher Beliefs and Attitude Towards Technology:

20. How do you think you have influenced teacher's attitude and beliefs towards technology integration?
21. What do you think is the general attitude and beliefs teachers have towards the integration of technology into the teaching and learning process?
22. What influence do you think teacher's attitude and beliefs have on how prepared they are to integrate ICTs into the teaching and learning process.
23. Do you think technology is a useful tool to aid and enhance the teaching and learning process and make it more effective?
24. Do you have any questions or any additional input on teacher readiness to use technology in the teaching and learning process (particularly focusing on skills or knowledge)?

APPENDIX D:
CRONBACH'S ALPHA MEASUREMENT

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Ques 18	321.80	1096.844	.105	.	.931
Ques 19	321.60	1087.822	.301	.	.930
Ques 20	322.10	1120.767	-.250	.	.933
Ques 21	322.10	1087.656	.238	.	.930
Ques 22	321.50	1102.056	-.003	.	.931
Ques 23	321.90	1090.100	.210	.	.930
Ques 24	321.50	1099.611	.073	.	.930
Ques 25	322.70	1049.122	.549	.	.928
Ques 26	323.80	1069.956	.495	.	.929
Ques 27	322.60	1080.711	.374	.	.930
Ques 28	322.60	1059.822	.536	.	.929
Ques 29	322.90	1039.211	.709	.	.927
Ques 30	322.30	1080.233	.441	.	.929
Ques 31	322.30	1086.900	.303	.	.930
Ques 32	322.40	1072.044	.718	.	.929
Ques 33	322.00	1094.667	.170	.	.930
Ques 34	323.80	1127.067	-.361	.	.933
Ques 35	323.60	1145.156	-.558	.	.935
Ques 36	323.40	1061.822	.485	.	.929
Ques 37	323.80	1097.067	.065	.	.931
Ques 38	323.40	1096.044	.045	.	.932
Ques 39	324.10	1109.656	-.128	.	.932
Ques 40	323.70	1148.678	-.500	.	.936
Ques 41	323.50	1101.833	-.013	.	.932
Ques 42	323.40	1096.711	.027	.	.932
Ques 43	323.10	1132.322	-.423	.	.934
Ques 44	323.10	1061.878	.498	.	.929
Ques 45	323.70	1147.344	-.428	.	.936
Ques 46	323.40	1055.156	.496	.	.929
Ques 47	323.00	1112.222	-.141	.	.933
Ques 48	322.20	1114.178	-.173	.	.933
Ques 49	321.50	1092.500	.296	.	.930
Ques 50	322.50	1091.611	.120	.	.931
Ques 51	322.50	1084.500	.314	.	.930

Ques 52	322.00	1107.556	-.094	.	.932
Ques 53	321.50	1098.722	.067	.	.931
Ques 54	322.10	1076.322	.437	.	.929
Ques 55	322.00	1078.889	.551	.	.929
Ques 56	322.30	1073.789	.481	.	.929
Ques 57	322.20	1076.844	.395	.	.929
Ques 58	321.80	1079.733	.653	.	.929
Ques 59	321.80	1072.844	.630	.	.929
Ques 60	321.80	1092.622	.272	.	.930
Ques 61	321.90	1077.433	.548	.	.929
Ques 62	322.40	1079.378	.288	.	.930
Ques 63	321.90	1084.544	.386	.	.930
Ques 64	321.60	1080.044	.644	.	.929
Ques 65	322.70	1028.456	.828	.	.926
Ques 66	322.60	1095.600	.076	.	.931
Ques 67	322.90	1045.656	.633	.	.928
Ques 68	321.90	1076.544	.801	.	.929
Ques 69	322.40	1032.044	.809	.	.927
Ques 70	322.30	1043.567	.641	.	.928
Ques 71	324.00	1048.444	.487	.	.929
Ques 72	323.20	1041.067	.555	.	.928
Ques 73	323.10	1011.211	.800	.	.926
Ques 74	322.00	1061.111	.672	.	.928
Ques 75	321.90	1077.433	.548	.	.929
Ques 76	321.90	1083.211	.417	.	.929
Ques 77	321.90	1077.433	.548	.	.929
Ques 78	321.80	1079.733	.653	.	.929
Ques 79	322.10	1064.767	.766	.	.928
Ques 80	321.90	1070.989	.696	.	.929
Ques 81	321.90	1083.656	.575	.	.929
Ques 82	321.90	1084.544	.386	.	.930
Ques 83	322.00	1074.889	.648	.	.929
Ques 84	322.10	1060.100	.635	.	.928
Ques 85	322.00	1074.889	.648	.	.929
Ques 86	322.10	1091.211	.214	.	.930
Ques 87	321.90	1083.656	.575	.	.929
Ques 88	322.40	1043.156	.787	.	.927
Ques 89	322.40	1043.156	.787	.	.927
Ques 90	322.40	1036.711	.878	.	.927
Ques 91	322.50	1054.056	.683	.	.928

Ques 92	322.60	1108.711	-.090	.	.933
Ques 93	323.00	1043.556	.669	.	.928
Ques 94	322.20	1061.067	.760	.	.928
Ques 95	322.30	1052.233	.866	.	.927
Ques 96	322.60	1069.600	.578	.	.929
Ques 97	322.60	1046.044	.791	.	.927
Ques 98	322.30	1077.789	.492	.	.929
Ques 99	321.90	1083.656	.575	.	.929
Ques 100	322.50	1065.389	.672	.	.928
Ques 101	322.40	1060.711	.679	.	.928
Ques 102	322.30	1065.122	.635	.	.928
Ques 103	322.60	1056.267	.716	.	.928
Ques 104	322.60	1044.267	.689	.	.927

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.930	.948	87

APPENDIX E:
UNIVERSITY OF THE WITWATERSRAND ETHICAL CLEARANCE



Wits School of Education

27 St Andrews Road, Parktown, Johannesburg, 2193 Private Bag 3, Wits 2050, South Africa. Tel: +27 11 717-3064 Fax: +27 11 717-3100 E-mail: enquiries@educ.wits.ac.za Website: www.wits.ac.za

24 June 2016

Student Number: 556916

Protocol Number: 2016ECE030M

Dear Tanika Naicker

Application for Ethics Clearance: Master of Education

Thank you very much for your ethics application. The Ethics Committee in Education of the Faculty of Humanities, acting on behalf of the Senate has considered your application for ethics clearance for your proposal entitled:

Exploring Teacher Readiness to Integrate ICTs into the Teaching and Learning Process: A Case Study of Two Gauteng Schools.

The committee recently met and I am pleased to inform you that **clearance was granted**. However, there were a few small issues which the committee would appreciate you attending to before embarking on your research.

The following comments were made:

- Stipulate in 3.6 and 3.7 that the participants, particularly the principals, will benefit from the research study by understanding their teachers' perceptions, attitudes and readiness levels in integrating ICT.

The Protocol Number above should be submitted to the Graduate Studies in Education Committee upon submission of your final research report.

All the best with your research project.

Yours sincerely,

A handwritten signature in black ink, appearing to read "M Mabete".

Wits School of Education

011 717-3416

Cc Supervisor: Dr Siphiwe Mthiyane

APPENDIX F:

GAUTENG DEPARTMENT OF EDUCATION APPROVAL LETTER



For administrative use only:
Reference no: D2017 / 202
 enquiries: Diane Bunting 011 843 6503

GAUTENG PROVINCE

EDUCATION
 REPUBLIC OF SOUTH AFRICA

GDE RESEARCH APPROVAL LETTER

Date:	29 July 2016
Validity of Research Approval:	29 July 2016 to 30 September 2016
Name of Researcher:	Naicker T.N.
Address of Researcher:	37 Malplaquet Street; Robertsham; 2091
Telephone / Fax Number/s:	011 680 8788; 083 375 6209
Email address:	tinika.naicker@students.wits.ac.za
Research Topic:	Exploring teacher readiness to integrate ICTs into teaching and learning process: A case study of two Gauteng schools
Number and type of schools:	One Primary and ONE Secondary School
District/s/HO	Johannesburg South

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved. A separate copy of this letter must be presented to the Principal, SGB and the relevant District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted. However participation is VOLUNTARY.

The following conditions apply to GDE research. The researcher has agreed to and may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

CONDITIONS FOR CONDUCTING RESEARCH IN GDE

1. The District/Head Office Senior Manager/s concerned, the Principal/s and the chairperson/s of the School Governing Body (SGB.) must be presented with a copy of this letter.
2. The Researcher will make every effort to obtain the goodwill and co-operation of the GDE District officials, principals, SGBs, teachers, parents and learners involved. Participation is voluntary and additional remuneration will not be paid;

Mudco
 2016/08/01

1

Making education a societal priority

Office of the Director: Education Research and Knowledge Management ER&KM)

9th Floor, 111 Commissioner Street, Johannesburg, 2001
 P.O. Box 7740, Johannesburg, 2000 Tel: (011) 355 0506

3. Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal and/or Director must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.
4. Research may only commence from the second week of February and must be concluded by the end of the THIRD quarter of the academic year. If incomplete, an amended Research Approval letter may be requested to conduct research in the following year.
5. Items 6 and 7 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and be paid for by the Gauteng Department of Education.
6. It is the researcher's responsibility to obtain written consent from the SGB/s; principal/s, educator/s, parents and learners, as applicable, before commencing with research.
7. The researcher is responsible for supplying and utilizing his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institution/s, staff and/or the office/s visited for supplying such resources.
8. The names of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may not appear in the research title, report or summary.
9. On completion of the study the researcher must supply the Director: Education Research and Knowledge Management, with electronic copies of the Research Report, Thesis, Dissertation as well as a Research Summary (on the GDE Summary template). Failure to submit your Research Report, Thesis, Dissertation and Research Summary on completion of your studies / project – a month after graduation or project completion – may result in permission being withheld from you and your Supervisor in future.
10. The researcher may be expected to provide short presentations on the purpose, findings and recommendations of his/her research to both GDE officials and the schools concerned;
11. Should the researcher have been involved with research at a school and/or a district/head office level, the Director/s and school/s concerned must also be supplied with a brief summary of the purpose, findings and recommendations of the research study.

The Gauteng Department of Education wishes you well in this important undertaking and looks forward to examining the findings of your research study.

Kind regards


.....

Dr David Makhado

Director: Education Research and Knowledge Management

DATE: 2016/08/01
.....

APPENDIX G:
INFORMATION SHEET AND LETTER FOR PERMISSION FROM PRINCIPALS

Date: 16/07/2016

Dear Sir/Madam

My name is Tinika Naicker and I am a student at the School of Education at the University of the Witwatersrand. I am currently completing my Master's degree in education and I am conducting research on teacher readiness to integrate Information and Communication Technologies (ICTs) into the teaching and learning process. My research topic is:

Exploring Teacher Readiness to Integrate ICTs into the Teaching and Learning Process: A Case Study of Two Gauteng Schools.

In my research study my focus is to explore whether teachers have the necessary skills and knowledge to integrate ICTs into the teaching and learning process. I also plan to explore teacher's attitude, beliefs and willingness to integrate ICTs and use them as tools for teaching and learning. In relation to these areas I plan to look at the principal's role in ensuring that teachers have the necessary skills and knowledge, as well as how the principal influences teacher's attitude and beliefs towards technology integration.

I would kindly like to gather information about my research topic from your school. My intention is to gather data by carrying out questionnaires with five teachers from your school (one teacher from each grade). Once I analyse the data received from the questionnaires, I would like to interview these teachers. In addition, I would be grateful if I could have the opportunity to interview you. For the purpose of facilitating the interview process, I would also like to audio-tape each interview that takes place. Through the transcription of audiotapes, a more accurate reflection of what was said during the interview can be obtained. This would also add to the validity of the research. You along with the other participants have the choice to decline being audio-taped during the interview. During the interview, you should feel free to ask any questions, as well as decline answering any question. This would mean that I would need to visit your school at least twice in order to facilitate the completion of the questionnaires and carry out the interviews with each participant in order to collect data.

The reason why I have chosen your school is because your school is exposed to and is currently involved in the implementation of ICTs into the teaching and learning process. This would position your school, yourself and the other participants within your school as possessing valuable and realistic information that would meaningfully contribute to my research.

If you (the principal/deputy principal) along with the five teachers agree to participate in my research I request about 1-2 hours of your time. However, this would be at your convenience. By participating in the research, you may benefit by having a better understanding of the extent to which your teachers are ready to integrate ICTs into the teaching and learning process.

The data that I collect from you and the other participants will be used for the purpose of drawing up a research report. However, the information may be published in a journal article in the future if I plan to pursue my studying. The data collected from the questionnaires, interviews and audio-tapes will be kept in a safe place and destroyed within 3-5 years after I receive the data.

The names of the research participants and the identity of the school will be kept confidential at all times and in all academic writing about the study. This will be done by using a made-up names (pseudonyms) to represent you, the other participants and your school. Your individual privacy will be maintained in all published and written data resulting from the study.

Please note that you, along with your school are in no way obligated to participate in this research. Instead, your participation is completely voluntary and I am inviting you to please participate. It is important to note that if you agree to participate in the research and if at any point, you feel you want to discontinue your participation this will be completely acceptable. This will be without penalty or loss of benefits. Please also note that if you decide not to participate in the research, this is also completely acceptable and no penalty will be held against you.

This is simply an invitation asking you as the principal/deputy principal for permission to please allow your school, five of your teachers and more importantly yourself to please participate in my research.

Please let me know if you require any further information. I look forward to your response as soon as is convenient.

Yours sincerely,

Naicker

Tinika Naicker

Name: Tinika Naicker

Address: 37 Malplaquet Street Robertsham 2091

Email: tinika.naicker@students.wits.ac.za

Telephone/ Cell number: (011) 680-8788/ 083 7727117

Principal Consent Form

Consent Form

Please fill in and return the reply slip below indicating your willingness to be a participant in my voluntary research project called:

Exploring Teacher Readiness to Integrate ICTs into the Teaching and Learning Process: A Case Study of Two Gauteng Schools.

I, _____ (the principal)
at _____ give my
consent for the following:

Permission to be interviewed

I would like to be interviewed for this study. YES/NO

I know that I can stop the interview at any time and I do not have to answer all the questions asked. YES/NO

Permission to be audiotaped

I agree to be audiotaped during the interview YES/NO

I know that the audiotapes will be used for the purpose of this project only YES/NO

Informed Consent

I understand that:

- My name and the information I contribute will be kept confidential and safe.
- The name of my school will not be revealed.
- I do not have to answer every question during the interview and I can withdraw from the study at any time.
- I understand that the interview will be audio-taped for the purpose of facilitating the interview.
- I have the choice to decline the interview being audio-taped.
- All the data collected during this study and the audio-tapes will be destroyed within 3-5 years.

Sign_____ Date_____

APPENDIX H:
INFORMATION SHEET AND LETTER FOR PERMISSION FROM TEACHERS

Date: 25/07/2016

Dear Sir/ Madam

My name is Tinika Naicker and I am a student at the School of Education at the University of the Witwatersrand. I am currently completing my Master's degree in education and I am conducting research on teacher readiness to integrate Information and Communication Technologies (ICTs) into the teaching and learning process. My research topic is:

Exploring Teacher Readiness to Integrate ICTs into the Teaching and Learning process: A Case Study of Two Gauteng Schools.

In my research study my focus is to explore whether teachers have the necessary skills and knowledge to integrate ICTs into the teaching and learning process. I also plan to explore teacher's attitude, beliefs and willingness to integrate ICTs and use them as tools for teaching and learning. In relation to these areas I plan to look at the principal's role in ensuring that teachers have the necessary skills and knowledge, as well as how the principal influences teacher's attitude and beliefs towards technology integration.

I would kindly like to gather information about my research topic from your school. My intention is to gather data by carrying out a questionnaire and interview with you. Once I analyse the data received from the questionnaire, I would then like to interview you. For the purpose of facilitating the interview process, I would also like to audio-tape each interview that takes place. Through the transcription of audiotapes, a more accurate reflection of what was said during the interview can be obtained. This would also add to the validity of the research. You have the choice to decline being audio-taped during the interview if you so wish. During the interview, you should feel free to ask any question or decline answering any question. This would mean that I would need to visit your school at least twice in order to carry out an interview and collect data from you.

The reason why I have chosen your school is because your school is exposed to and is currently involved in the implementation of ICTs into the teaching and learning process. This would position your school, yourself and the other participants within your school as

possessing valuable and realistic information that would meaningfully contribute to my research.

If you agree to participate in my research there is a risk that you may experience a degree of inconvenience. This is because you would need to give up about two hours of your time to engage in the questionnaire and interview. The data that I collect from you will be used for the purpose of drawing up a research report. However, the information may be published in a journal article in the future if I plan to pursue my studying. The data collected from the questionnaire, interview and the audio-tapes will be kept in a safe place and destroyed within 3-5 years after I receive the data.

Your name and the identity of your school will be kept confidential at all times and in all academic writing about the study. This will be done by using a made-up name (pseudonym) in my research, to represent you and your school. Your individual privacy will be maintained in all published and written data resulting from the study.

Please note that you are in no way obligated to participate in this research. Instead, your participation is completely voluntary and I am inviting you to please participate. It is important to note that if you agree to participate in the research and if at any point, you feel you want to discontinue your participation this will be completely acceptable. This will be without penalty or loss of benefits. Please also note that if you decide not to participate in the research, this is also completely acceptable and no penalty will be held against you.

This is simply an invitation asking you as a teacher in your school to please participate in my research. Please let me know if you require any further information. I look forward to your response as soon as is convenient.

Yours sincerely,



Tinika Naicker

Name: Tinika Naicker

Address: 37 Malplaquet Street Robertsham 2091

Email: tinika.naicker@students.wits.ac.za

Telephone/ Cell number: (011) 680-8788/ 083 7727117

Teacher Consent Form

Please fill in and return the reply slip below indicating your willingness to be a participant in my voluntary research project called:

Exploring Teacher Readiness to Integrate Information and Communication Technologies into the Teaching and Learning Process: A Case Study of Two Gauteng Schools.

I, _____ a
teacher at _____ give my consent for the
following:

Permission for questionnaire

I agree to fill in a question and answer sheet for this study. YES/NO

Permission to be interviewed

I would like to be interviewed for this study. YES/NO

I know that I can stop the interview at any time and I do not have to
answer all the questions asked. YES/NO

Permission to be audiotaped

I agree to be audiotaped during the interview YES/NO

I know that the audiotapes will be used for the purpose of this project only YES/NO

Informed Consent

I understand that:

- My name and the information I contribute will be kept confidential and safe.
- The name of my school will not be revealed.
- I do not have to answer every question on the questionnaire and during the interview and I can withdraw from the study at any time.
- I understand that the interview will be audio-taped for the purpose of facilitating the interview.
- I have the choice to decline the interview being audio-taped.
- All the data collected during this study and the audio-tapes will be destroyed within 3-5 years.

Sign_____ Date_____

APPENDIX I:

TURNITIN PLAGIARISM REPORT

Turnitin Originality Report

Document Viewer

Processed on: 13-Mar-2017 5:52 PM SAST
ID: 783525635
Word Count: 53602
Submitted: 1

FinalCopy.docx By Tinika Naicker

Similarity Index	Similarity by Source
11%	Internet Sources: 10% Publications: 4% Student Papers: 2%

<1% match (Internet from 24-Apr-2011)
<http://www.presentit.co.za>

<1% match (Internet from 20-Feb-2017)
https://espace.curtin.edu.au/bitstream/handle/20.500.11937/1960/188299_Gray2012.pdf?isAllowed=y&sequence=2

<1% match (publications)
[Technological Pedagogical Content Knowledge, 2015.](#)

<1% match (Internet from 20-Apr-2016)
<https://lra.le.ac.uk/bitstream/2381/33554/1/2015BinothmanWAPhD.pdf>

<1% match (Internet from 05-Mar-2015)
<http://41.89.160.13:8080>

<1% match (Internet from 16-Apr-2016)
<http://www.tojet.net>

<1% match (Internet from 23-May-2016)
<http://dar.aucegypt.edu>