The capabilities necessary for effective ICT integration in teaching at two public primary schools in Khayelitsha in the Western Cape

By

LEBOHANG MAHLO

Thesis submitted in fulfilment of the requirements for the degree of

Master of Education

In the Faculty of Education and Social Sciences

at the Cape Peninsula University of Technology

Supervisor: Dr. Anna Dippenaar

Co-supervisor: Dr. Zayd Waghid

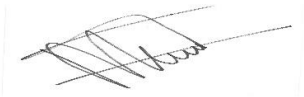
Mowbray campus

December 2020

CPUT copyright information
The dissertation/thesis may not be published either in part (in scholarly, scientific or technical journals), or as a whole (as a monograph), unless permission has been obtained from the University

DECLARATION

I, **Lebohang Mahlo**, declare that the contents of this dissertation represent my own unaided work, and that the dissertation has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.



09/12/2020

_____ _____

Sign **Date**

ABSTRACT

In 2015, the Western Cape Government (WCG) initiated the e-Learning Game Changer project to equip schools and teachers with Information and Communication Technology (ICT) equipment and skills to enhance teaching and learning experiences. Despite the WCG's efforts to support teacher development, ICT integration by teachers into teaching and learning in Western Cape rarely occurs in schools other than privileged ex-Model C schools. Limited ICT integration by teachers is not a new topic in research. However, the purpose of this study was to explore the participating teachers' capabilities needed for effective ICT integration in their teaching, with insights from two public primary schools in Khayelitsha in the Western Cape province. These two schools are both historically disadvantaged and are considered to have better ICTs for teaching and learning than other primary schools in the area of Khayelitsha as they benefited from the WCG's e-Learning Game Changer project. This study investigated conversion factors enabling or depriving teachers from achieving possible capabilities needed for effective ICT integration in the selected public primary schools. The concepts of Sen's capability approach were used to frame this study in order to investigate teachers' capabilities from the perspectives of both well-being and agency freedom. The study was based on a small sample of 10 participants, eight of which were teachers and two were principals, drawn from the two public primary schools. The study employed a qualitative research method with two phases of data collection. The first was lesson observations, and the second one-on-one semi-structured interviews. The findings indicated that, most of the conversion factors such as teachers' age, level of ICT literacy, social institutions (provincial e-Learning policy and school ICT policy), infrastructure, and resources deprived teachers of converting capabilities into functionings. However, conversion factors such as ICT skills obtained by the teachers through a community of practice and through university training, created capabilities for them to achieve certain functionings (achievements).

Key words: ICT, Smart Classroom, capabilities, public primary schools, teaching and learning, curriculum delivery, ICT access, functionings, unfreedoms, well-being, agency, community of practice.

ACKNOWLEDGEMENT

First and foremost, I would like to express my gratitude to Almighty, the Most High, Elohim, El-shaddai, Yahweh, Jehova, God for having made it possible for me to finish this work.

- To my supervisors, **Dr. Waghid** and **Dr. Dippenaar**, I wish to express my sincere appreciation and thankfulness for making an arduous project a pleasant experience. Their inspiration, constructive commentaries, guidance, support, and, most importantly, their patience made it possible for me to have completed this project on time. Without them, this thesis would not have appeared in its present form.

- I am also thankful to the **principals** of the two selected public primary schools in Khayelitsha for permitting me to conduct this research in their schools. I will always be indebted to them for their support.

- Sincere thanks to the **teachers** who unselfishly made themselves available to participate in this study. I will forever be grateful.

- I want to extend my profound gratitude to **Rose Jackson** for editing and proofreading this work and for her constructive comments and suggestions.

- The financial assistance of the **National Research Foundation** towards this research is acknowledged. Opinions expressed in this thesis, and the conclusions arrived at, are those of the author, and are not necessarily to be attributed to the National Research Foundation.

DEDICATION

For those who are seeking educational knowledge, may you not be discouraged.

TABLE OF CONTENTS

DECLARATION i
ABSTRACT ii
ACKNOWLEDGEMENT iii
DEDICATION iv
APPENDICES viii
LIST OF FIGURERS ix
LIST OF TABLES x
LIST OF ABBREVIATIONS xi
CHAPTER 1: INTRODUCTION AND BACKGROUND 1
Introduction 1
1.2 Background and Motivation 2
1.3 Statement of the problem 6
1.4 Aims and objectives 7
1.5 Research approach 7
1.6 Contributions of this study 8
1.7 Overview of the study 9
CHAPTER 2: LITERATURE REVIEW 11
Introduction 11
2.1 Capability deprivation 12
2.2 External unfreedoms prohibiting effective ICT integration 13
2.2.1 Availability and access to ICTs in schools in South Africa 13
2.2.2 Time constraints in implementing the school curriculum 14
2.2.3 Limited technical support in primary schools 16
2.2.4 Inadequate policy planning and implementation in primary schools 17
2.2.5 Electricity outages 19
2.2.6 Inadequate ICT training of teachers 19
2.3 Internal unfreedoms prohibiting effective ICT integration 24
2.3.1 Resistance to change by teachers 24
2.4 The importance of ICT integration in teaching and learning 26
2.5 ICT software application tools commonly used in a Smart Classroom 28
2.5.1 E-Books 29
2.5.2 Google Maps 29
2.5.3 Microsoft PowerPoint 30
2.5.4 YouTube 31
2.5.5 Video conferencing 32

2.6 The Capability approach as theoretical framework 33
2.7 Chapter summary 40
CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY 42
Introduction 42
3.1 Research approach 42
3.2 Research paradigm 44
3.3 Research design 45
3.4 Sampling of the school and participants 47
3.5 Qualitative data collection method and instruments 52
3.6 Data analysis (observations and interviews) 56
3.7 Trustworthiness 59
3.8 Ethical considerations 61
3.9 Chapter summary 63
CHAPTER 4: RESEARCH FINDINGS 64
Introduction 64
4.2 Research sub-question 1 64
4.2.1 Personal conversion factors and subsequent capabilities 67
4.2.1.1 Age of the teachers 67
4.2.1.2 ICT literacy 69
4.2.2 Social conversion factors and subsequent capabilities 76
4.2.2.1 Social institutions (provincial public policy) 77
4.2.2.2 Social institution (school policy) 79
4.2.3 Environmental conversion factors and subsequent capabilities 82
4.2.3.1 Infrastructure 82
4.2.3.2 Resources 83
4.3 Research sub-question two 86
4.3.1 Functionings (achievements) 86
4.3.1.1 Teachers' enhanced point of efficiency 88
4.3.1.2 Teachers' heightened level of creativity 91
4.3.1.3 Teachers augmented degree of pedagogical flexibility 92
4.3.1.4 Teachers' improved sense of agency 95
4.4 Chapter summary 101
CHAPTER 5: DISCUSSION, RECOMMENDATIONS AND LIMITATIONS 103
Introduction 103
5.1 Discussion 104
5.1.1 The desirability and necessity for cultivating a community of practice 105

5.1.2 The inadequacy of provincial and local government professional development sessions 108
5.1.3 The attitudes of older generation teachers towards ICTs and their use 110
5.1.4 Limited technical skills of some in-service teachers 112
5.1.5 The desirability of learners' learning outside the context of the classroom and the school 113
5.1.6 The influence of bureaucratic and outdated school policies on ICT use 114
5.1.7 The benefits for both teachers and learners of using ICTs in public primary schools 116
5.2 Recommendations 118
5.2.1 The role of the school principal in driving a digital literacy intervention strategy 118
5.2.2 The development/implementation of a sustainable professional development programmes 119
5.2.3 [Re]designing ICT policies 120
5.2.4 Developing a Fourth Industrial Revolution (4IR) curriculum in primary schools 121
5.3 Limitations of the study 123
5.3.1 Time frame 123
5.3.2 Gatekeepers' trust 123
5.3.3 Generalisation of the findings 124
5.3.4 Secondary sources 125
5.4 Recommendations for further research 125
5.5 Summary 126
LIST OF REFERENCES 127
APPENDICES 145

APPENDICES

Appendix A: Observation protocol……147

Appendix B: Interview protocol (teachers)……150

Appendix C: Interview schedule (principals)…….....152

Appendix D: Consent form (for participants) …….154

Appendix E: Schools' invitation letter to WCED's Smart Classroom training……..156

Appendix F: Permission letter to conduct research from WCED……157

Appendix G: Ethics clearance certificate (CPUT)……158

LIST OF FIGURERS

Figure 2.1: Capability Approach (Zheng & Walsham, 2008:226) ……..38

Figure 5.1: Fourth Industrial Revolution curriculum ..……...…….122

LIST OF TABLES

Table 3.1: Teachers' profile ……..…….....50

Table 4.1: Conversion factors influencing teachers' capabilities ..……66

Table 4.2: Enabled functionings as a result of teachers' capabilities …..…….……..88

Table 4.3: A summary of teachers' capabilities linked to conversion factors, and functionings enabled as a result of enabled capabilities ……...100

LIST OF ABBREVIATIONS

4th IR: Fourth Industrial Revolution

CAQDAS: computer assisted quality data analysis software

CAT: Computer Application Technology

CPUT: Cape Peninsula University of Technology

DoE: Department of Education

FAL: First Additional Language

ICT: Information and Communication Technology

ICTs: Information and Communication Technologies

IPA: Interpretative Phenomenological Analysis

IT: Information Technology

LAN: local area network

MIS: Management Information Systems

RSA: Republic of South Africa

SMT: School Management Team

TPA: Transcendental Phenomenological Approach/Analysis

WAN: wide area network

WCED: Western Cape Education Department

WCG: Western Cape Government

CHAPTER 1: INTRODUCTION AND BACKGROUND

Introduction

This study was inspired by my involvement in teaching for the past five years at primary school level in Grades 4 to 7. My encounter with new ICTs in the course of this teaching influenced my decision to study in the field of educational technology, and to research its use in the classroom. ICT skills courses offered by the Western Cape Education Department (WCED), together with the provision of Smart Classrooms to schools through the WCG's e-Learning Game Changer project, have provided me with the opportunity to attain first-hand experience regarding the use of ICTs for teaching and learning. This experience introduced me to new ways of adapting my practice, as well as the practice of my colleagues with whom I have worked since the inception of my teaching at the primary school level. As a result of my enthusiasm and positive attitude towards educational technology, at my school I am regularly called upon to solve computer-related problems and to assist other teachers with the implementation of certain ICT tools in their Smart Classrooms. This kind and level of experience resulted in my appointment to the IT committee at a primary school in Western Cape. This both afforded me the opportunity, and encouraged me, to expose computer-phobic teachers to various ICT skills, as well as to encourage and motivate them to make these a familiar part of their daily teaching practice. It was my curiosity and concern about the reluctance of my colleagues to integrate ICTs in their Smart Classrooms that attracted me to study these teachers' capabilities concerning ICT access and use in primary schools. I situate and frame this study in Amartya Sen's work on capabilities. Sen (1981; 1985; 1987; 1995; 1999; 2000), an internationally renowned Economics scholar famous for contributing ideas on the link between poverty and inequality, human rights, and social justice, has for forty years been, and continues to be, concerned with people's capabilities in various fields including education. He sees capabilities in terms of what people are freely able to do and to be. Thus, Sen's work and my own experience have attracted me to an investigation of the capabilities teachers need for them to integrate ICTs into their teaching effectively within the context of the WCG's e-Learning Game Changer project.

1.2 Background and Motivation

Since the initiation of educational technology, and its introduction in South African public schools over the last two decades (1995–2020), certain factors have been identified by various researchers as being responsible for creating what Sen calls 'unfreedoms' which militate against teachers using ICTs appropriately and effectively in public schools (Gunzo, 2020; Chisango & Lesame, 2019; Mwapwele, Marais, Dlamini & Van Biljon, 2019; Salam, Zeng, Pathen, Latif & Shaheen, 2017; Tiba, 2018; Van Zyl & Sabiescu, 2016). These factors include ineffective policy planning and implementation on the part of both education departments and schools, limited technical support in the use of ICTs, and inadequate ICT training (Salam et al., 2017; Van Zyl & Sabiescu, 2016), attitudes and resistance by certain teachers to change (Gunzo, 2020; Mwapwele et al., 2019), insufficient time given to implementing and completing the primary and secondary education curricula (Gunzo, 2020:144; Tiba, 2018), and limited access to ICT resources in certain public schools (Chisango & Lesame, 2019). Almost 30 years ago, Sen (1992) referred to these factors as 'conversion factors'. Conversion factors are barriers that either deprive ('unfreedoms') people from, or enable them to, convert capabilities into functionings (Robyens, 2011; Zheng & Walsham, 2008). Therefore, the extent to which teachers can achieve functionings from Smart classroom ICTs is influenced by these conversion factors (Chigona & Chigona, 2010). Tiba (2018:127) found that those teachers in his study conducted in Western Cape schools who integrate ICTs in their classrooms do so to fulfil certain desires, such as enhancing learning through using technology, facilitating collaborative learning, improving learner self-confidence, and developing in learners a greater sense of inquiry through their use of the Internet. Sen (1999) referred to these achievements or fulfilment of desires as functionings. Functionings disclose several aspects a person may value doing or being (Sen, 1999). Depriving teachers of certain capabilities related to ICT use due to conversion factors may lead to a lack of certain potential or real achievements (Sen, 1999). In other words, the availability of ICTs at schools may not guarantee the functionings of teachers if teachers lack ICT skills and knowledge (Bingimlas, 2009; Li et al., 2018). While teachers may have access to the ICTs found in a Smart Classroom at their school to deliver the curriculum, if they cannot use these ICTs due to certain conversion factors, such as lack of ICT skills, then the availability of ICTs is not likely to result in the functioning. However, the

enhancement of conversion factors (e.g., providing teachers with adequate ICT training to improve their skills) would create the capability for the teacher to integrate ICTs for teaching and learning; thus, having this capability may lead to the fulfilment of a teacher's functionings while also contributing to the happiness (well-being) of both the teacher and the learner (Chigona & Chigona, 2010).

The Western Cape ranks as one of the leading provinces in terms of the implementation, and successful outcomes of ICT integration in education (Mdlongwa, 2012; Graham, Stols & Kapp, 2020; Van Wyk, 2012). The Western Cape Education Department (WCED) has initiated many projects to encourage the use of ICTs in both primary and secondary public schools. The Khanya project was initiated in 2001 in an attempt to end, or at least reduce, the digital divide amongst former Model C schools and historically disadvantaged schools by providing the latter schools with ICTs through the establishment of both computer laboratories and ICT training to improve teaching and learning (Buzuzi, 2020; Mooketsi & Chigona, 2016; Sadeck, 2016). The stated aim and vision of the Khanya project was to encourage teachers and learners in public schools to use technology efficaciously as a means of improving teaching and learning across all subjects, particularly in Mathematics, Science, and Languages (Sadeck, 2016). Approximately 35 000 computers were placed in public schools' computer laboratories throughout the province through the project, commencing in 2001, with more than 26 000 teachers having received ICT training between 2001 and 2012 (Sadeck, 2016:7).

The Khanya project was introduced by the WCG and intended to function for only ten years. The WCED envisaged that by 2012 all the teachers in the province would be both skilled and motivated to integrate technology effectively into their teaching and curriculum implementation (Buzuzi, 2020; Chigona, Chigona & Davids, 2014; Mooketsi & Chigona, 2016; Sadeck, 2016). However, this was not the case. Despite the substantial efforts and financial investment by the WCG to increase ICT access for both teachers and learners in public schools, it appeared that teachers did not have the necessary capabilities or motivation to use ICTs effectively in their teaching (Sadeck, 2016; Chigona et al., 2014). The project may have failed to meet its aims for several reasons that include little or no training in fundamental technical issues; training providing only one type of technology (e.g. desktop, computer, or laptop); and

training which excluded individual teachers according to the subjects they were teaching (Mooketsi & Chigona, 2016; Sadeck, 2016).

After three years, on the 8 September 2015, former premier of the Western Cape, Helen Zille, formally launched the WCG's e-Learning Game Changer project to replace the Khanya project. The e-Learning Game Changer project aims to promote the use of ICTs in Western Cape public schools with the primary intention to improve the academic performance of learners in Mathematics and languages (Republic of South Africa [RSA], 2015). Like the Khanya project did some years before, the e-Learning Game Changer project aims to address the inequalities between former Model-C schools and historically disadvantaged schools by affording teachers and learners in the latter schools with access to the relevant ICT resources (WCG, 2019). The main objectives of the e-Learning Game Changer are to improve Languages and Mathematics in schools, to improve Grade 12 results, and to increase the number of well-performing schools (RSA, 2015).

Commensurate with meeting its objectives, the WCG, through the e-Learning Game Changer project, introduced the Smart School Project in 2015 (RSA, 2015). This project focuses on refreshing and updating the remaining Khanya computer laboratories and providing schools in high poverty level areas in Western Cape with Smart Classrooms in order to equalise the quality of education between better-resourced and poorer schools (Brand South Africa, 2015). Smart Classrooms are classrooms that use technological tools, such as laptops, teaching screens (Smartboards), and wireless data projectors, all of which are intended to help teachers engage and present lessons effectively and efficiently (WCG, 2019). Since the project's introduction five years ago, other technological tools found in the Smart Classrooms include Visualizers, eBeams, and the internet.

In 2019 a total of 28 871 tablets were delivered to some public schools (primary and secondary) in the Western Cape with 6422 Smart classrooms installed, and 1160 IT labs installed/upgraded (WCG, 2020). By the end of 2018, the WCG estimated that it had connected more than 1273 public schools in the Western Cape to a fully functional Wide Area Network (WANs) (WCG, n.d.). More than 333 schools are also connected to Local Area Networks (LANs) (WCG, 2019). At the beginning of 2019, the WCG estimated that it had installed Wireless Access Points in 945 schools (WCG, 2019).

According to the WCG, since 2015 more than 2000 teachers in the province have been trained by the WCED in the use of new technologies in their teaching (WCG, 2019).

In addition, the WCG developed an e-learning portal that learners, teachers, parents, management, and members of school governing bodies could easily access online and which offered, and continues to offer, a range of curriculum content, resources, e-books, activities, courses, and digital documents (Brand South Africa, 2015). To date the e-learning portal has more than 12 000 curriculum relevant digital resources available online (WCG, 2019). The WCG, through WCED, is actively supporting the integration of ICTs in schools in the province, mainly through the provision of ICTs and training. Unlike the Khanya project, the WCG's e-Learning Game Changer project exposes teachers and learners to, and attempts to equip them with, the skills to access and use, numerous ICTs such as whiteboards, laptops, wireless projectors, visualizers, and eBeams. However, despite, the WCG's efforts to address the ICT competencies of teachers, the ICT training provided by this initiative does not appear to be adequate (Sadeck, 2016). A review of the relevant literature in chapter 2 has revealed a scarcity of research focussing on the teachers' ICT training provided by the WCG's e-Learning Game Changer project on Smart Classrooms.

Moreover, to date I have found that few studies have explored teachers' capabilities concerning ICT use for teaching, and only one study involving public primary schools in the Western Cape. While I found one previous study which researched e-mentoring as a platform for the development of novice teacher competencies at a rural primary school in the Western Cape (Benjamin, 2019), and one which researched teachers' integration of technology for pedagogical use in a historically disadvantaged high school in the Western Cape (Buzuzi, 2020), I found only one study to date in ICT use in WCED primary schools. One study explored teachers' capabilities concerning ICT access and use in disadvantaged high schools in Western Cape (Chigona & Chigona, 2010). Chigona and Chigona (2010) studied teachers' capabilities and limitations in their educational use of ICTs in high schools in underprivileged areas, using the Khanya project as a case study in Western Cape.

It is against this background, and using the capability approach as theoretical framework, that this study aims to investigate the specific and appropriate teachers' capabilities needed for effective ICT integration within the context of the WCG's e-

Learning Game Changer project and Smart School Project. As was touched on briefly above, ‘capabilities’ refers to the opportunities and freedoms available to people to live the kinds of lives they desire (Sen, 1987; 1995; 1999). The DoE (2004:42) defines ICT capability simply in terms of the ability to use digital technology, communication tools and/or networks to access, manage, integrate, evaluate, and create information necessary for a learner to function in a knowledge society. However, using the capability approach lens, and for the purposes of this study, capabilities are defined from two perspectives: well-being and agency freedoms. Agency freedom focuses on a person’s ways of acting and exercising their own choices to achieve their desires (Kuhumba, 2018; Sen, 1985). Well-being freedom, on the other hand, is concerned with a person possessing an advantage to participate actively and productively in socio-economic activities (Kuhumba, 2018; Sen, 1987; Sen, 1985; Zheng & Walsham, 2008). These concepts are explored in much greater detail in the literature review (Chapter 2), and in relation to the context of teachers and ICT. In this present study, capabilities are freedoms which together constitute opportunities afforded to teachers to use ICTs competently and freely to deliver the curriculum as well as to develop their learners’ capabilities to achieve academically.

1.3 Statement of the problem

In the sense that capability is defined above by Sen (1985; 1987), effective ICT integration in teaching in certain public primary schools continues to be hindered by capability deprivation amongst the teachers at these schools. Therefore, in response to this statement of the problem, this thesis was guided by the following research question:

- **What are the specific capabilities needed for effective ICT integration in teaching in two public primary schools in the Khayelitsha area?**

The main question is guided by the following subsidiary questions:

- What are the conversion factors enabling or depriving the teachers participating in this study from achieving the capabilities necessary for effective ICT integration in their teaching in the selected public primary schools?

- What functionings were realised by the participating teachers as a result of the enhancement of conversion factors?

1.4 Aims and objectives

The main aim of this study was to investigate the specific capabilities needed by the participating teachers to be able to integrate ICT integration effectively in their teaching in the two selected public primary schools in the Khayelitsha area in the Western Cape province.

From this broad aim, the supporting objectives that needed to be achieved were as follows:

- to determine the specific conversion factors that enabled or deprived the participating teachers of, or limited them in, achieving the capabilities that might be necessary for their effectively integrating ICTs in their teaching in the selected public primary schools.

- to determine the achievements that were realised by the participating teachers as a result of the enhanced conversion factors.

1.5 Research approach

I have been, and continue to be, interested in exploring those conversion factors which may lead to capability deprivation of teachers from using ICTs in their teaching in the context of the WCG's e-Learning Game Changer project. Data were collected and analysed using a qualitative research approach. I considered the qualitative research approach to be appropriate for this study since the primary purpose of the study was to explore, investigate, and learn more about, a social phenomenon (Leavy, 2017). In the case of this study the social phenomenon is capability deprivation prohibiting the participating teachers' effective use of ICTs in their Smart Classrooms. Okeke and Van Wyk (2015) argue that the qualitative research approach is essential for the study of people's experiences since it enables researchers to employ methods that allow them to represent and elicit the voices of the participants in their studies. According to Hardman (2005), interviews constitute a suitable data collection method to achieve this. Creswell and Guetterman (2019) endorse this particular qualitative research

model, advocating for the researcher to collect data through observation and through interviews of research participants. Therefore, based on these qualitative research theories and models, I employed lesson observations and one-on-one semi-structured interviews in order to attain rich and in-depth insights in response to my research questions.

The research paradigm I employed is the interpretive research paradigm. As has been mentioned, I hoped, through these lesson observations and one-on-one interviews, to gain personal insights and an in-depth understanding of the phenomenon. Bakkabulindi (2015) argues for case studies as constituting one of the essential data collection methods conventionally used by interpretivist researchers. Yin (2009) describes a case study as a particular research design that aims at investigating a phenomenon in-depth and based on its real-life context. Given the nature of the phenomenon under study, I considered this research design to be useful and appropriate, and used the case study to explore the participating teachers' 'real-life context': the two selected public primary schools in the township of Khayelitsha. These schools had been equipped with Smart Classroom ICTs by the WCG's e-Learning Game Changer project. I considered the case study would provide an opportunity to obtain a rich and detailed picture of the phenomenon.

1.6 Contributions of this study

I consider the results of this study, and the recommendations arising from the findings, to have the potential to be beneficial to school principals, policy makers, and teachers. They are the ones who make decisions and, in the case of school principals and teachers, are responsible for the implementation programmes.

It is hoped that this study may also provide these stakeholders with useful information about the specific factors influencing teachers' limited use of ICTs for teaching and learning, particularly in 'disadvantaged' schools, and the importance of this knowledge for the effective and productive use of this teaching resource in these contexts.

Thus the study could contribute first, to the abilities of school principals and policy makers to improve teaching conditions and make these conducive to ICT accessibility and use in schools, particularly in disadvantaged schools, such as those which were the site of this study. Thus it is hoped that the study will provide policy-makers in such

schools with directions to assisting teachers in learning to use ICTs in creative ways for teaching by amending and redesigning policies to ensure teachers' and learners' accessibility to, and knowledge of, ICTs.

Then the study could be of particular value to in-service teachers by providing and empowering them with information on ways to improve their capabilities in terms of ICT pedagogical use. This insight is based on my observation of the lack of interest most of my colleagues have displayed in using ICTs in their teaching and learning.

Of relevance to this context and situation is the idea of communities of practice. The findings of this study, and those in some of the literature, showed communities of practice, instead of, or in addition to, formal training offered by an education department, to constitute the most effective method for teachers to improve their capabilities for ICT integration. Therefore, it is hoped that the current study may serve to encourage and motivate teachers to work collaboratively and supportively to regularly and creatively integrate ICTs in their teaching.

In summary, it is envisaged that the findings of this study could make both a practical and theoretical contribution towards developing and improving the specific teachers' capabilities that emerged in the course of this study, capabilities that serve as vital for effective ICT integration in teaching.

1.7 Overview of the study

This thesis is organised into five chapters as follows:

Chapter one - This chapter provides the research topic, background, and motivation of the study. It presents a statement of the research problem which underpins the researcher's motivation for conducting this study: the reluctance shown by, and limited ability of, the participating primary school teachers to integrate ICTs in their teaching, and the possible factors enabling or depriving teachers of their ability to achieve the specific capabilities necessary for ICT use. The research questions, and the aims and objectives of the study are presented, together with a discussion of a possible original contribution of the study to education policy and practice.

Chapter two This chapter presents a detailed literature review on the concept of capability deprivation as well as of studies conducted on the ways in which this has been experienced both globally and locally by teachers in their attempts to integrate ICTs effectively in their teaching. This includes the factors that lead to teachers' internal and external unfreedoms, the importance of ICT integration for teaching and learning, and ICT software application tools commonly used in a Smart Classroom. The chapter also presents a detailed explanation and discussion of Sen's capability approach as the theoretical conceptual framework underpinning this study.

Chapter three methodology - This chapter goes into the research design used for this study in detail, and includes the research approach, the research paradigm, the sample population, the observations, and the one-on-one interviews data collection methods used. A detailed discussion of how the data were analysed is presented, together with the trustworthiness of the study and the ethical considerations.

Chapter four data analysis and findings of the study - The data gathered are analysed using the manual hand analysis, and the findings presented in relation to the research sub-questions. The organisation of the data, based on each sub-question according to themes emerging during the data analysis stage, is described, recorded, and discussed, including the specific conversion factors enabling or depriving teachers from achieving capabilities, and the functionings achieved by teachers as a result of the enhanced conversion factors. The findings are linked to the capability approach.

Chapter five discussion, recommendations, and limitations – The chapter provides insights into the imperatives/drivers (developed from the findings recorded and discussed in Chapter 4) that can be linked to those capabilities found to be both lacking and necessary for the participating teachers in the two selected public primary schools to effectively integrate ICTs in their teaching. Finally, the researchers' insights concerning the implications of this research for both policy and practice are offered. Seven further implications that emerged from the study are discussed in detail. The researcher outlines the limitations of the study and offers recommendations for policy, practice, and further research in the effective use and integration of ICT in teaching.

CHAPTER 2: LITERATURE REVIEW

Introduction

In the previous chapter the aim of this present study was set out: to investigate the specific capabilities needed by the participating teachers to enable them to integrate ICT in their teaching in two selected public primary schools in Khayelitsha, Western Cape. An essential part of achieving this research aim is the examination and reviewing of previous studies focusing on teachers' use of ICTs in various educational contexts, both local and international, including studies done in contexts similar to the one in which the schools in this study are situated. The purpose of this review is to understand in more detail those factors that might enable teachers to, or deprive teachers from, achieving the capabilities they need to possess or develop for effective ICT use in their teaching. Since the introduction of ICTs in South African public schools over the last two decades, a range of complex factors have been identified that appear to be limiting the capabilities of teachers and learners from using ICTs confidently and effectively in their classrooms (Gunzo, 2020; Madoda, 2018; Mukhari, 2016; Mwapwele et al., 2019; Tiba, 2018). Thus, I considered a comprehensive review of empirical studies on this use of ICTs in teaching, as well as literature on the conceptual theoretical framework underpinning this study, vital to deepening my understanding of the particular capabilities primary school teachers have been found to need for integrating ICTs in their teaching. The chapter is organised under the following sub-headings:

- 2.1 Capability deprivation (unfreedoms)
- 2.2 External unfreedom
- 2.3 Internal unfreedoms
- 2.4 The importance of ICT integration in teaching and learning
- 2.5 ICT software application tools commonly used in a Smart Classroom
- 2.6 the Capability Approach as theoretical framework
- 2.7 Chapter summary

Each of the sub-headings is explored and debated in detail in accordance with the relevant literature.

2.1 Capability deprivation

As was briefly described in the previous chapter (1.2), the conception of capability deprivation has long been applied in the evaluation of poverty both by capability theorists such as Sen (1981) and by other researchers. This body of research indicates a close link between capability deprivation and poverty. In other words, if people are poor, the possibility exists that they are deprived of certain important freedoms (Sen, 1981). Walker and McLean (2013) have identified four types of capability deprivation: income and material deprivation, employment deprivation, education deprivation, and living environment deprivation. Sen (2000) referred to capability deprivation as 'unfreedoms'. He described an unfreedom in terms of a lack or a deprivation, and attributed unfreedoms to lack of public facilities, social care, and educational facilities. Thus, for people experiencing unfreedom, by implication, results in little or no opportunities for them to participate in the socio-economic activities of their communities.

Unfreedoms can further be broken down into two parts, which Waghid (2019:166) describes as external and internal unfreedoms. According to the Oxford dictionary, 'internal', as applied to an individual, refers to something or some quality that is situated on the inside of, or internal to, a person, whereas 'external' suggests something situated on the outside of, or external to, a person. Therefore, according to these definitions, for the purpose of this study, internal unfreedoms refer to unfreedoms that reside within, or are intrinsic to teachers, and are under the control of teachers. External unfreedoms refer to unfreedoms that are beyond teachers' control, and that prohibit teachers from achieving those capabilities needed for effective teaching and learning. However, it must be noted that these two kinds of unfreedoms are interconnected, since, as mentioned by Waghid (2019), internal unfreedoms may exist as a result of external unfreedoms.

In order to develop people's capabilities, Sen (2000) argues that it is crucial to eliminate these unfreedoms that serve to provide people with limited choices and little or no opportunities to do or to be what they value. Nussbaum (2000:230), with whom Sen worked collaboratively, agrees with Sen's (2000) view concerning these 'unfreedoms', seeing these conditions as unacceptable for human life, and needing to be improved. One way of eliminating people's unfreedoms, particularly those living in

poverty, is through the formation of policies whose aim is to create acceptable living conditions in which people's capabilities are enhanced (Khosla, Hasan, Samuels & Mulyawan, 2002). These unfreedoms, particularly as they relate to teachers, are discussed in detail below.

2.2 External unfreedoms prohibiting effective ICT integration

There are considerable challenges confronting many teachers that may be described as external unfreedoms that prohibit teachers' access to, and effective use of, ICTs in classroom contexts. These unfreedoms, in addition to the lack of availability and access to ICTs (Buzuzi, 2020; Tiba, 2018), include time constraints in implementing the curriculum (De Silva, 2015; Mukhari, 2016; Tiba 2018), limited technical support offered to teachers and schools (Buzuzi, 2020; Chigona & Chigona, 2010; Dzansi & Amedzo, 2014; Mukhari, 2016), lack of policy and planning by schools ~~(Gudmundsdottir, 2010;~~ Mukhari, 2016), power interruptions in schools during school hours (Mukhari, 2016), and inadequate ICT training of teachers (Anil & Jayakumar, 2019; Dube, Nhamo & Magonde, 2018; Madoda, 2018; Mukhari, 2016). These are discussed in detail in the following section.

2.2.1 Availability and access to ICTs in schools in South Africa

The issue of limited access to ICTs has caused a considerable equity gap in schools (Fortner, Normore & Brooks, 2018). Umugiraneza, Bansilal and North (2018) found that, at the time of their research, the use of ICTs in the curriculum delivery of Mathematics in Kwazulu-Natal primary schools was lower in comparison to that in high schools, as some teachers in some primary schools, particularly those in high poverty level areas, had no access to ICT resources. Mukhari (2016) found in his study of teachers' experiences of ICT use for teaching and learning in urban schools in Gauteng, that the level of teachers' ICT use in primary schools was considerably lower than that of high school teachers. One of the consequences of having limited or no access to ICTs is the possibility of prohibiting learners and teachers from exploring the rich and varied information available on the internet in an efficient and effective manner (Choung & Manamela, 2018; Mukhari, 2016).

In their study on digital inequality in rural and urban settings in South African schools, Choung and Manamela (2018) found that digital inequality issues were primarily the

result of lack of access to technological resources. Rowsell, Morell and Alvermann (2017) found that, in addition to this lack of access, marginalised communities do not have the same technological privileges as economically privileged communities do, and often have no access to ICTs. Graves and Bowers (2018) indicate that issues of inequality cause severe challenges in the implementation of ICTs in schools, as historically disadvantaged schools continue to suffer the inequalities of the past.

Buzuzu (2020) conducted a study which focused on factors that affect Mathematics teachers' integration of ICTs for pedagogy in less affluent high schools in the Western Cape. The findings showed lack of access to ICTs to be one of the unfreedoms limiting teachers from using ICTs. Limited access to ICT infrastructure, such as Smart Classrooms and computer labs, leads to insufficient or no ICT use at all (Anil & Jayakumar, 2019). If teachers cannot access, or have difficulties in accessing, the available ICTs, the possibility exists that effective blended learning is not taking place. Of course, limited access and use of ICTs do not operate in isolation, but may be the result of certain barriers mentioned above (2.2), such as time, limited technical support, inadequate policy planning, electricity outages, and inadequate training of teachers in ICT.

2.2.2 Time constraints in implementing the school curriculum

In his study, Gunzo (2020) found that the main barrier to teachers' integration of ICTs in their teaching in certain schools in the Eastern Cape was time constraints. In South Africa, the national curriculum - Curriculum Assessment Policy Statement (CAPS) requires teachers to cover large amounts of subject content. This leaves teachers in primary school classrooms with little time for curriculum planning or for effective curriculum or ICT implementation (De Silva, 2015). Teachers in many public primary schools are further expected to teach a range of different subjects in line with the curriculum requirements and with the limited resources available at these schools. In such cases, the time allocated for a lesson may not be sufficient for covering the required content due to a fairly rigid, one-size-fits-all CAPS (Bingimlas, 2009; Mukhari, 2016; Sadeck, 2016).

Valuable teaching and learning time can be wasted in many ways. For example, Gunzo (2020) observed that the majority of teachers in schools in the Eastern Cape

never finished their lessons within the allocated time periods when they attempted to integrate ICTs in their classrooms, as they spent too much time setting up the ICTs. A recent study by Buzuzi (2020) seems to support this finding by pointing out that the burden of setting up ICTs every morning in the classroom, an activity which was found to consume teaching and learning time, was one reason teachers were choosing not to integrate ICTs in their teaching. Teachers may thus be avoiding integrating ICTs in their classrooms as they believe that the use of the available software in computers in their teaching may be a waste of time since, in most cases, they see the software as being irrelevant to the curriculum they are attempting to deliver (Tiba, 2018). Therefore, in these contexts, the existence and availability of such ICTs in schools may be of no value, and in addition, this may cause financial constraints to the schools since the schools perceived the allocated money to be wasted on buying these ICTs instead of other more important (to them) resources.

According to Van Zyl and Sabiescu (2016), primary school teachers in urban poor and under-resourced environments in South Africa spend considerable teaching time introducing learners to technology instead of using the technology to teach the content. In such contexts, and under such conditions, teachers find it challenging and time-consuming to integrate technology in their lessons as they spend far too much time orientating learners to technology use in their learning (Van Zyl & Sabiescu, 2016). Buzuzi (2020) recognised the limited class time, and extra time allocated in relation to the real time needed by teachers and learners to use technology effectively, as external unfreedoms. This pressure on them was limiting the integration of ICTs by teachers in less affluent schools in the Western Cape. Bingimlas (2009) strongly advocated for school leaders (principals) to provide teachers with adequate time to become familiar with, and to use, new technologies for curriculum delivery. Moreover, Gunzo (2020) sees providing teachers with enough time to deliver the curriculum as creating the opportunity for schools to shift from the perennial teacher centred method of teaching to a more learner centred method). A learner centred method of teaching requires the creation and planning of a learning environment where learners are encouraged to work together as a team during activities, and the educational aim of such an environment is to cultivate dialogue and interaction amongst learners (Buzuzi, 2020:27).

2.2.3 Limited technical support in primary schools

A study conducted by Tiba (2018) which examined teachers' perceptions and experiences of using computers in teaching Social Sciences in marginalised primary and high school classrooms in the Eastern Cape, found that technical support was one of the significant factors prohibiting teachers from using ICTs in the primary schools studied. Chigona and Chigona (2010), Fergusson, Gibbs, Gosper and Philip (2009) are of the view that teachers avoid computer laboratories due to the perpetual struggle of facing technical errors which they are not able to solve due to a lack of available technical support at schools. Thus, teachers' and learners' capabilities are affected by the extent and quality of technical support available in these schools. As a result, Sadeck (2016:28) argues, if technical support is not available, or is of an unacceptable quality, teachers and learners will not have rewarding experiences with ICTs. Teachers should therefore be prepared and able to address any technical shortcomings that may arise through ICT integration in their lessons.

Buabeng-Andoh (2012) and Bingimlas (2009) suggest that, once ICT resources have been set up in schools, they need technical support and proper maintenance in the form of regular software upgrades and repairs. Thus, access to updated software and hardware is a crucial element of the successful implementation of ICT (Buabeng-Andoh, 2012; Bingimlas, 2009). Dzansi and Amedzo (2014) suggest the school or the department of education form structures that support teachers in cases of technical problems. Such structures may include an IT maintenance department with teachers trained to respond to technical (IT) problems at the school. Mukhari (2016) recommends that school leaders (principals) work together to ensure that ICT experienced and knowledgeable teachers be delegated to help in solving technical issues in schools. Gunzo (2020) found that the availability to teachers of technical support and skills might increase teachers' capabilities to deal with any technical problem that might arise during teaching and learning. However, Graham et al. (2020:760) in their study investigating the reasons for South African teachers using or not using ICTs in their classrooms, noted that the provision of technical support to teachers and learners would not necessarily guarantee ICT use in the classroom. This finding does not discount the possibility, that, without technical support, teachers

would be less motivated to even start integrating ICTs in their classrooms, nor the possibility that technical support can be poorly thought out and/or inadequate.

2.2.4 Inadequate policy planning and implementation in primary schools

In her study regarding factors influencing the use of ICTs in teaching and learning in South African township schools (primary and secondary), Mukhari (2016), found the absence of ICT policies and poor school leadership to be some of the unfreedoms keeping teachers from using ICTs. Mathipa and Mukhari (2014) noted that some primary school teachers in Gauteng indicated that the computer laboratories in their schools were not operational since there were no clear policies in place to promote and support ICT use, and teachers were not being provided with support to integrate ICTs in their classrooms. Several studies have found the rules set by the school management to be some of the critical factors determining whether teachers are integrating ICTs in the classroom or not. Van der Poll (2014) found in her case study that some teachers felt that the South African government and other policymakers are not sufficiently supportive of their efforts to integrate ICTs in curriculum delivery. Dube et al. (2018) report that some teachers in selected primary schools in South Africa have criticised the rules imposed on to them by school management concerning which teachers are entitled to use ICTs in the classroom and what subjects these ICTs can be used for. It can be argued that some or many of the policies set out by school management with the apparent intention of motivating teachers hinder and demotivate these teachers from using ICTs in their classrooms.

Graves and Bowers (2018) report that, in most cases ICT policies fail because they are only implemented using the “forward mapping approach,” which can be defined as a practice of excluding individuals at the lower level of employment from participating in the design of policies. They found that forward-mapped policy implementation can cause confusion and error amongst the ground level educators (Graves & Bowers, 2018). These researchers argue that teachers might refuse to implement policies if they have not been involved in the design process (Graves & Bowers, 2018). Likewise, Kozma (2011) argues that policies fail because teachers resist implementing practices that are based on the change of policies designed only by school leaders without the participation of teachers. The inclusion of all educators in the policy design processes

appears from these studies to be crucial, most importantly, for the reason that they are the ones who are affected by these policies now and into the future.

Rowsell et al. (2017) argue that ICT policies should move from focusing solely on the number and quantity of resource materials for improving ICT skills towards how people use these resources to improve the skills required for effective ICT integration. While the appropriate resources might be available at the school, unclear policies imposed on teachers, without consultation, might prevent the use of ICTs. Thus, Graves and Bowers (2018) imply that the lack of teacher ICT capabilities should not only be approached based on the available resources, but on the formation of policies that remove teachers' unfreedoms to integrate ICTs effectively in their curriculum delivery.

Among other benefits of having inclusive and adequate policies designed with the active involvement of teachers is the fact that policies can provide a vision of how all employees can benefit equally from such change and innovation (Kozma, 2011). It would thus be reasonable to argue that the carefully considered inclusion of all individuals in policy planning creates opportunities for promoting a healthy working and learning environment. A study, which seems to confirm the value and effectiveness of such practice was that conducted by Makwela (2019), who observed that most of the teachers in some township primary schools in Gauteng agreed that school policies on ICT integration motivated them to use ICTs in their classrooms. Therefore, it appears that, if teachers are happy that the environmental conditions in which they operate are conducive to the ICT use, they are more likely to succeed in delivering the curriculum with the help of ICTs. Maceviciute (2018) maintains that the goal of ICT policies, particularly in schools in socio-economically disadvantaged communities, is to encourage the use of ICTs by both teachers and learners among socio-economically marginalised groups. The aim of such policies would be not simply to narrow the digital divide, but also to open up opportunities for individuals to freely participate in societal and economic activities. Thus, the current study would suggest that marginalised, 'disadvantaged' schools are more likely to have teachers who fail to see or experience the value in using ICTs as they are deprived of the freedoms to use ICTs (Maceviciute, 2018).

2.2.5 Electricity outages

The Department of Education (DoE) seems to have an apathetic attitude regarding the impact of electricity outages on the effective use of ICTs in schools. The Sunday Times (2020) reported that the DoE/Basic Education Department seemed not to be particularly concerned with the effect load-shedding was having on curriculum delivery in schools, including on the use of ICTs in schools:

> Load-shedding is not such a major challenge to the majority of schools and, of course, learners. Natural light is sufficient for learning and teaching. Teachers don't depend entirely on electronic devices, as paper-based planning is still the norm for the majority of the subjects in school. *(Basic Education Department spokesperson; Elijah Mhlanga)*

What is interesting about a study done by Makwela (2019) is his finding that teachers in the study were in fact criticising constant power outages in schools in the specific context of these interruptions hindering their use of ICTs in these schools. The reintroduction of load-shedding by state owned enterprise, Eskom, in October 2019 overlapped with the dates of South Africa's first Grade 12 examinations of subjects such as Computer Application Technology (CAT), and Information Technology (IT), both of which required an uninterrupted power supply (Businesstech, 2019). These examinations were subsequently disrupted, which further contributed to students' levels of anxiety and other negative emotional states. While the more affluent schools in South Africa may have the resources available to continue their teaching using ICTs during load shedding, the majority of schools, particularly those in historically disadvantaged areas, continued to fall behind, thus exacerbating the digital divide that continues to exist between schools in affluent and those in high poverty areas (Tiba, 2018). Not only do the persistent electricity outages in South Africa continue to prohibit the majority of the schools in the country from integrating ICTs effectively, but this situation further highlights electricity as a capability needed by learners and teachers at these schools to be able to disrupt the digital divide status quo.

2.2.6 Inadequate ICT training of teachers

Several researchers have argued that, when ICTs are deployed at schools, they should be accompanied by appropriate and comprehensive teacher development and

training workshops (Johnston, 2015; Umugiraneza et al., 2018). Such training, they argue, should include training in the necessary skills for operating technology as well as training in ways to integrate these technologies into teaching and learning. Thus, Johnston (2015) argues that, while it would clearly be impossible for teachers to use ICTs without understanding the technology itself, ICT training workshops are sometimes inadequate, mainly because these training sessions are once-off with no follow up sessions or support after the training. Likewise, De Silva (2015) and Tiba (2018) observed that training programmes in some schools in Western Cape took place only once, and there was, and is, no collaboration in schools between teachers who have returned from training sessions and teachers who did not participate in the training. It would thus appear that there is a considerable need for continuing the training and support of teachers beyond such once-off training programmes to improve and strengthen their capabilities in the effective use of ICTs for teaching and learning.

Buzuzi (2020) points out that, even if teachers are provided training in the use of ICTs for curriculum delivery, this may not guarantee the teachers' use of ICTs in their classrooms. The point remains that teachers' capabilities to use ICTs affect their enthusiasm for doing so. Tiba (2018) observed that the training provided by the Khanya Project in the Western Cape was insufficient as some teachers were still not sufficiently confident to integrate their ICT knowledge and learned skills in their teaching and learning after the training. Chigona et al. (2014), in their study claim that some teachers in the Western Cape were at the time not keen to integrate ICTs in their curriculum delivery since the training they took part in did not necessarily or adequately prepare them to use these ICTs. There is also a mismatch between the nature of the training and the quantity of available IT resources at some schools. In this context, Suryani (2010), and other researchers, argue that some teachers do not use ICT in their teaching since they believe it does not matter how much they excel during their training. Often the reality is that they find it impossible in practical terms to implement their ICT knowledge and skills when they return to their respective schools, and in most cases their inability to implementing these skills may be due to the absence, or severe lack, of ICT resources at their schools (Anil et al., 2019; Fortner et al., 2018; Suryani, 2010; Umugiraneza et al., 2018).

However, while Bingimlas (2009), De Silva (2015), and Umugiraneza et al. (2018) found that the teachers in their study who frequently or regularly participated in training programmes tended to use ICTs in their lessons, and more effectively than those who did not, Madoda (2018:65) however, cautions that educationists and researchers in this field need to understand that ICT training on its own may not be a cure for the limited use of ICTs. He argues that this situation may be due to the existence of what are seen through the capabilities lens, as some external unfreedoms "that may be beyond teachers' control such as the lack of ICT resources in schools". Therefore, it should be noted that, whenever education departments or districts are planning to make ICT training available to teachers, they should ensure that ICTs are available at the participating teachers' schools. On the other hand, Bingimlas, 2009 and Li et al. (2018) argue that, although ICTs may be available in schools, and teachers may be willing to use them, they are unable to make use of them because of their poor ICT skills. Thus, from these studies, one can argue that effective ICT implementation in teaching and learning, regardless of the availability and quantity of ICT resources, can only occur if teachers possess the necessary skills to use ICTs. Therefore, it can be argued that providing teachers with continuous training in ICT use, and matching this with availability of ICT resources, can help to eliminate these unfreedoms, and has the potential to significantly improve those ICT capabilities deemed necessary for effective teaching and learning.

Madoda (2018) discovered that most of those teachers who were ICT literate in some schools in the Western Cape had acquired their ICT skills incidentally during their years at university. The findings of Buzuzi (2020) seem to agree with those of Madoda (2018), indicating that novice teachers who have recently graduated from universities show more confidence and enthusiasm in the use of ICTs in the classroom than do experienced teachers. However, in an earlier study, Chigona (2015) discovered that, even though newly qualified teachers may have spent four years being trained as teachers at a university, they may still be reluctant to integrate ICTs in their teaching, as they might not have been specifically trained in the use of ICTs in teaching. These views are shared by Bladergroen and Chigona (2019:33), who contend that university institutions need to change the focus "from learning about ICT to learning with it". This suggests that the training programmes at these institutions should create opportunities for pre-service teachers to both use and manage ICTs in their future classrooms

(Bladergroen & Chigona, 2019). In their study Dube et al. (2018) found that the ICT training programmes offered by some universities in South Africa lack pedagogical training in the use of ICTs, and this prevents teachers from effectively integrating ICTs in their curriculum delivery. Thus, from these studies it may be concluded that the quality and type of training related to ICTs that pre-service teachers are exposed to during the time of their studies is more likely to have a positive impact on their teaching when they start working as qualified teachers. For this reason, it would be reasonable to conclude that training institutions might be contributing to the limited ICT capabilities of teachers. Therefore, one would argue that it remains the responsibility of the training institution to train teachers in the pedagogical use of ICTs while they are at the institution (Bladergroen & Chigona, 2019).

In their efforts to provide quality training to in-service teachers, the DoE (2007:5) suggested that teachers in the same school develop a community of practice by being supportive of one another, with the aim of developing and improving their own and each other's' ICT skills. A community of practice involves a group of people who share concerns about work practice, and these people extend their knowledge and expertise to each other and to other communities of practice by networking in an ongoing way (Wenger, McDermott & Snyder, 2002:4). Being part of a community of practice provides an opportunity to learn new skills. It is a way of promoting social and professional relationships between colleagues through teamwork.

A community of practice is based on a recognition that the individual human mind is limited, and that therefore networking with other people may be an opportunity to bring fresh and new ideas into the group, ideas that extend beyond the repertoire of an individual member of the community, and that this kind of opportunity may not be a luxury but a necessity (Hung & Nichani, 2002:178). Lave and Wenger (1991) who, thirty years ago, together first proposed the concept, described communities of practice as consisting of core and peripheral members. This may be explained in terms of experienced employees (core members) in a community of practice passing on important knowledge to novice employees (peripheral members) (Gray, 2005). In other words, new employees learn from employees who have been working for a number of years. Lave and Wenger (1991) saw it as crucial for an employee to join such a community and learn as a newcomer (peripheral member) through observation. In the

process of learning through observation, employees may become more competent (core members) and may then fully participate in the socio-cultural practice of a community (Lave & Wenger, 1991). Lave and Wenger (1991) built on Bandura and Walters's (1977) Social Learning Theory (SLT), which suggests that people learn best through observing others. Thus, in a later article Wenger (1998) developed the concept of communities of practice, arguing that learning should not be viewed as an individual process and nor should it be viewed as a separate activity. Instead it should be viewed as a fundamental social phenomenon found in the context of human activities. Gray (2005) expanded this idea, arguing that, through collaboration with colleagues, employees are provided with the means to create a workplace identity and to understand their work. Wenger et al. (2005) further explain that colleagues and/or employees come together not necessarily because they work for the same department or institution, but because they find value in their unity. They have a joint enterprise and mutual engagement (Farnsworth, Kleanthous & Wenger-Trayner, 2016:6). In other words, they become a community of practice. Based on this collaborative developmental concept, Bladergroen, Chigona, Bytheway, Cox, Dumas and Van Zyl (2012:113) argue that if teachers need support in their use of ICTs they are more likely to turn to their trainers or to other teachers (peers). This discourse is in line with that of Madoda (2018:87), who argues that ICT training programmes should take place at schools, rather than at venues away from schools, and, most importantly, should also be done through peer learning. Peer learning occurs when more knowledgeable teachers mentor the less knowledgeable teachers until the less knowledgeable have totally mastered the skill (Mukhari, 2016:39). From these studies, and scholarly arguments for the value of community of practice and peer learning, one can argue that the practice of peer mentoring and community of practice are of great importance for all schools. Moreover, community of practice would seem to be an effective way of removing teachers' unfreedoms concerning ICT use.

In order for the WCG and WCED to together realise their education goals of enhancing teaching and learning through using ICTs, besides offering a limited training programme on basic ICT skills, they need to provide teachers with ongoing technical and pedagogic support in developing the necessary ICT capabilities to integrate these skills in their teaching (Makwela, 2019). Most importantly, school leaders need to organise and provide training sessions that develop in teachers the ability to creatively

solve any troubleshooting problems they may encounter when attempting to use technology in their classrooms (Tiba, 2018:157). Professional development of teachers in ICT use for pedagogy is therefore essential, and training programmes should aim to eliminate the prevalent negative attitudes of teachers towards the use of ICTs. From my own experience, there is a need for teachers to be taught in an experiential, hands-on way about the benefits of using ICTs in the classroom. In this way, teachers may come to see value in integrating ICTs in their teaching, and they would gain valuable practical experience. Li et al. (2018) agree that, if teachers are fully aware of the benefits of using ICTs, they are more likely to adopt these in their teaching. Positive experiences would, therefore, help teachers to have positive perceptions and attitudes towards the use of ICTs in their classrooms (Farjon, Smits & Voogt, 2019).

2.3 Internal unfreedoms prohibiting effective ICT integration

Resistance to change by teachers, seen through the capability approach lens, is an internal unfreedom which prohibits teachers from using the available ICTs in their classrooms (Mathipa & Mukhari, 2014; Mukhari, 2016). Negative attitudes and resistance by teachers to the use of those ICTs available and at their disposal is also a result of, or linked to, the external unfreedoms discussed in the previous section (2.2). Below, the internal unfreedom related to the pedagogical use of ICTs is discussed in detail.

2.3.1 Resistance to change by teachers

While some teachers may see ICTs as essential tools in the enhancement of teaching and learning, others may develop negative attitudes towards them, which may be both a result of, and cause them to resist, change (Bas, 2017). If teachers perceive ICTs as unsatisfactory and of no value in terms of easing their teaching workload, it is to be expected that they will not use them in their teaching (Buabeng-Andoh, 2012). Regan, Evmenova, Sacco, Schwartzer, Chirinos and Hughes (2019), and Makwela (2019), are also of the view that teachers' attitudes and beliefs determine whether they are likely to adopt and use ICTs in their classrooms. Therefore, one would argue that, if teachers have positive attitudes towards ICTs, it is likely that they will use ICTs in their teaching (Regan et al., 2019). From these studies, it can be argued that teachers'

negative attitudes towards ICT use are likely to influence other teachers to resist continuing with the use of ICTs in their classrooms.

Umugiraneza et al. (2018) and Dube et al. (2018) claim that personal characteristics and life experience, such as age and work experience, influence teachers' willingness and enthusiasm to integrate ICTs in their teaching. For example, Ritvanen, Louhevaara, Helina, Vaisanen and Hanninen (2006), in their study of teachers between the ages of 50 and 57, found these older teachers to have not only reduced physical capabilities, but to have developed slower mental processing. Umugiraneza et al. (2018) further argue that older teachers are usually more reluctant to use ICTs compared to younger teachers who do not need as much support in their attempts to integrate ICTs in their teaching. Umugiraneza et al. (2018) further imply that those younger teachers who have recently completed their teaching qualifications, unlike their older teacher counterparts, have had the opportunity to undergo training in the use of these new ICTs in their teaching.

In their study, Mathipa and Mukhari (2014) found that some older generation teachers believed that technology is only meant for younger people, and thus resisted using it in their teaching. These findings were further confirmed by Mukhari (2016) in a separate study. Some younger teachers in her study were of the view that most older generation teachers are not interested in using ICTs in their classrooms since they are nearing retirement. Thus, from these studies one could conclude that, if teachers believe that the integration of ICT does not fulfil their needs or those of their learners, there is a high possibility, based on this empirical evidence, that they will not use it in their classrooms. However, Dube et al. (2018) are of the view that negative attitudes towards ICT adoption do not work independently, or in a vacuum, but are often caused by limitations of time, technical support, and access to resources, together with poor policy planning and insufficient training rather than by age. Farjon, Smits and Voogt (2019) and Nordlof, Hallstrom and Host (2019) found, in some cases, the negative attitudes of teachers towards the adoption of ICTs to be caused by lack of resources. In light of this literature, the possibility exists that teachers may develop negative perceptions and attitudes about ICTs because they are unfamiliar with ICTs and have never used them before, together with, or rather than, because of their advanced age.

Findings from previous studies, such as those of Bas (2017), Buabeng-Andoh (2012), Dube et al. (2018), Makwela (2019), Nordlof et al. (2019) and Regan et al. (2019), provide a glimpse of the consequences of teachers' negative attitudes and perceptions of ICTs. The literature cited above clearly reveals that negative attitudes on the part of many teachers towards ICT adoption do not develop or operate in a vacuum, but can be caused by certain education contextual or external factors mentioned earlier in this section. It would be reasonable to assume that teachers' attitudes can be determined by external unfreedoms, such as lack of policy, limited time for teaching, limited technical support, and limited ICT resources. In other words, the external unfreedoms to a large extent may exacerbate certain internal unfreedoms, such as a negative attitude towards changes in teaching and learning strategies under the auspices of educational technology. Up to now, the literature review dealt with internal and external unfreedoms, therefore, in the next sections the literature review will continue as follows:

2.4 The importance of ICT integration in teaching and learning

A comparison between current teaching and learning experiences and those of twenty years ago, shows a difference in the extent of the use of ICTs. Two decades ago ICTs were rarely used in South African schools. The advancement and ease of accessibility of ICTs has since measurably influenced the culture of teaching and learning in the classroom (Waghid & Waghid, 2018). Gunzo (2020) and Makwela (2019) endorse this view, arguing that emerging ICTs, such as computers and the internet, have become essential tools in education since they possess the power to significantly influence and change the nature of teaching and learning. In fact, researchers have found that the integration of ICTs in those South African schools that have managed to achieve this, has resulted in the promotion of effective teaching and learning in the classroom (Benjamin, 2019; Buzuzi, 2020; Makwela, 2019; Madoda, 2018; Mukhari, 2016).

A number of studies conducted in contexts where ICTs were limited show that integrating new ICTs in teaching for the purposes of curriculum delivery is essential in the twenty-first century since it can improve learning processes and outcomes as discussed below in this section (Buzuzi, 2020; Gunzo, 2020; Tiba, 2018). The use of ICTs in teaching and learning has been shown to provide opportunities for learners to

understand and thoroughly question how things work (Waghid, Waghid & Waghid, 2016). At the same time, ICTs are understood to assist in developing high order thinking abilities such as cognitive skills (DoE, 2004:14). This suggests that the use of ICTs in teaching and learning challenges learners not simply to memorise, but to think independently and critically, thus having the potential to change the persisting predominantly teacher centred, rote learning pedagogical paradigm in many schools in South Africa.

An additional advantage of using ICTs in the teaching and learning process, Suryani (2010:16) argues, in her review of other studies, is its potential to improve learners' literacy and numeracy capabilities. For instance, Makwela (2019) cites Microsoft Word in computers as having the potential to develop learners' writing skills. He cites the examples of learners being able to make frequent use of computers for activities involving calculations using spreadsheets, word processing, data manipulation and presentation, manipulating images, and searching for information on the internet. Based on these studies, it would thus be reasonable to argue that the availability of computers in schools for teaching and learning can create an opportunity for learners to both test and develop their creativity since computers give learners the freedom to use the computers in ways they want to use them, not in response to a teacher's spoken instructions. In this way learners can develop a love and appreciation for ICTs. Thus, the resistance by teachers to make use of ICTs in their classrooms may also stop learners from developing an interest in the use of ICTs (Buzuzi, 2020).

ICTs constitute a combination of tools: both the hardware and software typically used to exchange information and knowledge between teachers and learners, and between learners with their peers in an interactive way (DoE, 2004). Ojo and Adu (2018) add that ICTs include devices used by teachers to assist them in accomplishing the school's curriculum goals and objectives. In this present study ICTs available to the participating teachers at the two selected public primary schools included resources in the Smart Classroom, such as white boards (Smart Boards), projectors, laptops, visualizers, eBeams and Wi-Fi. Thus, it must be noted that the combination of these ICT devices forms what is called a 'Smart Board'. A Smart Board is an interactive white board that works as a computer monitor. It allows the user to use a keyboard, a special stylus pen, or a finger to interact with the board (Alshahrani, 2016:200). Once an

eBeam is attached to the white board the white board automatically becomes interactive, and hence it is referred to as a Smart Board. Mugani (2020) conducted a study investigating the pedagogical impact of Smart Classroom on grade 11 teachers in Gauteng Province. The findings suggest that teachers may use ICTs in the Smart Classrooms for several reasons, which include the following:

- To create an environment where learners are keen to learn (attract learners' attention);
- To help learners to find it more conducive to learning to use visual and audio aids;
- To improve and increase learner participation in the classroom lesson activities;
- To save teaching and learning time: E-textbooks and other tools may be loaded on the Smart Board, which makes the work easy and less time is spent on planning the lesson; and
- To cover a lot of curriculum content in a short period of time.

Thus, based on various studies cited in this chapter, it can be argued that the use of the Smart Board for teaching and learning has the potential to make leaners more active participants in their own learning, and to increases their motivation to acquire new knowledge within an enjoyable learning environment (İstifçi et al., 2018). Tsayang, Batane and Majuta (2020) further claim that if teachers use Smart Boards in the classroom they can create opportunities for learners to participate more actively, and effectively in terms of acquiring new knowledge and skills, during lessons than they usually do in the absence of this ICT. Software applications used for teaching with the Smart Board have been shown to provide opportunities to teachers for them to present lessons visually and audibly, making concepts clear and close to leaners' lived experiences, and thus augmenting and enriching their learning experience (Adagideli & Ozsevgec, 2019:130). The next section describes in more detail the functions and use of these basic ICT software application tools.

2.5 ICT software application tools commonly used in a Smart Classroom

The WCED recommends that teachers use certain basic ICT software application tool when teaching with Smart Boards. These include E-Books, Google Maps, PowerPoint

presentations, videos (YouTube), and video conferencing (WCED, n.d.). These basic ICT software applications tools and applications are discussed in detail below.

2.5.1 E-Books

An E-Book is a book that can be shown and read on an electronic device instead of being printed on paper (Embong Azelin, Mohd Hashim & Shaari, 2012). Some E-Books can only be accessed and read online, some can be downloadable online, and some are only obtainable as book apps (Johnson, 2014). These E-Books can either be traditional books that are digitalised, or interactive. The latter allow learners to listen to the voice reading the book (Johnson, 2014). E-Books are used for various teaching and learning purposes, such as to improve learners' reading skills (Wang, Lu & Lee, 2011). If learners are struggling to read the use of E-Books by both teachers and learners may benefit such learners through their being able to hear the story being read aloud (Johnson, 2014). The use of E-Books as a literacy practice may provide learners with the opportunity to read along in order to improve their vocabulary. E-Books have various attractive features, such as user-friendly functions, attractive graphics, enlarged text size, and a plug-in speaker, all of which make reading lessons more varied and fun. Moreover, the availability of these features challenges learners to be more creative in the classroom (Embong et al., 2012). The use of E-Books in the classroom has been found to enhance learners' learning experiences. Pan (2011) contends that one of the benefits of E-Books is that learners no longer have to carry heavy printed traditional textbooks and reading books to school. The lighter weight in turn helps learners avoid unnecessary injuries such as lower back pain and poor posture (Embong et al., 2012). E-books are considered a tool that makes lessons more fun, and there is no doubt that electronic devices used to store these E-Books are more convenient to carry than printed traditional textbooks.

2.5.2 Google Maps

While Many geovisualisation tools such as MapQuest and Yahoo Maps are available to people, Google Maps is the most used geovisualisation tool (Lamb & Johnson, 2010). This claim is further supported by PPC Land (2020), arguing that the Google Maps site attracts over one billion users each month. Google Maps enables users to explore geographic locations anywhere globally, as well as satellite images, and aerial photographs (Lamb & Johnson, 2010; Demirci, Karaburun & Kilar, 2013). Landicho

(2020) posits that Google Maps may be a useful tool in teaching and learning. Essentially, learners to deepen their subject content knowledge (Kerski, 2011) can use Google Maps. The use of Google Maps can increase learners' interest and knowledge in subjects such as Science, Geography, and History, as it helps them understand certain concepts and topics more clearly (Landicho, 2020). Since learners can see close-up views of geographical areas using Google Maps, teachers and learners are provided with the opportunity to visualise countries, continents, and to engage in an immediate way with other Geography or History topics in their natural or global context. The literature reviewed in this section shows Google Maps to be a teaching and learning tool that clearly has the potential to be an engaging and enriching classroom resource.

2.5.3 Microsoft PowerPoint

Another important ICT teaching tool endorsed by Reich and Daccord (2015) as an education tool, is presentation software such as Microsoft's PowerPoint. PowerPoint enables an individual to create slides that integrate words, images, sounds, and videos (Reich & Daccord, 2015:5). Sankey, Birch and Gardiner (2010) are of the view that learners learn better when a combination of words and pictures are used in PowerPoint presentations than they do from words alone. Reich and Daccord, (2015) argue that PowerPoint Slides should be mainly used to present visual information. Thus, using PowerPoint slides, teachers can engage learners by asking them to analyse or interpret the images shown in the slides (Reich & Daccord, 2015). This method challenges learners to think as they need to concentrate on the features of the picture. Moreover, Mukhari (2016) found that teachers can use ICTs in the classroom to help them manage their time effectively. Lewis (2004:9) pointed out that if ICTs, effectively used, can save teaching time in the classroom, and can create more time for other activities. Both Sahin-Kizil (2014) and Mukhari (2016) found that the use of ICTs in schools saves time, and makes lessons easier, faster, and teachers are able to reach the objectives of their lessons. For example, having key points prepared on the PowerPoint slides displayed on the screen, instead of writing texts on the board can save teaching time (Lewis, 2004:9). Tiba (2018) also found this to be the case in his study on newly qualified teachers who reported that, because teaching and learning time was saved when they integrated ICTs in their teaching, they had more

time to spend focusing on their learners. Moreover, ICT not only saves teaching time, it also saves paper. The use of prepared instructions displayed on the Smart Board for learners to see minimises the use of paper, therefore decreasing time spent on printing and distribution of worksheets (Lewis, 2004).

Various studies and views of scholars mentioned in this chapter point to the need for teachers to integrate ICTs in their classrooms in order to prepare their learners for twenty-first-century ICT, and for learners to acquire the skills mentioned earlier in this section. In this way, learners are prepared and equipped by teachers for the Fourth Industrial Revolution (4IR) society, in particular for when they are entering universities and workplaces. However, despite the perceived and desired availability and obvious benefits of ICT integration, some teachers still have limited or no access to ICTs.

2.5.4 YouTube

YouTube is considered to be a valuable ICT tool to access information (Kabooha & Elyas, 2015). YouTube is a multidimensional tool that contains videos in all areas of knowledge that can be recovered easily (Kabooha & Elyas, 2015:3526). Reich and Daccord (2015) argue for use of YouTube videos in the classroom as being essential, enabling teachers to draw on other voices and images to enrich their teaching and their learners' learning process by engaging learners in a range of different learning styles. YouTube videos incorporated in a lesson have the potential to make difficult ideas and concepts easier for learners to understand besides engaging and sustaining the attention of learners, in particular weak and visual learners (Kabooha & Elyas, 2015). Indrasari (2015) also sees this value in the use of YouTube as a teaching tool, indicating that learners have a tendency to pay more attention when videos are played in the classroom. YouTube videos are suitable for use within the limited time given to teaching and learning in a lesson since, particularly at primary school level, they are usually of a reasonable length for use in a finite lesson period time (Kabooha & Elyas, 2015). Indrasari (2015) also sees videos as assisting in improving learners' writing skills. For example, learners can watch a short story with both visual and quality sound then, with prompts from the teacher, write a summary of the story individually in their own words. Kabooha and Elyas (2015) point out that YouTube videos may be valuable to learners learning a second language as these learners can watch and listen with interest, at the same time learning new vocabulary, language structures, and skills.

Moreover, these authors see the use of YouTube videos by teachers as minimising the level of anxiety among these leaners should some of them be particularly unfamiliar with the language being taught (Kabooha & Elyas, 2015).

2.5.5 Video conferencing

Video conferencing is a communication tool that allows users to share visual and audio features in real-time (Al-Samarraie, 2019; Hoper, 2014). In other words, video conferencing allows people in different locations to connect using the internet, while at the same time enabling them to see and hear each other. According to Correia, Liu and Xu (2020), there are four commonly used video conferencing tools: Zoom, Skype, Microsoft Teams, and WhatsApp. Video conferencing has been used in education for distance learning courses, professional education training, communication with subject advisers, computer-generated 'virtual' trips to museums for enriched content teaching, and co-operation between schools (Hoper, 2014). Al-Samarraie (2019) also sees the value of these video conferencing media, arguing that video conferencing has been used as a teaching and learning tool in education and to maintain effective communication between teachers and learners, especially when face-to-face meetings are not possible due to such barriers as the Covid-19 pandemic. Teaching and learning opportunities created by video conferencing include:

- Learners have the opportunity to exchange ideas and resources in a collaborative environment
- Learners' communication skills can be developed as they have the opportunity to actively engage with peers and teachers (Al-Samarraie, 2019:133).

If learners have the opportunity to interact with new people through video conferencing, Jung (2013) and Hoper (2014) emphasise that consistent use of this medium can develop learners' language competence. Based on the literature cited in this section, it can be argued that, through video conferencing, teachers may connect with the classroom next door or bring experts 'virtually' into the classroom to enhance teaching and learning.

2.6 The Capability approach as theoretical framework

In Chapter 1, I introduced the use of Sen's capability approach (Sen, 1985; 1987; 1995; 1999) as the theoretical framework for my study. Zheng and Walsham (2008) build on Sen's original capability concept seeing it in the context of the use of technologies in an e-society, and the capabilities of individuals in this context to be able to do or be. The focus of the approach on the capability development of people to have the freedom to participate fully in their daily activities (Sen, 1999), and the consequences of their being deprived of this, has been described above (2.1). In this sense, freedom plays a vital role in the development of individual abilities, in a context where people are rendered independent and free, or are enabled to help themselves (Alampay, 2003; Sen, 1999). Thus, the capability approach seeks to ensure that people use available resources freely, without any obstacles, to achieve what they consider valuable (functionings). Thus, as Walker's (2007) argument that the capabilities of people could be realised or improved by eliminating obstacles or 'unfreedoms' has been touched on (2.1), particularly with reference to an education context. These unfreedoms can include policies imposed by institutions on how resources should be distributed and/or used in the workplace (Chigona & Chigona, 2010). Chigona and Chigona (2010) are of the view that, when designing policies, the priority should be individual freedoms. Based on this literature, the primary purpose of this study is, through using this approach, to examine in depth the various individual freedoms teachers need to have to access and use ICTs.

As has been mentioned, Nussbaum (2003) and Sen (1985; 1987; 1995; 1999) saw the capability approach as strongly linked to the human rights framework. Within this context, the approach has over the years, focussed specifically on such issues as women's' rights, the rights of underprivileged people, and the rights of disabled people (Nussbaum, 2007). Zheng and Walsham (2008) in subscribing to the capability approach, endorse the view that poverty should not only be seen in terms of people having insufficient income but also as their being forced to live in poor conditions. In other words, they lack the freedom to participate in meaningful economic activities which would enable them to improve their living conditions and opportunities. Thus, the capability approach focuses on capabilities such as access to basic needs, and what people may lack, or which restrict them, when their income is low (Zheng &

Walsham, 2008). In addition to focussing on the socio-economic context, the capability approach has been used in recent years as a guiding framework in dealing with people's access and use of ICTs in all sectors of government including education, particularly in developing countries (Madon, 2004). Nussbaum (2003) and Walker (2010) describe how the capability approach has long been used as a framework for social justice, particularly linked to education. They argue for the causal link between the approach and social justice, and the reciprocal relationship between social justice and education, based on the equitable distribution of resources.

These basic concepts of the capability approach, functionings and capabilities, are used as a means of framing and guiding the current study. Sen (1995) refers to what people value and can have as functionings. In other words, functionings are the countless conditions of human beings, and the activities that people are free to embark upon. The term 'functioning' originates from the verb 'to function', which basically means to participate in an activity (Kuhumba, 2018:131). Functionings in this sense are people's achievements which result from their efforts to be or to do something (Kuhumba, 2018:131). According to Sen (1995:110), functionings are physical and emotional states like being well-nurtured, healthy, feeling protected, literate, happy, being involved in societal activities, respected, and, most importantly, having the freedom to participate in social and political life. Hence, these states of being, and doings, are referred to as 'achieved functionings' and they are what makes life valuable for an individual, and their feeling and being fulfilled (Kuhumba, 2018).

The literature cited above indicates that capabilities as being represented by different functionings (Sen, 1995; 1999; Zheng & Walsham, 2008). Capabilities are the opportunities and freedoms available to people to live the kinds of lives they desire (Alampay, 2006:14). In the context of the current study it can be argued that, if teachers are restricted from enjoying the benefits derived from the available ICTs, they cannot be said to have the freedoms to enjoy such benefits. Thus, as Nussbaum (2007) argues, material and institutional support play a crucial role in the development of capabilities. Although the concepts, capabilities and functionings, have different meanings, they are interconnected and interdependent. A capability can be referred to as potential functionings, freedoms, or opportunities, and a functioning can be

referred to as an achievement (Figure 2.1) (Robyens, 2005:100). Moreover, the enhancement of capabilities should create functionings (Kuhumba, 2018):

> A function is an achievement, whereas a capability is the ability to achieve. Functionings are, in a sense, more directly related to living conditions, since they are different aspects of living conditions. Capabilities, in contrast, are notions of freedom, in the positive sense: what real opportunities you have regarding the life you may lead (Sen, 1987:36).

Sen (1987) intentionally refuses to specify these functionings and capabilities: functionings and capabilities can be relevant to an individual depending on diverse settings (Zheng & Walsham, 2008). However, Nussbaum (2003:41) specifies a list of the following ten central human capabilities:

- Life – to live life to the end or to live the normal length of life
- Bodily health – to have access to good health, and to those substances necessary for growth, and to have passable shelter
- Bodily integrity – to have freedom to move from place to place without harm, violence, and any kind of abuse
- Senses – being able to access education so that one can sense, imagine, think and reason in a human way.
- Emotions – being able to have attachments to things or people other than ourselves. To have emotions towards others
- Practical reason – being able to use reason with the aim of acting on it
- Affiliation – (a) being able to live with others in peace and to show concern for others; (b) being able to be treated equally with others on the basis of race, sex religion etc.
- Other species – being able to live with concern for animals, plants, and nature in general
- Play – being able to be happy, laugh, and enjoy recreational activities
- Control over one's environment – (a) political environment – having the freedoms to express one’s views and take part in the community’s political decisions that rule people’s lives; (b) Material environment - having the freedom

to access and use property (land and portable resources) equally with others, and having the freedom to be treated equally with other workers.

Although Nussbaum (2003) specifies some of these necessary capabilities, she would agree with Sen (1987) and with Zheng and Walsham (2008) that the list itself is not fixed: it is open-ended, meaning that these capabilities can change based on environmental conditions.

Williams et al. (2018) endorse the following teacher capabilities as being necessary for effective ICT integration by teachers. They should be able:

- To follow procedures to ensure that the available ICTs are used ethically and responsibly
- To use ICTs to generate a reliable and conducive learning environment for learners to work together, connect, and be fully engaged in their learning
- To act as learning facilitators in the digital classroom
- To use ICTs to share information with their learners that allows them to make decisions on their own about their learning
- To use ICTs to gather and examine information to inform and generate critical reflection on their teaching with the aim of improving their teaching
- To select the appropriate ICTs for teaching without wasting any teaching time
- To support learners and colleagues in their use of suitable ICTs for teaching and learning.

Chigona and Chigona (2010), Madoda (2018), Mukhari (2016), Sadeck (2016), and Salehi and Salehi (2014) indicate the necessity for teachers to have the capabilities necessary to solve minor technical errors when they arise while using ICTs in the course of curriculum delivery. It would be a given that such a capability would save time and avoid the hours long wait for IT personnel to arrive to fix the problem. Lastly, Chigona et al. (2006) argue that some capabilities necessary for teachers to possess for effective ICT integration, other than in the classroom, should include using ICTs for lesson planning, preparing activities for learners in advance that require them to use ICTs, and to use ICTs other than for curriculum delivery, e.g. for mark recording. The literature cited above indicates that teachers' ICT capabilities can only be enhanced if

teachers have unlimited access to ICTs and are provided with the necessary training and support in the use of ICTs.

Well-being freedom and agency freedom are two additional concepts forming the basis of the capability approach (Sen, 1995). Sen (1985) viewed capabilities from these two perspectives. Robyens (2005:100), in agreement with Sen (1985), argues that a person's overall freedom is made up of a number of freedoms. Well-being freedom is the freedom to have a good life, and agency freedom is the freedom to achieve what a person has reason to value (Grunfeld, Hak & Pin, 2011:153). Kuhumba (2018:133) defines agency as the different ways in which an individual person acts, or is able to act, and exercise his or her choices to achieve those states of being she or he values. In other words, agency freedom focuses on what a person is free to do and achieve, while well-being freedom is described by Kuhumba (2018) in terms of a person's advantage. For instance, a person's advantage can be measured through valuable states of being, such as being well-nurtured, educated, and so forth (Kuhumba, 2018). Well-being freedom focuses on a person's capability to possess numerous functioning vectors (Kuhumba, 2018). Therefore, these freedoms can also be referred to as opportunities available to people to enable them to live the kind of lives they want to live, to do or achieve what they want to do or achieve, and to be what that they want to be (Robyens, 2005). Sen (1985) explained agency as being manifest in situations where people can realise and value things they see as essential, and have reasons to value these. A person is thus regarded as an agent whose happiness is his or her primary concern (Sen, 1995).

This study focuses on understanding the relationship between commodities, in this case, ICTs in the Smart Classrooms provided by the WCG's e-Learning Game Changer project, and the capabilities teachers generate for themselves and for their learners from using these ICTs. What teachers achieve from using ICTs in Smart Classrooms is thus regarded as functioning. The freedom and real opportunities open to teachers to use the ICTs in the Smart Classrooms are capabilities. Figure 2.1 illustrates this relationship:

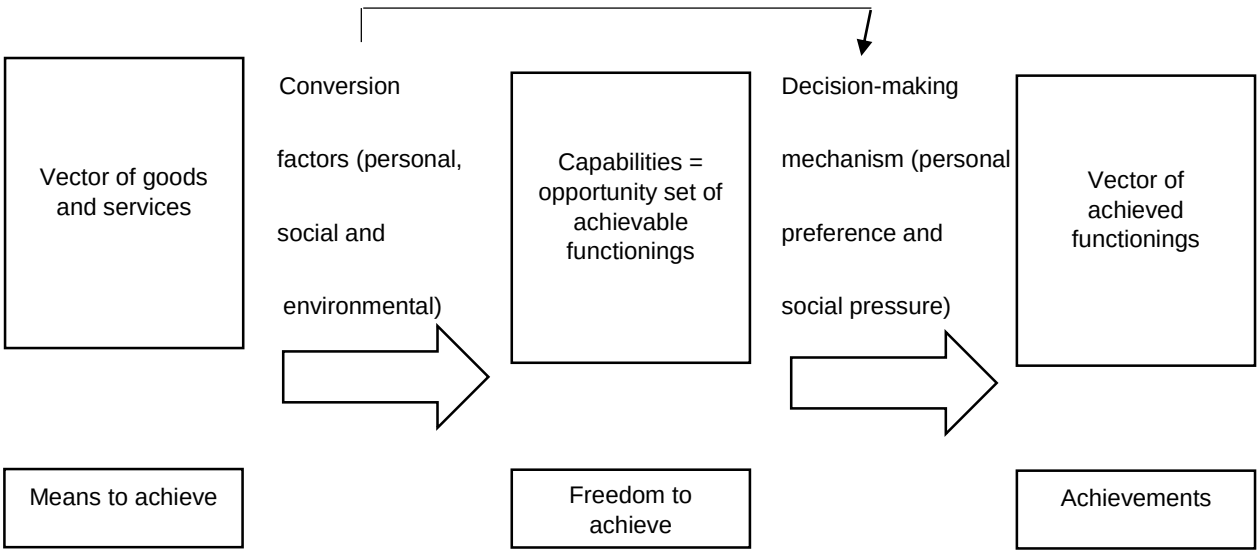


Figure 2.1: Capability Approach (Zheng & Walsham, 2008:226).

Figure 2.1 shows how the vector of goods and services (commodities) may be converted to capabilities through personal, social, and environmental conversion factors (Grunfeld et al., 2011). Functionings would then be achieved through individual decision-making mechanisms, such as personal preference and pressure. In other words, the capability of a person to use these commodities is influenced by a range of conversional factors. The conversion factors influence the freedoms of people to convert the characteristics of goods/resources/services into functionings (Robyens, 2011). These conversion factors can positively or negatively influence a person's freedom to achieve their capabilities through the available resources. Zheng and Walsham (2008:227) list some of these conversion factors:

- personal conversion factors (skills, training conditions, age);
- social conversion factors (policies); and lastly,
- environmental conversion factors (infrastructure, other resources).

Personal conversion factors are individual factors that strongly influence people's capabilities to use resources, and these factors vary from person to person (Robyens, 2011). Moreover, personal conversion factors include personal characteristics, such as an individual's mental and physical condition, literacy level, and gender, which in turn influence the types and degrees of capabilities a person can generate from

available resources (Zheng & Walsham, 2008:226). Social conversion factors are factors that influence a large group of people in the society in which they live, such as policies formulated and made mandatory by leaders, (Robyens, 2011). According to Zheng and Walsham (2008:226) social conversion factors are characteristics of social settings, such as social norms (e.g. role of women, rules of behaviour, materialism, ideology, religion, etc.), social institutions (e.g. rule of law, political rights, public policies), and power structures (e.g. hierarchy, political power). Lastly, environmental conversion factors are classified according to the physical environment in which people interact with one another. To mention one aspect of a physical environment, specified by Robyens (2011), the stability and physical condition of buildings. Zheng and Walsham (2008:226) see environmental conversion factors as including environmental characteristics, climate, infrastructure, resources, and public goods. While all of these conversion factors might be interrelated, their sources might not be the same. This can be illustrated with the case of a Smart Board. Firstly, how much a Smart Board contributes to the effective teaching of a teacher depends on that person's skills (a personal conversion factor). Secondly, policies at the school may specify who, how and when a teacher is allowed to use the Smart board (a social conversion factor). Lastly, the availability of a suitable, appropriately equipped classroom (Smart Classroom) to install and connect the Smart Board and other resources is regarded as an environmental conversion factor. It should be noted that some sub-conversion factors are left out of the framework. Thus the focus is only on the identified factors.

Individual differences and choices play a significant role in determining whether and how people use available commodities (Alampay, 2003; Zheng & Walsham, 2008). By implication, even if ICTs are made available, people can exercise their choice to use or not to use, and how and for what purpose to use them. Personal choices influenced by decision-making mechanisms, such as personal preferences and social pressure, determine the actual achievements of functionings. However, it should be noted that these choices are also affected by personal, social, and environmental conversion factors (Zheng & Walsham, 2008:227).

Sen (1999) argued that the focus in a capability approach should not only be on the availability of material resources but on how these resources are used meaningfully

for individual benefit. Sen (1999) insisted that the purpose of the capability approach is to broaden individual capabilities by eliminating unfreedoms that might prohibit them from participating in socio-economic activities. Thus, this approach insists that individual capabilities can only be enhanced and developed if people are free to access and use available resources. In the context of teachers accessing and using ICTs effectively, the capability approach can be seen to encourage teachers to have freedoms to access and use ICTs in order to achieve functionings. The value of this framework for this study is its recognition that human capabilities vary depending on the environment. Thus, I consider a major contribution of this study to be its exploration of the range of possible teachers' capabilities needed for the participant teachers to effectively use and integrate ICTs in their teaching, and the various ways in which their education environment could be limiting and/or enabling this process. The flexibility of the scope of the study allowed me to identify the particular opportunities the participant teachers had, or did not have, to use the available ICTs to achieve functionings.

The relationship between conversion factors and capabilities is demonstrated in the findings of Zheng and Walsham (2008:231) in their study regarding ICT use by hospital staff in a chosen rural hospital in Eastern Cape, South Africa. Zheng and Walsham (2008:231) summarise an analysis of information literacy as a conversion factor depriving hospital employees from achieving the capabilities necessary to function effectively in hospitals in the Eastern Cape. The findings demonstrate the relational features of social exclusion and different types of capability deprivation, both in well-being and agency freedom. In this chapter, much of the literature which cites studies framed by the capability approach, features similar processes to that described and summarised in the study of hospitals in the Eastern Cape (Zheng & Walsham, 2008). This includes a small body of literature that explored the conversion factors that might enable or deprive teachers from achieving those capabilities deemed necessary for effective ICT integration in public primary schools. This literature revealed capability deprivation (unfreedoms) among teachers in terms of accessing and using ICTs in studies of various schools in various contexts.

2.7 Chapter summary

The literature in this chapter indicates that, despite the widely recognised value and relevance of ICTs in the classroom, particularly in the 21st century, there exist factors

at many schools, both globally and in South Africa, that cause unfreedoms for teachers to access and use available ICTs. It would appear from the literature that teachers' capabilities to use ICTs, including locally, in Smart Classrooms, are being both limited and threatened. The literature has also demonstrated that if teachers are provided with proper and continuous ICT training, they are more likely to integrate ICTs in their teaching, and in this way, teachers' ICT capabilities are developed. The issues related to access and use of ICTs in schools globally and in South Africa have been outlined. The literature describing and evaluating the capability approach was reviewed. Issues related to ICT access and use provide a direction and framework for this study's research design and methodology, described and discussed in the following chapter.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

Introduction

Chapter 1 offered a brief description of the research design, methods and methodology, together with the rationale for the choice of the research instruments. This chapter aims to provide a detailed understanding of the research design I employed to answer the research question as stated in the first chapter. I discuss and justify this design in detail, together with the methodology. I elaborate on the research paradigm, research approach and data collection methods I employed in order to gain an in-depth understanding of the phenomenon investigated. Trustworthiness and ethical considerations are also explained in detail and how these enhance the credibility and authenticity of the study. The primary aim of this chapter is to clearly and methodically explain the steps taken in the collection of the data to ensure that the research aims and objectives were met. The rest of this chapter is organised as follows:

- 3.1 research approach
- 3.2 research paradigm
- 3.3 research design
- 3.4 sampling of the school and participants
- 3.5 qualitative data collection methods (observation and interviews)
- 3.6 data analysis (observations and interviews)
- 3.7 trustworthiness/Triangulation/validity & reliability
- 3.8 ethical considerations
- 3.9 summary

3.1 Research approach

Creswell and Guetterman (2019:293) explain that a research approach can involve one of two different paths - a qualitative or a quantitative research approach. Sometimes a researcher uses a mixture of these two approaches. These two paths have distinguishing features in terms of the collection, analysis, and interpretation of the data (Creswell & Guetterman, 2019:293). Okeke and Van Wyk (2015) describe a research approach as a detailed plan the researcher follows in the process of

conducting a research study. The qualitative research approach is considered appropriate when the primary purpose of the research study is to explore, investigate, and learn more about a social phenomenon (Leavy, 2017). A quantitative research approach differs from a qualitative research approach in that it is based on testing a theory, and the data are described numerically rather than by using words, as is the case in qualitative research (Gilbert, 2008; Leavy, 2017; Bakkabulindi, 2015). While these two research approaches differ in many ways, a researcher's choice of approach would be motivated by his or her interest in studying a phenomenon, or a particular kind of phenomenon, and, through this research, discovering a solution, or solutions, to a research problem.

I followed a qualitative research approach in this study since the purpose of my research was to explore in depth the capabilities the teachers in my study needed for them to integrate ICT effectively in their teaching in two selected public primary schools in the Khayelitsha area in the Western Cape. The qualitative research approach would assist me in gaining an in-depth understanding of the experiences these teachers had when using ICTs. Grbich (2012) explains the importance of the link between a qualitative research approach and exploring how individuals understand and make sense of their experiences and – as is the case with the present study - their practices. Duck and McMahan (2016) add that a researcher using a qualitative research approach aims to study, and gain an understanding of, the behaviour of individuals in addition to describing their experiences. Such an approach is mainly concerned with how people think and feel, and the meanings they construct out of their actions. In their quest to understand such meanings, Okeke and Van Wyk (2015) argue that researchers who use qualitative research approach create for themselves opportunities to represent the authentic voices of their study participants. This was the case in this present study. In the course of my research I was able to gain an in-depth understanding of my participants' experiences of their use of Smart Classroom ICTs, and the meanings they made of these experiences, through engaging with their views and perceptions.

Cohen, Manion and Morrisson (2007:173) describe and explain the features of qualitative research:

- The researcher uses multiple methods for data collection;
- The research is framed within the assumptions and nature of qualitative research;
- The research follows one or more of different approaches in eliciting data from the participants in his/her study, including biography, ethnography, phenomenology, case study, or grounded theory;
- The research begins with a single focus on a problem rather than a hypothesis (as is the case with quantitative research);
- Criteria for verification are set up, and rigour is used in writing up the report;
- Credibility is required so that readers are able to imagine themselves in the situation of the participants; and
- The writing engages the reader while upholding credibility and truthfulness.

Some or all of these features are important to enhancing the effectiveness and value of qualitative research. This is particularly so in the case of research framed by the capability approach theoretical framework: the framework provides opportunities for the researcher to understand as fully as possible what the participants in his research desire, need, or mean (Okeke, 2015).

3.2 Research paradigm

Bakkabulindi (2015) identifies two main research paradigms, the positivist and the interpretivist paradigms. A paradigm can be defined as a set of beliefs researchers hold about events and human relationships (Blaikie & Priest, 2017; Willis, 2007). In subscribing to a positivistic paradigm, a researcher believes, or assumes, that most phenomena in the world are observable and measurable (Willis, 2007). The positivist paradigm is based on testing an existing theory, and the theory is associated with variables that are measured with numbers and analysed using statistical methods (Blaikie & Priest, 2017). Additionally, in adopting the positivist paradigm, researchers tend to use certain kinds of data collection methods and tools in their work, such as experiments, surveys, and field studies (Willis, 2007). A researcher subscribing to an interpretivist paradigm, on the other hand, tends to use different kinds of data collection methods. These include case studies, ethnographic studies, phenomenographic studies, and ethnomethodological studies (Bakkabulindi,

2015:25). Research paradigms are crucial in research studies since they inform choices about which research questions to address and which methodology is suitable for a research study.

This study was firmly rooted in the interpretivist paradigm as the research was more concerned with exploring and coming to understand the capabilities needed by teachers for them to integrate ICTs effectively in their teaching practices in the selected public primary schools. Moreover, I considered it important to take into consideration the views and feelings of the participants in achieving this understanding. Cohen et al. (2007) emphasise the interpretivist researcher's aim as being to understand individuals' interpretations of the world in which they live and perform their daily activities. Bakkabulindi (2015) endorses the view that interpretive research is about understanding what people think and feel, in addition to how they communicate. I aimed to explore and ascertain perspectives from the participants regarding their possible concerns about their access to, and use of, ICTs. The study, therefore, focused on achieving an in-depth understanding of these teachers' access to and use of ICTs to enhance their teaching. In this sense, my interpretivist research paradigm helped to ensure my immediate engagement with the case study model, whose purpose was to facilitate the study of the interactions of events and human relationships connected with the study participants in a particular situation.

3.3 Research design

According to Thomas (2011), designing research is like designing anything else; a researcher needs to have a purpose for conducting a research study, then drafts a plan detailing how he/she will go about achieving this purpose. Van Wyk and Taole (2015:165) define a research design as a basic plan for a research study that comprises four central ideas: the strategy, the conceptual framework, the question dealing with what the researcher intends studying/researching, and the tools and procedures for collecting and analysing the data. This thesis followed a case study research design. A case study is a focussed study of a specific person(s), experience, organisation, or (in an education context) school performance, or any other specific context (Donnelly & Arora, 2015; Yin, 2010). For example, if a researcher intends to understand individual aspects of behaviour in a particular social setting, a case study would be a suitable design to use (Tight, 2017).

According to Thomas (2011), a case study research design in combination with the style of the interpretivist paradigm makes for a good fit. Cohen et al. (2007) see the case study and interpretative paradigm as being made for each other; they supplement, and work naturally with, each other. Therefore, by employing both an interpretative paradigm and a case study research design, I considered I would be able to achieve greater insight in the process of answering my research question (Thomas, 2011). Tight (2017) adds several other advantages of using a case study as a research design in a qualitative research approach. These include the following:

- its flexibility allows experiences and situations to be studied in-depth;
- it provides the researcher with the space and flexibility to explore multiple viewpoints of participants;
- it enables the researcher to engage participants actively in the research process; and
- the findings obtained using this design can be put in place by the researcher and other stake holders to generate action as a means to create a solution to a problem.

Moreover, case studies represent a particular kind of research design by means of which a researcher is able to study one particular item (a person, group, an organisation, a city, a country, an event), usually through data collection methods such as direct observation of the case being studied, and interviews of the people involved in the case (Yin, 2010). Donnelly and Arora (2015) add to the list of advantages of a case study design that there is more than one way to conduct a case study because a researcher can use different data collection methods, such as unstructured interviews and direct observations. Given the purpose of this study, the case study research design was considered the most suitable for this study mainly in order to obtain a rich picture of the phenomenon. It thus aimed to study the phenomenon in its completeness, and to explore different angles of it in order to arrive at proposed solutions to the research problem.

3.4 Sampling of the school and participants

Sampling in research may be defined as a process of recruiting participants from a large population to collect data (Lumadi, 2015). These participants act as representatives of the population (Lumadi, 2015; Thomas, 2017). Cohen et al. (2007) and Thomas (2017) reason that sometimes it can be challenging to obtain information from the whole population due to constraints such as lack of finance, limited time, and difficulty of accessibility. Thus, to collect rich data it is necessary to use a smaller group of the total population. This group, or sample, represents the whole target group. When selecting a sample for a study, Cohen et al. (2007) emphasise that it is crucial to look at the total population first, and then work down to the sample.

A population can be a group of people, objects, or anything from which a sample can be recruited/selected for the purpose of making judgements about, and drawing conclusions from, a phenomenon (Lumadi, 2015:226). There are two main methods of sampling that researchers may employ: probability or random sampling, and nonprobability sampling, also known as purposive sampling (Lumadi, 2017; Thomas, 2017). With the former, every member of the population to be selected as part of the sample has an equal chance of being selected, whereas, with the latter, not all the members of the population have equal chances to be included in the sample (Lumadi, 2015).

This present research was conducted in two public primary schools purposefully selected from the Metro East Education District, in the Western Cape. In purposive sampling, researchers enjoy the advantage of handpicking the cases to be included in the sample (Thomas, 2017). The schools in this study are situated in the City of Cape Town municipal area. They are referred to as School A and School B to ensure confidentiality. Both schools are situated in the area of Khayelitsha, a historically disadvantaged township, and have both recently benefited from the Western Cape e-Learning Game Changer project with Smart Classrooms.

The South African government categorises Quintile one to three schools as being economically disadvantaged based on their being in the most impoverished geographical areas. Quintile four and five schools are in the economically advantaged category and are located in the more affluent urban and geographical areas

(Nudelman, Moodley & Berman, 2018; Ogbonnaya & Awuah, 2019). Quintile one to three schools are non-fee-paying schools and receive more funds from the government compared to quintile four and five, which are fee-paying schools, and which receive little or no funds from the government apart from the payment of the salaries of the teachers at these schools, the number of teachers being based on a standard teacher-learner/class size ratio (Ogbonnaya & Awuah, 2019). Both schools in this present study are categorised as quintile three schools. Both schools were selected on the basis of having relatively good infrastructure and resources compared to other historically disadvantaged schools in the area of Khayelitsha.

The two schools have benefited from the WCG's e-Learning Game Changer project in the form of Smart Classrooms. The sample chosen relates to a specific purpose: the two schools have advanced Smart Classroom ICTs in terms of quality and quantity, making it easier to answer the research question. Therefore, given the research question, and the nature of the chosen research approach and design, I deemed it necessary and appropriate to apply non- probability and purposive sampling in the selection of schools with the specific purpose of accessing appropriate and knowledgeable people in terms of ICT access and use. However, it must be noted that this sample did not attempt or claim to represent the entire research population. It was less complicated, less expensive, and less time consuming to use this type of sampling. At the same time, it proved to be perfectly adequate as I had no intention to generalise the findings to general population, however, the findings may be generalised to theoretical position.

The purposive sampling method adopted for this study, according to Creswell (2019), is one where researchers select participants deliberately to learn more about the central phenomenon. The purposive sampling method was used to specifically select those teachers at the selected schools who had access to Smart Classroom ICTs, given that not all classrooms were equipped with Smart Classroom ICTs in the Western Cape province at the time. Thus, this sampling method was in line with Thomas’s (2017) endorsement of purposive sampling as being adequate when used with the intention of accessing those in the research population who have some knowledge about the problem being researched.

Out of a total population of seventy (*n*=70) teachers, the sampling consisted of ten (*n*=10) participants. To ensure their anonymity, the participants are referred to in this study as Teachers A, B, C, D, E, F, G, and H, and Principals A and B. All ten (*n*=10) participants were invited to participate in the interviews and were informed of the scheduled interviews. All participants (excluding principals) were also informed of the intended lesson observations. Four teachers (*n*=4) were selected from each school on a voluntary basis. Two Foundation (*n*=2) and two Intermediate Phase (*n*=2) teachers per school were selected, i.e. four participants (teachers) (*n*=4) per phase (Foundation and Intermediate phases), making a total of eight teacher participants (*n*=8). Since teachers are directly affected by the lack of access to ICTs, I deemed it necessary to involve more teachers in the study in proportion to the number of principals. The participants were divided into two age groups, those between the ages of 26 and 40 representing younger participants, and those between 50 and 58 representing older participants (see Table 3.1). The motive for participants' categorisation according to age came from the literature review, which indicated a reluctance on the part of older teachers to use ICTs for teaching. Therefore, on this basis, it was essential for me to categorise participants according to their age to confirm or dispute the literature. Ritvanen, Louhevaara, Helin, Vaisanen and Hanninen (2006), in their study examining the response of the autonomic nervous system in younger and older female teachers in Finland considered female teachers ranging from the ages of 50 and 57 to be old.

Table 3.1 teachers' profile.

School	Teachers	Age	Gender	Grade	Subjects
A	A	40	Female	3	Foundation phase subjects
	B	31	Male	6	Mathematics
	C	32	Male	6	Mathematics
	D	56	Female	2	Foundation phase subjects
B	E	51	Female	2	Foundation phase subjects
	F	38	Male	6	English (FAL)
	G	26	Female	5	Mathematics
	H	56	Female	3	Foundation phase subjects
Principal	A	50	Male	-	-
	B	58	Female	-	-

Table 3.1 shows that teachers in the Foundation Phase were teaching all four subjects as part of the Foundation Phase curriculum: Home Language (IsiXhosa), First Additional Language (English), Mathematics, and Life Skills.

When interviewing the principals (see Appendix C), I was mindful that, while principals were/are not directly affected by the limited use of ICTs the role of the principal is essential in driving ICT integration in schools. Principals play leadership and

supportive roles in ensuring that teachers have access to, and are using, available ICTs, particularly in the enrichment of teaching and learning. I considered my choice of the selected number of participants to be satisfactory for the purposes of investigating the research phenomenon and addressing the research question. Moreover, the choice of the number of participants was determined by factors such as budget and time constraints. I considered careful budgeting essential, since I was mindful that a larger sample would require more resources, in turn entailing more expenses which I could not afford at the time of the data collection process. Time was of the essence since I found I had to spend extensive time initially convincing the school principals to allow me to conduct research in their schools and on their teachers. Moreover, I had to conduct meetings before collecting data with the possible participants to explain the purpose of the research study and to elicit their willingness to participate. Therefore, due to budget and time constraints, I considered the selected sample to be a convenient one for this study – i.e. a convenience sample.

All eight (*n*=8) teachers were teaching subjects that included IsiXhosa Home Language, English First Additional Language (FAL), and Mathematics, subjects which are recognised as the focus of the WCG's e-Learning Game Changer project. While Guthrie (2010) is of the view that the bigger the sample, the better the results, as this also provides trustworthiness. In this study, I took into consideration the advantages of a small-scale study in terms of saving time and money, since, as has been mentioned, using a large-scale study can be both costly and time consuming (Cohen et al., 2007).

Even though school learners are the most affected by the lack of a teachers' access and use of ICTs, they did not form part of the sample for this study. The study sought to answer the research question through the engagement of primary sources, which in this case were educators (teachers and principals). However, I was mindful that their teachers' resistance to the integration of ICTs in their teaching significantly affects learners. Therefore, incidental (or 'secondary') information regarding ICT learning and learners' experiences was obtained in the course of the interviews with teachers about their perceptions, experiences, knowledge, and understanding of their learners' behaviours and attitudes towards learning with Smart Classroom ICTs. Given that teachers work hand in hand with their learners, I viewed teachers as a valuable source

of information concerning the attitudes of their learners towards ICTs and learning to use ICTs.

3.5 Qualitative data collection method and instruments

The data collection method is the process researchers embark upon when deciding on the most suitable instruments to collect data and proceed to design these instruments (Cohen et al., 2007). In qualitative research the researcher gathers data by observing and interviewing research participants using instruments such as observation protocol, and scheduled interviews or focus groups (Guthrie, 2010). Cresswell and Guetterman (2019:204) argue that qualitative data collection involves more than simply defining whether a researcher plans to observe or interview participants. According to Cresswell and Guetterman (2019:205), there are five steps which one needs to consider and follow when embarking on qualitative data collection. These steps include:

- first, the researcher identifies their participants and research site(s) using probability (purposive sampling);
- second, the researcher needs to gain access to the site and to the participants by obtaining permissions from the gatekeepers;
- third, once permission has been secured, the researcher needs to determine what type(s) of data will best answer the research question;
- fourth, the researcher needs to design the appropriate instruments to collect and record the data; and
- lastly, the researcher collects data while at all times during the research process adhering to the agreed upon ethical considerations.

These steps clearly indicate that qualitative data collection methods encourage researchers to be both careful, and, in particular, interpretive. A qualitative data collection method emphasises the value of naturalistic observation and interviewing of research participants. Thus, the data collection instruments I adopted in this study included non-participant observations and in-depth semi-structured one-on-one interviews. It should be noted that, during the conducting of the study, I was permanently employed at one of the primary schools chosen for sampling. I was mindful that this could create a bias in the findings since I was already aware of the

ICT situation at the school. Therefore, I put in place certain measures in an attempt to eliminate this bias when collecting the data. Firstly, a neutral person, a teacher from neither of the two sampled schools was present during all interviews and observations. Then, after each lesson observation or interview, I and the neutral person compared and discussed what we had observed concerning participants' responses in the interviews. Lastly, I applied the Transcendental Phenomenological Approach (TPA) through "reflective-meditation". TPA involves the constant repetition of attaining a level of awareness where the researcher temporally deletes all her/his past knowledge to avoid this influencing or affecting how he/she collects and analyses the data (Adu, 2019:16). The data collection methods are discussed in detail below.

3. 5. 1 Field observation

According to Bryman (2008), in a non-participant observation, the researcher witnesses a social activity but does not participate in it. Creswell and Guetterman (2019:213) describe the various different kinds of observation methods, which include participant observation, non-participant observation, and either spending more time as a participant than as an observer, or spending more time as an observer than a participant. A non-participant observer is a researcher who visits a site and observes the actions of the participants without being involved in their activities (Thomas, 2017). In general, observations of whatever kind are useful for case studies as the researcher can focus directly on what is happening rather than – at one remove - hearing what people say they do (Cohen et al., 2007).

Before conducting non-participant observations, I designed an observation protocol (see Appendix A) which I used to record the data during an observation. According to Waller, Farquharson and Dempsey (2015), an observation protocol is a document planned and designed by the researcher to take notes during an observation. The use of an observation protocol ensured that the field notes I took were properly and usefully organised. During the observation process I was seated at the back of the classroom to avoid disturbing the flow of the lesson, while at the same time documenting both descriptive and reflective field notes.

After one hour for each of the eight lessons, the observation phase of the research/data collection ended. Eight (*n=8*) teachers were observed during these

lessons to determine whether and how they were using ICTs in their Smart Classrooms. It must be noted that the principals were not observed in this way as they did not teach any classes. After documenting the notes on the actual observations in real time, we (myself and the neutral person) reflected on the teachers' reported use of ICTs which they revealed during their classroom teaching. Through these lesson observations, I gained first-hand experiences of the research participants in their natural professional setting. I was able to observe that some of these teachers appeared to understand how to operate and use ICTs in their Smart Classrooms.

In the current study, I documented only what I observed in the classroom. I observed one lesson per teacher; in other words, eight lessons were observed in total. Chitiyo, Taukeni and Chitiyo (2015) posit that observation is a data collection method used by qualitative researchers, particularly in ethnographic studies. However, as a unique data collection instrument, observation has both advantages and disadvantages (Creswell & Guetterman 2019). One of the many advantages of observation is that it focuses on activities and events as they happen in their natural setting (Cohen et al., 2007; Guthrie, 2010). Classroom observations were useful in this study as they afforded me the opportunity to see at first-hand what each teacher participant was doing in real time, rather than hearing a report from him/her on what he/she usually does when using ICTs in his/her teaching. However, one of the disadvantages of classroom observation is the difficulty of building relationships with the participants (Creswell & Guetterman 2019). This could be due to the fact that an observer uses most of the observation time observing, unlike interviews, where a researcher spends most of the time talking, listening, and engaging directly with the interviewee (Waller, 2015). For this present study, the observation data collection method was chosen as one of the two qualitative data collection methods since investigating the phenomenon in a natural setting increases the reliability and credibility of the findings, which in turn helps to ensure the trustworthiness of the findings (Chitiyo, Taukeni & Chitiyo 2015).

3.5.2 Interviews

The second data collection method and instrument used in this study was the series of semi-structured one-on-one interviews. These were used to interview eight (*n=8*) teachers and two (*n=2*) principals on a one-on-one basis. I chose the semi-structured interviews as a data collection tool because they allowed me to be more flexible since

interviewers are free to change the sequence of the questions and include additional questions, depending on the responses given by the interviewees (Gilbert, 2008). This meant that participants/interviewees could answer the interview questions freely in any way they deemed suitable. All the participants were asked the same set of questions in English, and follow-up questions were added during the interview process to obtain more clarity where necessary.

In-depth semi-structured interviews with all ten (*n*=10) participants were conducted primarily to investigate their experiences and perceptions concerning their use of ICTs in their Smart Classrooms. Semi-structured interviews permit the engagement of participants with the interviewer, as they allow the interviewer to ask participants to clarify their answers, and include participants asking the interviewer to clarify the questions (Galletta, 2013:24). Brown (2001:76) adds that, when using semi-structured interviews, the interviewer typically has control over the order in which the questions are to be answered. This method was used in the study to gain a complete presentation of each participants' experiences in order to understand and be able to describe and analyse their collective views and experiences.

The interviews with the sampled teachers were conducted in their classrooms after school hours and lasted about 30 minutes per interview. I opted to do the interviews after school hours when there were no learners on the school premises. This was also to avoid interrupting the teaching and learning process during school hours. The interviews with the two (*n=2*) principals were conducted in their offices after school hours to avoid interrupting their work responsibilities during school hours. The interviews with the two (*n*=2) principals lasted about 20 minutes each. All interview questions were guided by the capability approach theoretical framework underpinning this study.

I used an audio recorder to ensure that interviews were captured accurately, and an interview protocol to record notes (Appendix B). The reason for using audio recorders was because I wanted to gain a detailed and accurate record of each interview. An interview protocol is an instrument that contains the list of questions in the order they are to be asked and can also be used to record notes (Galletta, 2013). Before conducting the interviews, I was aware of the possibility that not all participants would feel comfortable to be voice recorded for fear of being victimised (Creswell &

Guetterman, 2019). I was prepared to acknowledge this concern, and thus I prepared interview protocols to take notes as an alternative if any of the participants were to object to being audio recorded. Fortunately, this was not the case, as all participants agreed to be audio recorded during interviews.

In this study I was able to link the teachers' actions and behaviour or attitudes towards the use of ICTs, as observed in their classrooms, with their verbal descriptions during the interviews of their views and feelings regarding ICT use, and to link these observations with the interviews as data collection instruments. As already mentioned, in conducting the interviews, a set of focused questions (see Appendix B) guided the interview process. I chose this particular strategy because it both facilitated and elicited in-depth description from the participating teachers of their personal experiences of their use of ICTs for their teaching in the Smart Classrooms.

3.6 Data analysis (observations and interviews)

Any analysis of qualitative data requires the researcher to know how to make sense of the data collected so that he or she can generate meaningful answers to their research questions (Miles, Huberman & Saldana, 2019; Willis, 2007). Data analysis involves systematically arranging the data, exploring and coding the data, developing themes from this process, describing the findings, reporting the findings, interpreting the meaning(s) of the findings, and confirming the accuracy of the findings (Miles et al., 2019). In addition, Feza (2015) argues that a data analysis should be designed with the purpose of ensuring that the results of the analysis are reliable.

In order to comply with the above criteria for an accurate and reliable data analysis, I followed a systematic and careful data collection procedure. I first organised, then transcribed both interviews and observational notes. Creswell and Guetterman (2019:238) explain that organising the data is essential in research as the data collected during a study such as the present one are likely to be substantial. For this study, all the copies of audio recorded interviews were stored in password-protected electronic files. Observational notes were organised separately in a locked file drawer, and duplicate copies of all forms of data were stored separately. Audio recordings of interviews and observational notes were then transcribed.

Data transcription is a process that involves converting audio recordings or field notes into written/typed data (Creswell & Guetterman, 2019). This process involved transcribing in full the actual words uttered by the participants during the interviews. After the transcription process, the transcripts went through the extensive data analysis process. Data analysis involves "data coding" (Miles at al., 2019). Coding entails labelling segments of data and categorising and summarising these (Thornberg & Charmaz, 2013). Data can be analysed manually or through a MS Word computer processing programme. The manual analysis of qualitative data simply means that researchers ‘read’ the data, at the same time marking important aspects by hand and dividing the transcribed data into themes (Creswell & Guetterman, 2019:240). The data collected for the current study were analysed using manual qualitative data analysis.

I used manual qualitative data analysis in preference to computer-assisted qualitative data analysis software (CAQDAS), such as ATLAS.ti for two reasons. Firstly, learning to use CAQDAS in a short time can be overwhelming and stressful for some researchers (Saldana, 2015). This would have required me to focus my mental energy on the software at the expense of a thorough and quality analysis of the data. Secondly, as Basit (2003) emphasised, using CAQDAS may be suitable for those researchers who wish to quantify their data. As already noted, since this case study is centred on qualitative research design, I considered a quantitative analysis approach to be unsuitable. Moreover, as recommended by Saldana (2015), inexperienced researchers, and researchers conducting small scale studies, need to first to do the coding of data on printout copies, not on CAQDAS. Saldana (2015) further argues that using manual data analysis makes it significantly easier to manipulate the data and gives a researcher more of a sense of ownership of the work. In the current study I used the manual qualitative data analysis, specifically making use of both Transcendental Phenomenological Analysis (TPA) and Interpretative Phenomenological Analysis (IPA). PTA enabled me to engage in a self-reflection process, setting aside my past knowledge and preconceived ideas about ICT use in public primary schools, with the purpose of eliminating chances of tainted information as far as possible. Therefore, I appraised the data from new and fresh perspectives by deliberately blocking all previous experience and knowledge of ICT use in teaching. IPA helped me to interpret the participants' views about their experiences of using

Smart Classrooms (Adu, 2019). I paid particular attention to participants' views about what they had experienced, and how they felt concerning the use of Smart Classrooms. Thus, I followed the general IPA systematic process for using qualitative data analysis as outlined by Adu (2019:15):

- Read the interview transcripts very carefully, one by one, and sentence by sentence and then make notes about first impressions;
- Label the relevant and/or important information or views using a highlighter pen. This could be in the form of words, sentences or paragraphs;
- Write down your interpretations about the labelled relevant information by addressing questions such as, what does this information mean (what can be concluded based on the information)? What is the participant implying, or trying to imply? At this stage codes are created by categorising relevant information – information relevant to the research question;
- Develop themes based on your interpretations. This means themes emerge from the data and are created by combining codes according to the characteristics of these themes. Some codes would be eliminated; and
- Determine the relationship between the created themes by comparing and contrasting them.

As already mentioned, I manually analysed data using MS Word, rather than by hand. I did not make any printouts; instead I worked on the soft copies of the transcripts on a MS Word format. The transcripts were formulated into a table with two columns, one for each school. Then the relevant passages of the text of the transcribed interview were highlighted using 'text highlight colour', and comments were inserted to label (code) passages and sentences. The study relied on the theoretical proposition of Sen's capability approach to analyse data (Sen, 1981; 1985; 1987; 1995; 1999; 2000). The capability approach (Sen, 1981; 1985; 1987; 1995; 1999; 2000) enabled me to begin to determine the factors that were empowering the teachers in the study to achieve their capabilities, and those factors that were depriving them of doing so. The data obtained from the participants were then used to establish the capabilities that these teachers needed to develop for integrating ICTs effectively in their teaching.

3.7 Trustworthiness

The trustworthiness of a study is the guarantee of the reliability of the findings obtained in the research (Marshall & Rossman, 2010). Triangulation, validity, and reliability were applied in this study to show the trustworthiness of the research findings.

3.7.1 Triangulation

Triangulation is commonly used as a process of combining evidence from different participants and data collection instruments to validate findings and conclusions in a research study (Creswell, 2014). In other words, triangulation is the use of two or more methods of collecting data to enhance validity. Triangulation allows the researcher to obtain data from different sources, from different people at different times, and in different places (Flick, 2008). Researchers use a combination of multiple data collection instruments in a case study as a strategy to add consistency to their research study (Lin, 2010). According to Lin (2015:174), triangulation consists of four types:

- Triangulation of methods: the use of several different data collection methods to collect data and answer research questions;
- Triangulation of data sources: double-checking the consistency of the collected data – collected from two or more sources;
- Triangulation of investigators; integrating numerous interpretations of the phenomenon provided by different researchers; and
- Triangulation of theories: using multiple theoretical perspectives to study the same phenomenon.

To ensure the trustworthiness in this study, I applied two types of triangulation: triangulation method and triangulation data source. In line with triangulation of method, triangulation was applied by employing two data collection methods: lesson observations and one-on-one semi-structured interviews. In terms of triangulation of data sources, member checking was used so that participants were able to check whether the transcripts accurately reflected what they had said during their respective interviews. According to Creswell (2014), member checking entails providing participants with the final research report to give them the opportunity to confirm the

accuracy of the findings from their interviews. The combination of multiple triangulations was used to achieve high-level truthfulness as far as possible.

3.7.2 Validity

The validity of this research relied on the research instruments mentioned above, which were then used to determine the capabilities needed by the participating teachers for effective ICT integration in their teaching. I guaranteed the validation of the observation protocol and interview questions before endorsing their use in the study through pilot testing. Pilot testing is another critical aspect of determining the trustworthiness of a study. Gumbo (2015:372) describes a pilot study as a trial run of the main study/data collection process. Prior to conducting the main study, I conducted a pilot study with two teachers at School B. The rationale for choosing only two teachers for the pilot was based on the understanding that it would be unnecessary to use more than two participants since the target population was small. This approach was used to ensure the feasibility and validity of both data collection instruments in this study.

A researcher may conduct a pilot study for several reasons connected to the feasibility and validity of the main study. Firstly, there may be a need to change certain aspects of the observation and interview instruments based on the feedback received from the participants in the pilot study (Blessing & Chakrabarti, 2009). Secondly, it serves to avoid disappointments and time-wasting, since there is a high possibility that research participants in the main study may find it challenging to understand the questions asked in an interview (Gumbo, 2015), and thus I was able to provide greater clarity to some of the questions. It should be noted that the implementation of the pilot study assisted me in minimising the data collection problems. It must be further noted that the findings of the pilot study were not included in the main study. Gumbo (2015) explains the reasons for not including the findings of the pilot study in the main study's findings: such findings could possibly taint the findings of the main study. The focus of the pilot study was to acquire feedback from the two participants about how they experienced the research instruments used, which included the lesson observation and interview questions. Such feedback was useful since it assisted me in adjusting and improving the research instruments for the main study (Blessing & Chakrabarti, 2009). For instance, two questions were eliminated from the interview protocol after

the pilot study as it appeared that they were irrelevant to the aims of the study. It must be noted that the pilot participants were not included in the main study since they had already been exposed to the data collection instruments.

3.7.3 Reliability

Reliability can be described as the aptitude of a researcher and his or her study to reproduce the same results using the same methods, in other words, to provide results that other researchers could repeat (Guthrie, 2010). Lin (2010:172) adds that reliability involves the evaluation of data collection methods which should be consistent, and not misrepresent the research findings. To achieve reliability in this study, I observed eight (*n=8*) lessons taught by eight (*n=8*) teachers in the two selected (n=2) public primary schools. I spent periods of time observing all eight (*n=8*) teachers' lessons in order to obtain comprehensive, in-depth data that sufficiently addressed the research questions. I used an observation protocol (see Appendix A) to record notes for all lessons. The use of the observation protocol was to guarantee as far as possible that the field notes taken would be appropriately structured.

3.8 Ethical considerations

Ethics are defined as principles of conduct about what is right or wrong (Duku, 2015; Thomas, 2011). Since conducting research involves human participants, when researchers are conducting a research study, their actions should be guided by principles such as honesty, truthfulness, and reliability (Sotuku & Duku, 2015). Thomas (2011) further argues that it is particularly important for researchers to abide by, and reflect, these principles in case study research since researchers may be directly involved with the research participants. Thus the primary ethical consideration for researchers conducting qualitative research is respecting the privacy of the individuals with whom they are working. In this study, the most relevant ethical considerations are identified below.

3.8.1 Ethical clearance

Before I went to the school premises, I applied for and received ethical clearance from the Ethics Committee of the Faculty of Education at the Cape Peninsula University of Technology (CPUT) (see Appendix G) and from the Western Cape Education

Department (WCED). Permission from WCED (see Appendix F) to conduct research at the two public primary schools was obtained. Cohen et al. (2007) emphasise that the first step a researcher needs to take before embarking on collecting their data in a targeted site is obtaining official permission to undertake the research study. This I did and obtained both official permission and information from the afore-mentioned parties.

3.8.2 Informed consent

Before researchers collect data, they need to have discussions with the identified research participants about the projected research, and to obtain their assurance that they are willing to participate in the study. Sotuku and Duku (2015) reiterate that when a researcher first meets the identified research participants to discuss the details of the research study, he/she is said to be in quest of informed consent. In other words, consent is more about assuring that research participants understand, and agree to take part in, the research study. According to Thomas (2011), informed consent should include an explanation of the nature and purpose of the study, the expected benefits of the study, the harm that may possibly be caused by the study, and an assurance of the participants' confidentiality and anonymity. Lastly, participants should be informed of their right to take part or not in the study (Sotuku & Duku, 2015).

I acquired the necessary permission in writing from the principals of the selected public primary schools. I then proceeded to brief the sampled teachers about the details of the study and to invite questions. I gave them enough time to study and sign a participation consent form (see Appendix D) which explained in detail the nature and purpose of this present study. Their signing of the consent forms was taken as an indication that the participants fully understood the research project and their involvement in it. The participants' right to privacy was safeguarded, and participants were given fictitious names to maintain their anonymity. Participants were also assured of their right to withdraw from the study at any time without being harmed. The objectives and procedures of the study were explained thoroughly to participants before any observations or interviews took place.

3.9 Chapter summary

This chapter has mapped the research design and methodology adopted in this study. The qualitative research approach and motivation for using a case study research design were elucidated. An in-depth description and explanation of the sampling methods, data collection methods, and instruments used in this study were included. I also discussed the various measures needed to ensure the trustworthiness of this research study. Lastly, the ethical issues associated with this kind of research study were also highlighted. In the next chapter, the collected data are discussed and analysed.

CHAPTER 4: RESEARCH FINDINGS

Introduction

In this chapter the research findings from the collected data are presented. As described in the previous chapter, the data were collected using classroom observations of, and semi-structured interviews with, the selected teachers, and interviews with the principals at the two public primary schools. The findings, and their interpretation/analysis, are informed by the capability approach as the theoretical framework of the study. The aim of the study is to investigate those capabilities necessary for the participating teachers to have for integrating ICTs effectively in their teaching and learning. Thus, based on interpretations of the findings, the chapter presents a response to the main research question: what are the specific capabilities needed for effective ICT integration in teaching in two public primary schools in the Khayelitsha area? Included in the chapter is a response to the following subsidiary questions:

- What are the conversion factors enabling or depriving the teachers participating in this study from achieving the capabilities necessary for effective ICT integration in their teaching in the selected public primary schools?
- What functionings were realised by teachers participating in this study due to the enhancement of conversion factors?

The capability approach was used to inform the answers to both of the subsidiary questions, specifically by identifying, from the findings, the conversion factors that could be either promoting or preventing teachers from converting capabilities into functionings (achievements) in their Smart Classrooms.

4.2 Research sub-question 1

What are the conversion factors enabling or depriving the teachers participating in this study from achieving the capabilities necessary for effective ICT integration in their teaching in the selected public primary schools?

In the response to the first sub-question, the identified conversion factors are discussed in order to understand the extent to which these factors were enabling or depriving the participant teachers from achieving their capabilities concerning ICT integration. As highlighted by Chigona and Chigona (2010), and by Zheng and Walsham (2008), as cited in chapter 2, section 2.6, the capability of a person to use commodities, which in the context of this study are ICTs, is influenced by three types of conversion factors, namely personal, social, and environmental conversion factors. The extent to which people can achieve functionings (achievements) from the available resources is further influenced by these three important conversion factors, as seen in table 4.1 below. Therefore, the conversion factors linked to teachers' capabilities were used as themes to analyse the findings in this section.

It must be noted that table 4.1 below only represents the data collected from the interviews with the research participants. The symbol 'X' in the table indicates that these participants mentioned or implied in their interview responses that a particular conversion factor affected either their daily use (the participants), or the daily use of ICTs in the Smart Classrooms by other teachers at their schools. The table does not include the data collected in the form of lesson observations since it would not be possible to observe some or all of the conversion factors internal to a person. However, to help explain these conversion factors and the affected capabilities in detail, the lesson observation data were used to supplement the one-on-one interview data (see sections 4.2.1, 4.2.2, and 4.2.3) below.

Table 4.1 Conversion factors influencing teachers' capabilities

		Conversion factors							
		Personal				Social		Environmental	
			Level of teachers' ICT literacy						
Schools	**Teachers**	Age	University training ICT skills	Community of practice ICT skills	Lack of technical skills	Provincial public policy	School policy	Infrastructure	Resources
A	**A**	X		X	X	X			
	B	X	X	X	X	X		X	
	C			X		X			
	D		X		X	X			
B	**E**			X		X	X		X
	F		X		X	X	X		X
	G	X	X	X	X		X	X	X
	H			X	X	X	X	X	X
Principal	**A**	X		X		X		X	
	B								X

4.2.1 Personal conversion factors and subsequent capabilities

As described by Robyens (2011), cited earlier in chapter 2, section 2.6, personal conversion factors are internal to the person. They may have a strong impact on a person's capabilities to use or not use available resources. These conversion factors include personal characteristics, such as a person's mental and physical condition, level of ICT literacy, and gender, as explained by Zheng and Walsham (2008), cited in chapter 2, section 2.6. From the data analysis, age was identified as an additional personal conversion factor since it is an internal characteristic of a person. Therefore, from the transcribed semi-structured interviews, I identify two important personal conversion factors - the age of the teachers, and their level of ICT literacy - as leading to their insufficient use of, or lack of willingness to use, ICTs on the part of both participant teachers and other teachers at their respective schools (see table 4.1). However, in terms of ICT literacy, some skills obtained through a community of practice and through university training appeared to be the only conversion factors that enabled teachers' capabilities to use ICTs.

4.2.1.1 Age of the teachers

In the interviews age seemed to have played a significant factor in the participants' responses concerning ICT use in the Smart Classroom. This factor was highlighted in chapter 2, section 2.3.1, by Umugiraneza et al. (2018), and Dube et al. (2018). However, as recorded in chapter 2, section 2.3.1, Dube et al. (2018), Mathipa and Mukhari (2014), and Umugiraneza et al. (2018) do not specify in their studies which specific age in number of years they considered to be old. On the other hand, as cited in chapter 2, section 2.3.1, Ritvanen et al. (2006) considered people between the ages of 50 - 57 to be old. In this study, participants did not specify what age they themselves considered old in their interview responses. For instance, Teachers A and B at School A, and Teacher G at School B, reported that some of their colleagues are reluctant to use ICTs due to their advanced (unspecified) age (see table 4.1). Three ($n=3$) of the eight (n-8) teachers corroborated this finding in the interviews:

Teacher A at school A:

> "… [T]hen the older teachers in the school, the less they use it and they have that belief that children need to write manually using pen/pencil and paper".

Teacher B at school A:

> "Teachers who have been teaching for quite many years do not see value on ICTs; thus they need training, not two weeks' training, not one-week training, not one-day training, but a training longer that two weeks. Older teachers are not comfortable in using ICTs. I think once they get the necessary training that might change".

Teacher G at school B:

> "Honestly, they're old and because they're old um... Okay not because they're old, let me not say because they're old, okay because maybe they're old. Because back in the days they didn't really use computers. And as the years went they got workshops, and you do get some of the old people who are not good, but they are able to do on their own, but I think that's why, and I think also not 'narrow minded' sounds rude, but they're not willing to learn, they're telling themselves, 'I won't be able to do this".

This view was echoed by Principal A at School A when responding to the question in the interview: "*Do you think your teachers are comfortable teaching with technology?"*

> "[…laughs] they are not comfortable. Some of them are, but only a few of them. But I know that the majority is not comfortable in using ICTs. Especially the older teachers. They are scared of technology, and they are used to that old method [chalk and blackboard]".

Consistent with the above sentiments, in the lesson observation of Teacher E and Teacher H at School B, who were over the age of 50 (Table 3.1 in chapter 3), demonstrated a lack of ICT skills as they were not able to set up and operate ICTs in their own Smart Classrooms. A teacher who appeared to be younger, and who was teaching grade 4 learners, was called to assist the two teachers (E and H), respectively. This finding is in line with that of Umugiraneza et al. (2018), as discussed in chapter 2, section 2.3.1. These researchers investigated the reason the older

teachers in their study were typically reluctant to use ICTs compared to younger teachers who had recently graduated from tertiary institutions. Some of the older teachers in the study had never had the opportunity to be trained in the use of ICTs during their studies. For this reason, as found in the study done by Umugiraneza et al. (2018), and in the present study, age can be considered to have a significant influence on teachers' decisions on whether to integrate ICTs in their classrooms or not.

This reluctance might be the result of older teachers feeling intimidated by new technology and only being comfortable with traditional teaching methods, such as the chalk-and-talk style method, as indicated in the interview of Principal A at School A. According to the research participants, these teachers clearly do not see ICTs as essential and necessary tools to enhance teaching and learning. As discussed in more detail in Chapter 2, section 2.3.1, Bas (2017) and Mukhari (2016) reiterate that, while some teachers may accept that ICTs are essential tools in the enhancement of teaching and learning, and in promoting blended learning, they may also have negative attitudes towards them, which may cause them to resist change. It can be debated that age was one of the factors perceived by the participant teachers to have contributed to the generally limited use of Smart Classroom ICTs by certain teachers. These responses would seem to indicate that, for these teachers to adopt ICTs in their teaching, it would be necessary to change their mind-set, which in this case represents an internal unfreedom.

4.2.1.2 ICT literacy

The teachers interviewed indicated a lack of ICT literacy among themselves and teachers in general to be an important contributing factor to their limited use of ICTs. In response to the interview question: "*How did you obtain your ICT skills?*" four (*n=4*) of the eight (*n=8*) participant teachers (Teachers B and D at School A, and Teachers F and G at School B) explained that they relied on the basic ICT skills that they acquired at tertiary institutions while they were studying towards their Bachelor of Education (BEd) degree:

Teacher B at School A:

> "Um… I think I first got ICT skills at varsity; that's where I was exposed to ICTs then I got the skills. While you are there you are taught how to operate

> computers. I did ICT skills as one of the modules in varsity… and the fact that we were almost using computers every day in varsity helped me to have some of the computer skills".

Teacher D at School A:

> "I can say that I got a formal training when I got a scholarship to study ICT integration at the university, and at the time the department just started to introduce ICT in schools... I also did a computer module on my fourth year while completing my teacher's degree".

Teacher F at School B:

> "While I was in university, we did computer literacy. So that is the skill, I received from university, and it is also the one that I'm still depending on up to so far".

Teacher B's comment would seem to confirm that if teachers do not practice using ICTs in their Smart Classrooms on a regular basis, they are very likely to struggle when initially attempting to use them. During the observation of Teacher G at School B, who had not taken part in the Smart Classroom ICT training, I noted that she was also the only teacher at School B who appeared to have better ICT skills than the other teachers at this school. During the interview, Teacher G explained that she relied on her basic ICT skills that she had acquired at the university while studying towards her BEd degree:

> "I recently graduated from my studies. At varsity it's important that you learn to use computers because everything is almost done on computers. From typing your assignment to searching information online. I am confident to say that I do have those basic and necessary skills".

The data seem to align with the findings of Umugiraneza et al. (2018), as reported in chapter 2, section 2.3.6. They found in their study that newly qualified teachers who had recently graduated from universities showed more enthusiasm when it came to using ICTs in the classroom than their older colleagues. Both the literature and the responses of the teachers participating in the current study suggest that younger teachers, particularly fairly recent tertiary institution graduates, tend to be more familiar

with new ICTs due to their having been trained to use similar resources. From these findings it can be concluded that training on the setting up of ICTs is the first essential step towards equipping teachers with ICTS skills, and empowering them, to integrate ICTs in their pedagogy. As implied by Bingimlas (2009), De Silva (2015), and Umugiraneza et al. (2018) (chapter 2, section 2.2.6), if teachers are able to operate ICTs, they are more likely to learn to use these as part of their pedagogy.

Since the participating teachers believed that the training provided by the WCED in the use of Smart Classrooms was inadequate, as seen later in this chapter, section 4.2.2.1 below, these participant teachers were of the view that teachers at many schools had to seek other means of improving their ICT skills. For instance, regarding a question in the interview, "*How do you get support from your school in terms of your skills' development?"*, six (*n=6*) of the eight (*n=8*) participant teachers (Teachers A, B and C at School A and Teachers G, H, and E at School B) highly valued the support they received from their colleagues regarding the use of ICTs for teaching in the Smart Classrooms.

During the interviews these six (*n=6*) participant teachers reported that they sometimes got assistance from other teachers either in their schools or teachers from other schools in learning how ICTs work (see table 4.1). The teachers reported this kind of support to have improved their capability to use ICTs in the Smart Classrooms. This finding clearly indicates a community of practice to be operating amongst teachers at various schools mainly in the area in which the two selected schools are situated in terms of using ICTs to develop and improve teachers' capabilities in schools, as captured in the teachers' comments:

Teacher A at School A:

> Apart from trainings and workshops, I would say that I get ICT skills from my colleagues. For instance, if I can’t solve a computer problem, I would call a colleague to come and help. As well as colleagues from other schools.

Teacher B at School A:

> “…and our principal always encourages that we help one another. For example, many teachers are not well informed when it comes to technology. Young

teachers know how some technological resources work so they are the ones that always help other teachers in terms of showing and teaching them how the Smart Board works".

Teacher C at School A:

"I obtain my ICT skills by being assisted by other teachers here at the schools as well as other teachers from other school. Um… there's a teacher from a school whom I would call if I need help on something, like internet problems. Schools around here rely on supporting each other because the department is not doing enough. They [DoE] don't want to provide regular training because they don't care about teachers and they expect us to produce good results".

Teacher E at School B:

"…Sometimes we get help from other teachers, especially the young ones at the school. Since we did not get enough training to use these resources, we are fortunate to have people who already know how to use technology".

Teacher G at School B:

"…I didn't know how to use a Visualizer, I had to ask Mr A to show me how to use it. So, meaning if our schools did not have knowledgeable teachers when it comes to technology, we wouldn't be using these things. Maybe laptops would have been the only technology we use. The visualizer is something new that I never used it even at school when I was at school, but because I think I'm younger, I'm able to just check how to work on it or ask someone".

Teacher H at School B:

"Yes, I do get support, because teachers at school, the young blood teachers, they help us, and they are patient. Since we are old, they are very patient with us, and they help us a lot. I would always ask if I don't understand how something works".

Principal A at School A also confirmed the above comment by Teacher B at School A:

> "…like I said we do have those teachers that are more skilled than others, so we would also ask them to assist those that are less skilled, so that helps a lot. We also have an IT committee at the school that is made up of teachers that are more skilled on ICT, so they also assist those that are struggling".

From these reports it appears that those teachers who are regarded by these teachers as being ICT competent in a number of public primary schools are helping to improve teachers' ICT use in the Smart Classrooms. Moreover, the findings indicate both the existence and the importance of relationships between schools: schools in these instances do not function in isolation. In some instances, the participating teachers indicated that they themselves sometimes learn to use or improve their skills in the use of ICTs with the assistance of younger teachers at their own schools. This might have been the case because the younger teachers had recently graduated from universities and had had the opportunity of being trained in the use of ICTs, a situation described by Umugiraneza et al. (2018) as cited in chapter 2, section 2.3.1.

Moreover, the comments of Teachers A and C at School A clearly indicate that teachers at this school were in the process of developing communities of practice. The act of forming a community of practice is in line with the suggestions of the DoE (2007:5), as mentioned in chapter 2, section 2.2.6, that teachers in schools should develop a community of practice through being supportive of one another to develop and improve their and others' ICT skills. The comments of these six (*n*=*6*) participant teachers (Teachers A, B, C, G, H, and E), together with Principal A's comment above, also indicate the importance of having well-skilled and knowledgeable colleagues when setting up ICTs. The presence of such teachers clearly helped increase the freedom of the participating teachers, as well as that of their colleagues and of teachers at other schools, to use ICTs in their Smart Classrooms, which, in turn, improved these teachers' well-being and agency freedom. Teachers at both schools described themselves as fortunate to have such teachers who are always available when needed to assist with ICTs and technical issues. This finding is similar to that of Bladergroen et al. (2012) as reported in chapter 2, section 2.2.6. They found in their study that when the teachers in their study needed advice regarding the use of ICTs they were more likely to turn to their peers for help than to technical experts or the DoE. Therefore, the findings of the Bladergroen et al. (2012) study, as well as those

of the current study, suggest that the successful implementation of ICTs to improve teachers' teaching capabilities and ICT knowledge and skills in these two schools relied to a significant extent on a community of practice.

Lack of technical skills among teachers in these two public primary schools was another personal conversion factor associated with ICT literacy reported by the participant teachers to have contributed to their limited use of ICTs in the two public primary schools (see table 4.1). This conversion factor is also highlighted by Fergusson et al. (2009) and Tiba (2018) in their studies, as reported in chapter 2, section 2.2.3. In the interviews, six (*n=6*) of the eight (*n=8*) participant teachers (Teachers A, B, D, F, G and H) suggested that they at times felt demotivated to use the Smart Classroom ICTs as they found they were unable to solve most of the technical and trouble-shooting problems that generally arise with blended learning. This finding indicates that a lack of technical skills at these schools discouraged some of the participant teachers from using the available ICTs in their Smart Classrooms. This finding is reinforced by some of the participant teachers' responses to the interview question: "*Can you solve any internet problems or technical problems?*":

Teacher A at School A:

> "…no, another problem we have at the school is technical problems. Like, if there is no internet, or [we are] struggling to login on some computers we need to look and wait for a teacher who can help. That wastes time…".

Teacher B at School A:

> "Most teachers don't have technical skills to solve computer problems and that causes them not to use technology. If certain teachers do not use ICT then that means teachers who use it will not have full support from the rest of the staff. If you cannot solve a technical problem, no one is available at the school to help you".

Teacher D at School A:

> "Since we have Smart Classrooms and a resource centre at the school the only problem we have are technical problems. Like, there is no internet, or struggling

to login on laptops because in these laptops you need to connect to the internet for you to log in…".

Teacher F at School B:

> "No. I cannot solve technical problems. One thing I am able to do is just to log in on the laptop. I only use a laptop, so if I have a problem with internet on the laptop, I would ask another teacher to help me".

Teacher G at School B:

> "maybe I can solve some but I'm not that strong".

Teacher H at School B

> "No [laughing…] I can't. I still need to be taught".

Since teachers in these two public primary schools clearly lacked technical skills, their agency to integrate ICTs was reduced, as Sadeck (2016) implied (chapter 2, section 2.2.3). On top of that, the relative unavailability of experienced technically skilled teachers in these schools contributed to many of the teachers' abandoning ICTs. This was evident from the observations of the classes of Teachers A and C at School A, who appeared to struggle with solving technical problems. For instance, Teacher A at school A was unable to connect to the Wi-Fi during the particular lesson I observed. As a result, she could not use YouTube videos for her lesson as planned. Teacher C at School A was experiencing the same problem with internet connectivity, but fortunately he was assisted by another teacher adept at using it. Poor internet connection at the school appeared to be a major technical challenge for the participant teachers in these two public primary schools. Thus, some teachers were not motivated to use the available ICTs in their Smart Classrooms due to a lack of some technical skills to solve troubleshooting problems which include; if an application is running slow and the laptop is frozen, and, although they were to some extent assisted by some teachers, there was little technical support offered to them. This finding is similar to that of Chigona and Chigona (2010), who discovered, as discussed in chapter 2, section 2.2.3, that some teachers in their study appeared to be reluctant to use the available ICTs in their classrooms as there was no technical support available in their

schools. This factor could thus be said to strongly contribute to the participating, and other teachers' freedom to solve technical problems.

The findings of the current study indicate that ICT literacy in terms of ICT skills obtained through a community of practice and university training is an important personal conversion factor that in many instances enabled the participant teachers as well as their colleagues to achieve their capacity to use ICTs in the Smart Classroom (although to a limited extent). Thus, the identified capability concerning well-being freedom was:

- to use ICTs to confidently deliver curriculum content with the necessary ICT skills.

The identified capability concerning agency freedom was:

- being able to perform basic ICT skills effectively in the Smart classroom.

The findings also indicate that lack of ICT literacy in terms of technical skills as a personal conversion factor deprived teachers of achieving their capacity to use ICTs effectively in their Smart Classrooms. Therefore, in this regard, the identified deprived capability in terms of well-being freedom was:

- being able to deliver content without being constrained by technical issues.

The identified capability concerning agency freedom was:

- being able to resolve technical issues in the process of curriculum delivery.

The findings indicate the likelihood of the enhancement of teachers' technical skills increasing teachers' capability to solve technical problems in their Smart Classrooms.

4.2.2 Social conversion factors and subsequent capabilities

As reported in chapter 2, section 2.6, Robyens (2011), in her discussion of the capability approach, argued that social conversion factors affect the lifestyles of large groups of people in society. In the case of teachers' ICT competency, social institutions in the form of education departments and or School Management Teams (SMTs) responsible for designing school policies often manifest a lack of a provincial or school-

based policy on ICT training and school policy. In the one-on-one interviews the teachers in the current study saw this lack as having contributed to their and other teachers' limited use of ICTs (see table 4.1).

4.2.2.1 Social institutions (provincial public policy)

Teachers at both public primary schools, in line with the WCED's provincial policy (see appendix E), were required and expected to attend Smart Classroom training. In the interviews, seven (*n=7*) of the eight (*n=8*) participant teachers acknowledged that they had received some WCED sponsored training in the use of Smart Classroom ICTs. However, these teachers also indicated that the training was inadequate as there was only one training session available, and they did not gain anything useful from it. These seven (*n=7*) participant teachers (Teachers A, B, C, D, E, F, and H) only attended the once-off, training session offered by the WCED, and this lasted for less than five hours and took place over a single day. Responding to the interview question: "*Do you think that the training provided by the WCED is sufficient to equip teachers with the necessary ICT skills?*" Teachers A, B, C, D, and principal A at School A, as well as teachers E, F, and H at school B highlighted the inadequacy of the Smart classroom ICT training offered by the WECD:

Teacher A at School A:

> "…The training we get from the department is not enough, mainly because the duration of these training is very limited. For example, when we were trained for these Smart Boards the training only took one day. There were no follow up trainings thereafter. We had to learn a lot of stuff just within few hours. So, the department is not doing enough".

Teacher B at School A:

> "Um... [Thinking…] I wouldn't say it is enough. I think we need more of training on ICT because the only teachers comfortable when it comes to ICT is normally novice teachers. And that causes lack of support among teachers. Their trainings only take few hours, nothing more, so that's really not enough, especially for older teachers…"

Teacher C at School A:

> "It is not enough because you will find that other teachers, they never understood everything that was said. And so, we needed another training so that we can polish our understanding. It was only a one-day training, so that's a little time...".

Teacher D at School A:

> "…training of teachers that are raw is not enough, the time is not enough…The problem is learning a two-year work in three days is not enough; so time versus the workload".

Teacher E at School B:

> "The training only happened once. It only took few hours. It's impossible to use these resources with that kind of training. How can we use these things with that kind of training? I think a month would be enough to train teachers".

Teacher F at School B:

> "No… that is the problem …those workshops, they are being held at least once a year. I think they are not being held more often so that teachers can be used to them".

Teacher H at School B:

> "The training is not enough because maybe it only come once…. If teachers come back from the training, they should also be given the opportunity to train other teachers at the school. The department it only pushes people to use ICT on a limited time. Like the training starts at 08:00 in the morning and ends at 13:00, that is not enough. There was not even a follow up training".

Principal A at School A also confirmed that the training provided for teachers by WCED on Smart Classrooms was inadequate (see table 4.1):

> "When we received these Smart Classrooms, we had a training, but to me it was not enough. It was just um… it was um... one Saturday morning from nine o'clock until one o'clock afternoon...".

While the WCED provincial policy on ICT training requires teachers to attend ICT training in the use of a Smart Classrooms, the participating teachers clearly indicated they considered it unsatisfactory. Teachers strongly indicated that the short duration of the training was the main reason for its inadequacy. They were unanimous in the view that they had not gained enough from the training. This inadequacy meant that they barely used ICTs for curriculum delivery in their respective schools. These findings resonate with those of De Silva (2019~~5~~) and Tiba (2018), as reported in chapter 2, section 2.2.6. These researchers stressed that training programmes in some schools in South Africa are insufficient as they normally take place only once per year. These findings strongly indicate that once-off training workshops are not sufficient to empower and provide teachers with the capabilities necessary for them to integrate ICTs effectively in their Smart Classrooms. Moreover, the findings show many teachers being deprived of their capability to use ICTs freely and confidently. Due to this, these teachers' agency freedom to teach with ICTs is also limited. From their views and reported experiences, it is clear that the inadequacy of the ICT training they received from the WCED on the use of Smart Classrooms is a source of frustration for these teachers. Therefore, it can be argued that insufficient teacher training affords teachers with limited capability to use ICTs due to their lack of ICT skills.

4.2.2.2 Social institution (school policy)

The findings show four (*n=4*) of the eight *(n=8*) participant teachers (Teachers E, F, G, and H) attributing their limited capability to their selected schools' policy concerning access to, and duration of, ICT use in the Smart classroom (see table 4.1). The policies of the selected schools concerning the use of ICTs seemed to have had an influence on the participating teachers' limited use of ICTs. Responding to the question in the interviews conducted with the teachers, "*What are some of the challenges you and other teachers come across in your school concerning the effective use of ICT in the Smart Classroom, and how are these addressed?"* all these four (*n=4*) participant teachers at School B (see table 4.1) identified the challenges, the first of which was having to request the ICTs in advance in line with their school's policies:

Teacher E at School B:

> “If you want to use some of these technologies, you must make sure you do that in advance because you might not get them. For example, you must at least ask for it in the office in the morning before you go to class. According to the IT committee the procedure is that you must ask for it in advance, then, after using it, bring it back in the office”.

Teacher F at School B:

> “The reason for the lack of motivation in me to use technology might be caused by a number reasons… you should request for ICT in advance; that is the procedure...”.

Teacher G at School B:

> “… if we want to use ICTs, we must ask for it in time; that is the rule. If you missed the morning you might not get it for the rest of the day…”.

Teacher H at School B:

> “Challenges are that, like today I wanted to use it but when I go and ask for it at the office, I was told it’s too late. The rule is that I should ask for it before 08:00 in the morning...”.

In the interviews of these teachers at School B, it was evident that not all ICTs were kept and stored in the Smart Classrooms. ICTs such as laptops, projectors, visualizers, and eBeams were kept in the deputy principal's office/safe for security reasons in line with the school's safety and security policy. Only the White Boards were kept permanently in the Smart Classroom. This was an indication of a lack of flexibility regarding the school policy as teachers could not access ICTs at any time convenient for them during school hours.

It is evident from the participants' responses that their freedom to use ICTs was limited due to their schools' rules. It is thus reasonable to argue that schools' policies and rules determine to a significant extent whether teachers are likely to use ICTs in their Smart Classrooms or not. This demotivating and limiting factor is discussed by Madoda (2018) and Mukhari (2016), as reported in chapter 2 section 2.2.4. It is clear from the data collected for the current study that teachers felt that, in spite of both DoE

and WCED policy, schools are on the whole not supportive of the successful integration of ICTs in the Smart Classrooms. Since, the participating teachers at School B were not allowed to request ICTs after certain times at their schools, they were deprived of their freedom to access these ICTs whenever they wanted to. In turn, their learners' well-being freedom was compromised, as De Silva (2015) found in his study as reported in chapter 2, section 2.2.4. Moreover, given that participants indicated their discontent with some of the rules, the findings of the present study suggest that teachers at this school (B) were not involved in the decision-making process which determined the school ICT policy.

The findings in this section suggest that social institutions, such as WCED provincial policy and school policy on ICT use, could represent social conversion factors that lead to capability deprivation among the participating teachers concerning ICT use and access. Therefore, in this study, the identified deprived capabilities from the perspective of well-being freedom concerning the social conversion factors were found to be:

- to be able to use ICTs effectively; and
- to live in an environment without being denied access to ICTs.

Concerning agency freedom, the identified capabilities were:

- to be able to teach effectively with ICTs;
- to be able to participate in the schools' management decision-making; and
- to be able to request access to ICTs at any time during school hours.

The above-identified deprived teachers' capabilities indicate that the use of ICTs in the Smart Classrooms among the participant teachers was limited in these two public primary schools. Therefore, it is clear from the limitations and deprivations which emerged from the above findings that these capabilities were necessary for teachers to be able to integrate ICTs in their Smart Classrooms effectively.

4.2.3 Environmental conversion factors and subsequent capabilities

In the capability approach, environmental conversion factors are identified as infrastructure, resources, and public goods found in an environment in which a person lives, as indicated by Zheng and Walsham (2005) in chapter 2, section 2.6. These might be features of a teachers' external environment. In the current study infrastructure and resources are identified as the environmental conversion factors that lead to capability deprivation amongst the participating teachers concerning ICT use.

4.2.3.1 Infrastructure

Unsurprisingly, power interruptions due to load shedding were reported by Teacher B and Principal A at School A, and Teachers G and H at School B, as the first environmental conversion factor associated with infrastructure, and one that leads to capability deprivation of the participant teachers both attempting and willing to use ICT. In other words, these participants reported load shedding to be interrupting and disturbing their effective and regular use of ICTs in their schools. In the interviews, three (*n=3*) of the eight (*n=8*) participant teachers and one (*n=1*) of the two (*n=2*) participant principals (see table 4.1) raised their concerns regarding the negative impact of load-shedding on their school's daily programme and on their use of ICTs in their classrooms:

Teacher B at School A:

> "Load shedding currently is one of the challenges because these resources cannot be used without electricity. Sometimes there is also a problem with internet server".

Teacher G at School B:

> "…and also, we have load shedding, yeah! that's the challenge, that's also a challenge. Because if you had planned a whole nice exercise activity using the Smart Board, then there is no electricity it affects the whole lesson. So, you always need a plan B".

Teacher H at School B:

> "…you will be willing to use it but because of the load shedding you end up on not using it and once there's a load shedding in the middle of the lesson, that turns me off from the lesson. You also end up losing your learners attention…".

Consistent with the above responses, Principal A at School A stressed:

> "I am aware that load shedding disturbs the use of technology by teachers in most schools in Khayelitsha. Teachers cannot use Smart Boards if there is no electricity. It becomes a challenge because we experience load shedding during school hours, and teachers are busy at that time with teaching using Smart Boards. So, it is really a challenge because teachers end up not using these things".

These comments clearly indicate that infrastructure (see table 4.1) in the form of load shedding was leading to the participating teachers' capability deprivation concerning ICT use. Consequently, their well-being freedom was reduced, since their planned blended learning could not take place. Under these circumstances, these teachers, although initially willing to use ICTs, would choose to avoid using ICTs, not being able to ensure that effective teaching and learning would continue uninterrupted, even during or after the load shedding period. Thus, the well-being and agency freedoms of these teachers to use the available ICTs in their Smart Classrooms were reduced due to their anxiety about load shedding. These results are in line with the findings of Makwela (2019) as reported in chapter 2, section 2.2.5. She found that teachers in Gauteng were not happy with the constant power disruptions occurring in their schools as this disrupted their use of ICTs in their classrooms. Since power disruptions are beyond teachers' control, it would be reasonable to suggest that schools should have back-up plans in the event of load shedding to ensure that the use of ICTs continues.

4.2.3.2 Resources

The whole process of the collection of ICTs, together with the setting up and installing of ICTs in the Smart Classrooms emerged as the second environmental conversion factor associated with resources that impeded the participant teachers (Teachers E, F, G, and H) at school B from realising their capabilities. From the observation of all teachers at School A, I noted that the projectors at this school were permanently screwed and locked into a frame structure on the classroom ceiling as they were

intended to be. However, at School B, teachers raised concerns that the allocated time for teaching and learning was insufficient since time was spent collecting and setting up ICTs from the storeroom every time they were needed for a lesson. In the interviews, all four (*n=4*) of the participant teachers at School B expressed similar concerns:

Teacher E at School B:

> "Every time we want to use projectors we have to walk a distance from office to class. I can't put that thing up there on the celling because its heavy. I have to ask a male teacher to help me. That whole process wastes my teaching time…".

Teacher F at School B:

> "Since I don't use technology most of the time, I know that teachers that are using it are complaining because to use it requires a lot of time. The other day one of colleagues from grade four was stressing out because every time when using the Smart Board, he first needs to attach the projector on the frame in the ceiling. So, teachers avoid using Smart Boards because they waste time".

Teacher G at School B:

> "…Sometimes I don't use it (ICT) because it takes time out of a lesson. Already our lessons are short, especially for Maths, because you have mental maths, which takes time. It needs a man because I'm short. I'm a woman, like I can't adjust that thing, the projector because you need to install it up there on the ceiling. So, it takes a lot of time about 15 to 20 minutes; even to get it in the morning I first have to wait after briefings then get it. Like today my lesson did not start on time because I had to wait for a computer (laptop). I ended up not even using it".

Teacher H at School B:

> "Then another challenge is that I have to carry the whole equipment from the office to the class and I need to set it [up] on my own; that alone wastes time. I can't connect the projector to a laptop, so sometimes I have to wait on another teacher to help me…".

At School B, every morning, teachers were required to collect ICTs from the office, and, in addition, they had to screw projectors onto the ceiling every time they used them. Projectors were not permanently attached or screwed into the ceiling due to safety reasons, as indicated by Principal B at School B:

> "Burglary is a challenge, because every time now and again the ICT resources are kept in the strong room. So, it's difficult for teachers to leave the technology in their classrooms because of high rate of burglary at the school. We had four burglary instances last year. Even though teachers are complaining that their teaching time is spent on installing and connecting projectors, we have no other choice but to keep these resources in the office because our classes are not safe".

The analysis of the teachers' responses also showed that the practice of screwing projectors on the ceiling required what amounted to a workforce. For instance, female teachers needed to ask male teachers to help them install projectors as some teachers could not climb up on the table to screw a projector onto the welded frame on the ceiling. The findings clearly indicated that using ICTs was not conducive to teachers working effectively with ICTs. Therefore, since teachers at School B were not happy with the environmental/infrastructural conditions, it was not possible for effective ICT integration to take place in this school. Teachers at School B described the hardship of carrying these ICTs from the office all the way to the classrooms every morning. Thus, these four teachers reported that they tended to avoid using these ICTs. Anil and Jayakumar (2019) (chapter 2, section 2.2.1) concluded from their findings of a study done in India, this avoidance could mean that, if teachers do not use ICTs regularly in their Smart Classrooms, they could end up losing interest completely, resulting in their being deprived of their agency to learn and gain new skills from using the available ICTs.

The comment by Principal B clearly indicated one among several environmental factors being out of the control of both the teachers and the principal. Moreover, these findings explain why the teachers in School B tended to avoid using the available ICTs in their Smart Classrooms. Thus, it would be reasonable to argue that such circumstances contributed to the reduced well-being and agency freedom of these teachers in terms of enjoying the capabilities necessary to integrate ICTs in their Smart

Classrooms. These findings seem to align with those of Gunzo (2020), as reported in chapter 2, section 2.2.2. He observed in the Social Science classroom in schools in the Eastern Cape Province that setting up and using ICTs for teaching necessitated teaching time in the classroom beyond the time allocated for a lesson.

Thus, the findings of the current study indicate that environmental conversion factors in terms of infrastructure and resources are conversion factors that lead to the participating and other teachers' capability deprivation concerning ICT use and access. The deprived capability in the perspective of well-being freedom identified in this study was:

- to live in an environment without facing hardships in the use of ICTs;

In the perspective of agency freedom, the identified capabilities were:

- to use ICTs in a convenient and conducive physical environment; and
- to be able to deliver content without being constrained by time.

As a result of environmental conversion factors such as infrastructure and resources, the use of ICTs in the Smart Classrooms of the participant teachers was limited in these two public primary schools. Therefore, the findings strongly suggest that the capabilities these teachers were deprived of are necessary for effective ICT integration to take place in the Smart Classrooms. Moreover, the findings indicate the strong possibility that enhancing these capabilities would increase the use of ICTs among the participating teachers in the Smart Classrooms.

4.3 Research sub-question two

What functionings were realised by the teachers participating in this study due to the enhancement of conversion factors?

4.3.1 Functionings (achievements)

Despite significant capability deprivation being found to exist amongst the participant teachers, the data obtained through lesson observation and one-on-one interviews revealed certain functionings as having materialised amongst some of the participant teachers when using Smart Classroom ICTs to deliver curriculum content.

The data revealed that, to some extent, through the teachers' use of ICTs (commodities), in the Smart Classrooms (however limited), the influence of the personal conversion factor (ICT skills obtained through a community of practice and through university training), had created the capability for the participant teachers to use ICTs for curriculum delivery, although to a limited extent, and this varied amongst the participant teachers. Through this process certain functionings materialised. I used the capability approach as a conceptual lens through which to identify these specific functionings which had materialised to a limited extent and in varying degrees. The functionings include the following:

- Teachers' enhanced point of efficiency
- Teachers' heightened level of creativity
- Teachers' augmented degree of pedagogical flexibility
- Teachers' improved sense of agency

Table 4.2 below only shows the data related to functionings obtained through the one-on-one semi-structured interviews with the participant teachers. This was based on the assumption that it would not be possible to directly observe the teachers' functionings (achievements) in their classroom teaching. Therefore, teachers indicated with a symbol 'X' means that they implied in their interview responses that using ICTs in the Smart Classrooms helped them to achieve certain functionings, albeit to a limited extent. However, to explain these functionings in detail (see sub-section 4.3.1.1, 4.3.1.2, 4.3.1.3 and 4.3.1.4), the data obtained through lesson observations were used to support data obtained in the one-on-one semi-structured interviews. The enabled functionings are highlighted in table 4.2 below.

Table 4.2 Enabled functionings as a result of teachers' capabilities.

School	Teachers	Enabled functionings			
		Teachers' enhanced point of efficiency	Teachers' heightened level of creativity	Teachers' augmented degree of pedagogical flexibility	Teachers' sense of agency
A	A	X			
	B	X	X	X	X
	C		X		X
	D			X	X
B	E		X		X
	F	X			
	G	X	X	X	X
	H	X			X

4.3.1.1 Teachers' enhanced point of efficiency

Five (*n*=5) of the eight (*n=8*) teacher participants acknowledged that the use of ICTs enhanced their teaching (see table 4.2). This may have had positive implications on teaching and learning across the same grade in the two public primary schools due to the level of consistency concerning the subject content in the grade, in this case, grade 3 classes which were taught by Teachers A and H. In response to the interview question: "*In your own opinion, how does the use of ICTs enhance teaching and learning?"*, Teachers A and B at School A, and Teachers E, G, and H at School B

acknowledged and highlighted certain improvements that they were aware of in their teaching since embarking on the use of ICTs, including time saving and sharing of lesson material:

Teacher A at School A:

> “Now as a teacher ICTs help me in preparing my lessons using PowerPoint. I would go to bed knowing that I’m prepared for the next day with my PowerPoints notes ready for the next day. It makes my job easier and it saves my time…”

Teacher B at School A:

> “… it [PowerPoint slides] makes your work easy, so that you don't take much time in writing notes on the board. So, it makes your work to be easy and it saves time...”.

Teacher E at School B:

> “Sometimes during the grade meetings, we prepare notes for the entire grade using PowerPoints slides so that we teach the same thing in my grade and that helps us to save time.

Teacher G at School B:

> “For me what I benefit is the time, because we have to write the same thing, I go to different classes. I have to constantly write on the board, there's no space and its time consuming, but if I have like a power point slide presentation, I don't have to keep rewriting”.

Teacher H at School B:

> “It helps me on a too much paperwork. Because instead of printing notes for every learner I would just ask my colleagues to help me connect the devices and children will look at the prepared PowerPoint slides on the Smart Board and that helps to spend my teaching time wisely…”.

The comments made by the participant teachers at both of the selected schools clearly indicated how ICTs, in particular, laptops had enhanced their efficiency as these ICTs

provided them with the freedom to be able to achieve a higher level of productivity with minimum time wasted and taken from valuable teaching and learning time. In this instance, some teachers took advantage of personal conversion factors such as ICT skills obtained through a community of practice and the tertiary institutions where they had trained to use their teaching time effectively and productively. Laptops, projectors, and whiteboards were preferred by those teachers who were willing to use ICTs as the most valuable ICTs to ease their workload and to simplify their daily teaching tasks. These teachers also reported that they sometimes added multi-media inputs such as pictures and sounds in their PowerPoint slides to make lessons more interesting. Sahin-Kizil (2014) and Mukhari (2016) (chapter 2, section 2.5.3) point to the educational value of ICTs in blended learning, describing how these tools made learning easy and enjoyable for the teachers in their study, whilst promoting the efficient use of teaching time. This could be one reason why all the participant teachers with the exception of Teacher F chose, or were willing to use ICTs in their Smart Classrooms.

According to Teachers A and B at School A, and Teachers E, G, and H at School B, their use of PowerPoint slides instead of writing on the board enhanced their productivity, since sometimes the allocated time for teaching and learning could be limited as a result of time wasted on setting up ICTs. This finding was similar to those of Bingimlas (2009), Mukhari, (2016) and Sadeck (2016), as cited in chapter 2, section 2.2.2. Although Teachers A, B, and C at School A, and teachers F, G, H, and E at School B, mentioned in the interviews that they used PowerPoint slides for subject content delivery in their lessons to make lessons more interesting, only three (*n=3*) participant teachers, Teachers A and B at School A, and Teacher G at School B, were observed using PowerPoint slides in their lessons. For example, Teacher A at School A was observed using PowerPoint slides in what could be deemed an effective way for her grade 3 English lesson on ‘healthy foods,’ during which she showed images of types of foods on PowerPoint slides. In my observations, learners seemed to engage fully in the lesson, and at least half of the class raised their hands to answer the question. The only teacher who did not mention why she never used PowerPoint slides in her lessons was Teacher D at School A.

4.3.1.2 Teachers' heightened level of creativity

Based on the teachers' comments and on my observations of the lessons, the availability of laptops with Microsoft PowerPoint application provided most teachers with choices and the freedom to choose how to teach, while at the same time providing them with opportunities to be more creative in their teaching. Teachers B and C at School A and Teachers G and E at School B reported valuing this opportunity to use the available ICTs in ways they wanted to, which they implied as enabling them to enjoy their teaching more. Moreover, according to some of the participants, learners were able to learn effectively through the visuals supported by text in the lessons. These four (*n=4*) participant teachers showed their enthusiasm for this more visual and enriched presentation of subject content:

Teacher B at School A:

> "…When I use PowerPoint slides and also show pictures in them, learners become more interested in the lesson. Learners can ask questions while pointing on the pictures, and also it makes it better for me because I can also point to the pictures and explain. And also I can write explanations on the slides".

Teacher C at School A:

> "In nowadays as you can see that learners nowadays are more learning visually because they watch these things. They are more intuitive in visual things. For example, when I use PowerPoint, I would write on each slide a subheading then put pictures. So, they learn faster than when you just tell them by word of mouth…".
>
> "When I use PowerPoint I would write on each slide a subheading then put pictures. So they learn faster than when you just tell them by word of mouth. You can also display videos on the PowerPoint slides, so they can see from there what you're about to talk about. So it's kind of easy to teach, using ICT especially PowerPoint slides".

Teacher G at School B:

> "…As you saw when I was using PowerPoint I included both pictures and the explanations of the pictures because in my experience this helps learners to understand better. When they do an activity they become interested and almost all of them will finish on time and when I am marking their books I can see that they enjoyed the lesson. I think that is because it's boring to them if I only use words in my PowerPoint".

Teacher E at School B:

> "…and these PowerPoints slides we include pictures and voices of people. Children love it when they can see pictures and sounds".

The findings clearly show that these teachers felt that the use of ICTs assisted their learners' understanding of content due to the graphic pictures and, in some instances, to the videos. Hence, personal conversion factors in terms of ICT skills obtained through a community of practice and from tertiary institutions could be said to have played a significant role for Teachers B and C at School A and Teachers G and E at School B in achieving creativity in their lessons. These comments by these four (*n=4*) participant teachers strengthen the arguments of Sankey, Birch, and Gardiner (2010) (chapter 2, section 2.5.3) on the benefits of multimodal learning: learners learn better when words and pictures are combined, and ideas and concepts are demonstrated on PowerPoint presentation, than when only words are used. From the data presented above, it can be understood that these four participant teachers valued their freedom, even though was limited, to use their laptops in ways they choose to do, and whenever they were given an opportunity, to enrich their teaching, for instance, by including pictures, sounds, and videos in PowerPoint slides.

4.3.1.3 Teachers augmented degree of pedagogical flexibility

It was evident from the interviews with, and lesson observations of, three (*n=3*) of the participant teachers, Teachers B and D at School A and Teacher G at School B, that these teachers valued the opportunity of having access to the internet (although limited by various factors listed above) as this meant that teachers did not have to rely entirely on their own teaching styles when teaching, but could bring other innovative and refreshing teaching styles into their classrooms through the use of YouTube videos, as described by Reich and Daccord (2015) who are cited in chapter 2, section 2.5.4.

In other words, these three teachers valued their freedom to use online videos in their classroom for subject content delivery related to curriculum. The integration of online videos in the classrooms appeared, both from the observations of lessons and the interviews, to be enhancing these teachers' flexibility and creativity since they, and in theory other teachers, could use ICTs in a variety of different ways. For instance, when I observed Teacher B at School A, the teacher played a video in his Mathematics class on the topic of multiplications. The teacher paused the video from time to time, to interact with learners, asking them questions related to the content of the video. This teaching strategy is similar to that in the example discussed by Indrasari (2015) as cited in chapter 2, section 2.5.4. Although I did not observe Teacher G at School B using videos in her lesson, during her interview she explained that when she used videos in her lessons she sometimes paused the video and asked her learners questions orally, based on the video's content, then continued the video to let learners check if their answers were correct. In this instance, Teacher G commented on the flexibility this allowed her in her teaching:

> "Sometimes when I'm using YouTube videos I can be very flexible. Like in a Maths lesson, I would let a video play, then stop to allow my learners guess the answer. So that helps children to improve their thinking and solving skills".

At the same time as those teachers who make full use of ICTs are being flexible and creative with ICTs, they are also improving their learners' well-being freedom, since their learners can benefit from developing life skills that they can use outside the school environment in the future as well as engaging with society. These teachers highlighted how the use of ICTs enhanced their flexibility in their teaching. An additional benefit was that learners appeared to have enjoyed lessons which incorporated videos. Teachers B, D and G commented positively on these benefits, both for them and for their learners, in particular when interacting with, and learning from, other teachers:

Teacher B at School A:

> "It helps learners because they experience different teaching styles because you come as a teacher but you can also use lessons from other teachers… for

> example here at the school we have a Wi-Fi that is available every day to be used by teachers so you can use certain sites for teaching, like YouTube…".

Teacher D at School A:

> "Most of the time I use the laptop because I like to use the YouTube videos on the internet, and I am good at using a laptop. I can search anything. My leaners can watch other teachers online and I can also learn from other teachers… As a teacher I can also learn new teaching styles from the videos. It's a good thing to us and learners that we have Wi-Fi here… Videos also improve my flexibility in class".

Teacher G at School B:

> "I can learn from other teachers around the world. Internet helps me like sometimes I am not feeling well, so instead of standing in front of the class and giving a lesson I can just use a YouTube video so that my learners can watch and listen. um… I am grateful because internet makes my job easy and it gives me the opportunity to improve my personal teaching style".

These teachers were reporting that the availability of ICTs such as the internet in their schools provided them with the opportunity to easily change their teaching styles through online videos, and through this, to enhance both their flexibility in their teaching and increase the variety of their teaching styles. For instance, both teachers and learners had the opportunity to watch and listen to a person giving a lesson on video, and thus be exposed to someone other than their own teacher. In this way, one could argue, both learners' and teachers' agency freedom was improved. For example, in the observation of a lesson taught by Teacher D at School A, after her learners had watched and listened to a 2-minute video of a person reading a story on a YouTube video, the teacher encouraged learners to reflect on, and write about, what they had heard. This teaching strategy helped in developing learners' listening, comprehension thinking, and writing skills. This teaching strategy using these particular ICTs is similar to an example given by Indrasari (2015), cited in chapter 2, section 2.5.4, where learners were provided with the opportunity to watch and listen to a short story with a clear sound, and then write a summary of what they had understood from the story. Teachers D and B at School A, and Teacher G at School

B, seemed to value this kind of opportunity. They offered several reasons in their responses as to why they believed videos and the internet are valuable ICTs in promoting blended learning. This provides another example of how this use of ICTs can increase a teachers' flexibility. Teachers can access a wide variety of subject content that supports and aligns with the curriculum. This means that teachers are no longer forced to stand in front of the class and talk all the time. They can move away from the talk-and-chalk teacher centred pedagogic model and use other teaching styles, using ICTs and online resources to make their lessons more interesting and varied. This is done to prevent what Kabooha and Elyas (2015) discussed (chapter 2, section 2.5.4): that sometimes, learners can become uninterested or bored when they hear the same voice repeatedly.

4.3.1.4 Teachers' improved sense of agency

The use of ICTs such as the internet to access YouTube videos to introduce new topics was perceived by teachers to have enhanced their agency freedom. The enabled capability of using ICTs for curriculum delivery through the identified personal conversion factor, such as ICT skills obtained through a community of practice and university training, made it possible for teachers to achieve their agency freedom. The findings show that the capability of being able to use ICTs in the Smart Classrooms to deliver the curriculum played a significant role in allowing the participant teachers – in varying degrees - to improve their sense of agency. In all observations of those lessons during which teachers included videos in their teaching, learners seemed to pay more attention to the videos that played on the Smart Board than they did when a teacher did not use these. In the observation of three (*n=3*) participant teachers at School A, Teachers B, C, and D, and two (*n=2*) participant teachers at School B, Teachers E and H, I noted that, in all classes where teachers were using videos in their lessons, ICTs had the effect of attracting and keeping learners' attention. This observation was similar to conclusions drawn from the findings of a study conducted in Indonesia by Indrasari (2015) (chapter 2, section 2.5.4): learners tend to pay particular attention, and to sustain this attention, when videos are played in the classroom. Several participants confirmed this conclusion:

Teacher G at School B:

> "…also, like the videos are very interesting for kids. Sometimes subjects like Maths, or even subjects like English, maybe they are teacher orientated. So most of the time the teacher has to explain, but if we have ICT, we give the learners chance to actually look at someone else besides me who's always talking, which then attracts their attention".

Teacher D at School A:

> "Sometimes online videos can be useful for gaining the attention of your leaners, and also it helps not to lose that attention. For example, when explaining difficult topics learners get bored and tend to lose focus but if you use technology like videos and pictures they become interested in the lesson…".

Teacher B at School A:

> Um… I almost use like [thinking] everyday depending on the type of topic I'm at. Most of the time I would use these resources when I'm starting or introducing a new topic. And more especially if I think the topic is difficult for them to understand quickly. Like now when we start "multiplications" I have to make use of videos because I know these children are struggling there".

These comments seem to align with the findings of Kabooha and Elyas (2015) cited in chapter 2, section 2.5.4. These researchers argued that the use of YouTube videos is mostly suitable when introducing new topics, since these videos have the power of making difficult concepts more accessible and drawing the attention of academically challenged learners. In the findings of this current study, participant teachers indicated that on the whole teachers valued the opportunity brought by the accessibility of ICTs for them to use ICTs. They had found that ICTs not only attracted and focused learners' attention, but also helped learners understand better and quickly since they could see objects in, and concepts related to, their natural context. Thus the participant teachers reported valuing the use of YouTube videos in blended learning as they recognised that these enhanced their sense of agency freedom.

In response to the interview question*, "Why is it important for your teachers to use ICTs in their teaching?"*, the two (*n=2*) principals, Principal A and B, further confirmed the value of ICT use in enhancing their teachers' sense of agency while at the same time maintaining effective blended learning:

Principal A at School A:

> "Well, according to my experience, when you start a lesson you need to secure the attention of your learners. It's a pity I am not in class anymore because I need to be here in the office and run the school. When I was teaching, videos and audios helped me to gain the learners' attention. You can see how quiet children are when they watch videos".

Principal B at School B:

> "Teachers must use technology because is a useful tool because it helps them to manage their classes better. Um... [thinking…] For example, if you use videos and pictures to teach in class children become more excited, and for that reason they don't want to be disturbed when they are watching. So that's why I believe technology is important to attract their attention".

Teacher F at School B expressed a similar view to the two principals on the usefulness of ICTs in teaching:

> "In my opinion, I think it is very much helpful because the children of today that we teach, they are more advanced in technology. And you attract, if you are using technology such as PowerPoint slides, and you include pictures in it you attract the attention in your lessons meaning that the teaching and learning time is spent wisely".

Although all of the teachers in this study reported having been exposed to a wide variety of ICT software application tools in the WCED professional development workshops, and as recommended by the WECD, many continued to limit their use of ICTs to basic tools such as Microsoft PowerPoint, and videos through YouTube in class as a means of conveying information. This indicates that these teachers were

more comfortable using basic ICT software application tools than with making use of the range available to them, in order to ensure that they were relaying information to their learners efficiently and effectively. It may also mean that these teachers were more comfortable with conveying information when in a position of power in terms of feeling that they are in control of the few basic ICT software application tools. Some software application tools exposed to teachers in the professional development sessions may prove to be too complicated for them to attempt to use in teaching and learning, in particular for those teachers with low levels of technological literacy. This may discourage these teachers from exploring the value of a wider range of ICT software application tools in teaching and learning. This could mean that, because teachers choose to remain in a comfort zone, there is a reluctance to further explore other ICT software application tools such as E-Books, Google Maps, and Video conferencing. Additional reasons for the reluctance of these teachers to integrate a wider range and variety of innovative tools in their teaching may be linked to the context that the teachers find themselves in, where learners –are accustomed to being taught, or teachers to teaching, in a particular way, irrespective of the subject: the traditional 'chalk and talk' style. Video conferencing may resonate more with online or blended forms of learning, while the use of Google Maps may be more relevant to certain subjects such as History or Geography. Hence, the software application tools that the participant teachers were exposed to in the professional development sessions may not always have been seen by them to be appropriate to the subjects that they were teaching at the time. However, this is not to say that such software application tools should be disregarded by teachers such as the participants in the current study, as these tools could be used in innovative ways to expose learners to unfamiliar contexts, and extend their curiosity and creativity in the fields of Mathematics, the sciences, languages, and the arts.

Although the study found a range of factors limiting the sampled teachers' willingness or ability to use ICTs in their teaching, a large number of positive responses of the teachers towards the use of ICT are quoted in this section. These include a general perception on the part of these teachers that learners are more likely to enjoy lessons when multiple ICTs are integrated into their lessons on a continuous basis: in all the lessons I observed where teachers were using ICT, these teachers linked laptops, whiteboards, and projectors through a Wi-Fi connection. Moreover, the findings

strongly indicate that these teachers acknowledged that learners are more adept than they used to be at using the technology, including in online interactions. It seemed from the sampled teachers' reports in the interviews that using ICTs also encouraged learners to interact and engage with teachers in a more motivated and sustained way.

In spite of these positive responses towards the use and value of ICTs in teaching and learning, the findings of this study indicate that the general level of the participating teachers' integration of ICTs in their teaching in their Smart Classrooms was low. The findings revealed several conversion factors that could be seen as leading to the deprivation of the participant teachers' capabilities. These conversion factors are grouped in terms of personal, social, and environmental factors (see table 4.3). However, despite these teachers lacking certain capabilities as a result of limited access and use of ICTs, they showed that they had managed to achieve four important functionings in the course of their using ICTs. This was due to the availability of personal conversion factors, such as ICT skills obtained – albeit to date to a limited extent - through a community of practice and previous training at university (see table 4.3). Table 4.3 below summarises the identified conversion factors linked to the capabilities and achieved functionings of the participant teachers.

Table 4.3 A summary of teachers' capabilities linked to conversion factors, and functionings enabled as a result of enabled capabilities.

Commodity	Agents	Conversion factors	Capabilities (freedoms)		Functionings (achievements)
			Well-being	**Agency**	
Smart Classroom ICTs	Teachers	**Personal conversion factors** -Age of teacher -ICT literacy	-To use ICT to deliver curriculum content with necessary ICT skills -Being able to deliver content without being constrained by technical issues	-To be able to perform basic ICT skills effectively in the Smart Classroom - Being able to resolve technical issues in the process of curriculum delivery	- Teachers' enhanced point of efficiency - Teachers' heightened level of creativity - Teachers augmented degree of pedagogical flexibility -Teachers' improved agency
		Social conversion factors -Social institutions (provincial policy and school policy)	-To be able to use ICTs effectively -To be able live in an environment without being denied access to ICTs	-To be able to teach effectively with ICTs -To be able to participate in the schools' management decision making -To be able to request access to ICTs at any time during school hours	
		Environmental conversion factors -Infrastructure -Resources	-To be able to live in an environment without facing hardships to use ICTs	-To be able to use ICTs in a convenient environment -To be able to deliver content without being constrained by time	

The only enabled capability that emerged in any significant way from the findings was the participating teachers' use of ICTs to deliver the curriculum. This capability depended on a personal conversion factor, such as ICT skills obtained through community of practice and university training, as seen earlier in section 4.2.1.2. The realised functionings discussed subsequently in this section were achieved due to the identified enabled capability, and this is in line with what was mentioned by Kuhumba (2018), as cited in chapter 2, section 2.6, that capabilities should enhance functionings. Therefore, it is with these findings that the identified functionings (achievements) relate only to personal conversion factors (ICT skills obtained through community of practice and university training).

4.4 Chapter summary

This chapter presented the findings on the participating teachers' capabilities needed for them to effectively integrate ICTs in their teaching and learning in two public primary schools. The data revealed capability deprivation among these teachers to have resulted from certain conversion factors, namely, teachers' age, level of ICT literacy, social institutions (provincial e-Learning policy and school ICT policy), infrastructure, and resources. All of these agents of deprivation, according to the capability approach, meant that these teachers, although having varying degrees of ease of access to ICTs, as well as of levels of ICT literacy, were deprived of their opportunity to use ICTs in a fully creative and effective way in their Smart Classrooms to deliver the curriculum. However, the data also revealed that, despite capability deprivation existing in these schools, certain of the participant teachers showed themselves willing and able to convert the available ICTs into particular functionings. This was linked to these teachers being able to use and enhance their ICT literacy to deliver the curriculum as a result of being members of a community of practice and having had university ICT training. These functionings included the participant teachers' enhanced efficiency, their heightened level of creativity, their increased pedagogical flexibility, and their sense of agency.

In Chapter 5 I provide insights concerning this current research's implications gained from these findings. These implications include cultivating a community of practice,

the inadequacy of local government professional development sessions, attitudes of older generation teachers towards ICTs, limited technical skills of in-service teachers, learners' learning outside the context of the classroom, the influence of rigid bureaucratic school policies on ICT use, and the benefits of using ICTs in primary schools. Recommendations for improved policy and practice, and for future research are offered. In addition, the limitations of the study are discussed.

CHAPTER 5: DISCUSSION, RECOMMENDATIONS AND LIMITATIONS

Introduction

As stated in chapter 1, section 1.4, the study aimed to discover the specific capabilities needed by the participating teachers for them to be able to integrate ICTs effectively in their teaching in the two selected public primary schools in the Khayelitsha area in the Western Cape. In response to the main question: [what are the specific capabilities needed for effective ICT integration in teaching in two public primary schools in the Khayelitsha area?], this study found certain capabilities to either enable the participating individual teachers to use ICTs effectively in their Smart Classroom, or to deprive them from using these capabilities. The capabilities include the following:

- To be able deliver content without being constrained by technical issues;
- To be able to perform basic ICT skills effectively in the Smart Classroom;
- To be able to resolve technical issues in the process of curriculum delivery;
- To be able to use ICTs effectively;
- To be able to teach effectively with ICTs;
- To be able to live in an environment without being denied access to ICTs;
- To be able to participate in the schools' management decision making;
- To be able to request access to ICTs at any time during school hours;
- To be able to live in an environment without facing hardships in the use of ICTs;
- To be able to use ICTs in a convenient and physically conducive environment; and
- To be able to deliver content without being constrained by time.

Considering that many individual schools in the Western Cape have been provided with Smart Classroom ICTs with the specific purpose of the teachers at these schools making us of these ICTs to enhance their teaching and learning, attention needs to be paid to enhancing these teachers' capabilities to use ICTs confidently and effectively in their Smart Classrooms. From my own experience as a teacher in a primary school, and from the literature, I have noted that the provision of ICT resources to schools

does not guarantee that teachers will automatically use ICTs in their classrooms (Bingimlas, 2009; Li et al., 2018). Therefore, I sought to discover and understand what conversion factors might enable teachers to, or deprive teachers from, achieving the capabilities necessary for effective ICT integration. The rest of this chapter is organised under the following sub-headings:

- 5.1 Discussion
- 5.2 Recommendations
- 5.3 Limitations
- 5.4 Summary of the chapter

5.1 Discussion

The preceding chapter dealt with the analysis of the findings obtained through data collected from the semi-structured interviews with, and the lesson observations of, the selected teachers, and interviews with the principals at the two selected public primary schools. In this chapter, my insights concerning this research's implications for both policy and practice are offered. Seven implications have emerged from the findings of this study:

- The desirability and necessity for cultivating a community of practice;
- The inadequacy of the provincial and local government professional development sessions;
- The attitudes of older generation teachers towards ICTs and their use;
- Limited technical skills of some in-service teachers;
- The desirability of learners' learning outside the context of the classroom and the school;
- The influence of bureaucratic and outdated school policies on ICT use; and
- The benefits for both teachers and learners of using ICTs in public primary schools.

The first six implications are discussed concerning sub-question 1: [What are the conversion factors enabling the teachers participating in this study to achieve, or depriving them from achieving, the capabilities necessary for effective ICT integration in their teaching?] The seventh and the last implication is discussed, based on the findings, concerning sub-question 2: [What functionings were realised by the teachers

participating in this study due to the enhancement of conversion factors?]. The discussion of the findings in this chapter is framed and underpinned by the theoretical framework (capability approach) and is informed by the findings of similar studies reported in the literature review in chapter 2.

5.1.1 The desirability and necessity for cultivating a community of practice

As outlined in chapter 4, section 4.2.1.2, the findings appeared to suggest the need to establish a community of practice among the participating teachers at selected public primary schools, and possibly with teachers at other schools. The analysis of the data in chapter 4, section 4.2.1.2, strongly suggests that teachers in this present study considered a community of practice essential to enhance their capabilities to use ICTs efficaciously in their Smart Classrooms. The points teachers made in the interviews about communities of practice assisting and supporting them in the use of ICTs in their teaching strongly indicate these teachers' appreciation of the existence of communities of practice in these two schools and other schools in the area. From these findings, I concluded that a community of practice creates an opportunity for teachers to learn new skills and practices for teaching confidently in a Smart Classroom, and in so doing, developing their professional identity in the workplace. At the same time, they would be making sense of, and understanding, their work, as Gray (2005) puts it, as reported in chapter 2, section 2.3.6. These findings are also consistent with those of Lave and Wenger (1991), as described in chapter 2, section 2.2.6. These authors argued at the time that it is vital for employees to join communities of practice not only to learn new skills but, most importantly, because their participation in a community of practice, could increase the value and effectiveness of the curriculum in an education context.

The finding in the present study regarding communities of practice also revealed the inadequacy of the ICT training provided by the WCED on the use of Smart Classrooms by teachers: the teachers in the study appeared to rely substantially on their community of practice to acquire the ICT skills they needed. In the interviews, seven (*n*=*7*) teachers (A, B, C, D, E, F, and H) who had taken part in the Smart Classroom ICT training provided by the WCED were firmly and unanimously of the view that the training session was insufficient as it only lasted a few hours and there was no follow-up training. It was evident from teachers' responses that the leading cause of the

insufficiency of the WCED ICT training is its limitation to a once-off training session. They bemoaned the absence of any follow up training sessions or support. This view correlates with the argument by Johnston (2015), Mukhari (2016), and Tiba (2018), as reported in chapter 2, section 2.2.6, that ICT training can, at times, be ineffective if training sessions are only held once a year.

Therefore, from the findings of the present study, and from those of Hung and Nichani (2002:178) (chapter 2, section 2.2.6), I conclude that networking between teachers is a necessity rather than a luxury, since this practice appeared to be the only source of skills and knowledge for the in-service teachers in the current study. Wenger et al. (2005), as reported in chapter 2, section 2.2.6, found that employees in their study had good relationships with one another, not necessarily because they worked for the same company, but due to the fact that they came together because they found value in sharing ideas. This strongly suggests the importance of the relationship between teachers at the same school since these teachers are able to seek assistance from their colleagues when the need arises: in the case of the present study, assistance in learning ICT skills and using ICTs.

Thus from the literature, and from the findings of the current study, I conclude that teachers facing challenges in terms of ICT use may find it easier to engage with more knowledgeable and more skilled colleagues on an ongoing basis than with a trainer or facilitator from outside the school. This is where a community of practice comes into effect in terms of developing an individual's capabilities, if one takes it as a given that teachers' capabilities to use ICTs are developed through learning in context. However, this is not to imply that the training provided by WCED had no impact on the participant teachers' ICT pedagogical practice. I concluded that the training programme was insufficient for reasons such as the short duration of the training, as was also concluded by Johnston (2015), Mukhari (2016), and Tiba (2018) from their findings (chapter 2, section 2.2.6), and from what emerged from the analysis of the present study's findings in chapter 4, section 4.2.2.1. These indicated similar problems. It could be that the WCED programme was not specifically designed to train teachers in integrating ICTs into their pedagogical practice; instead, they were simply taught, or were shown, how a particular ICT works. Thus, it could be argued that such poorly designed, decontextualised programmes may harm rather than positively influence teachers' decisions to use ICTs for curriculum delivery in their Smart Classrooms. For

instance, after returning from training, teachers such as those in the current study may still not see value in the use of ICTs as they believe the training did not sufficiently prepare them for using the new ICTs in their teaching. This was the finding of Chigona et al. (2014), and of Sadeck (2016), as reported in chapter 2, section 2.2.6.

The data I analysed in chapter 4, section 4.2.1.2 also indicate that individual public primary schools do not function in isolation. In terms of encouraging teachers to use ICTs, this suggests the possibility of a number of schools in the same area establishing a community of practice that would result in the sharing of resources, knowledge, and solutions to problems facing other schools related to the lack of ICT use. I am mindful, from my own experience, that not all schools are willing to share resources. Some schools may share resources with the sole aim of saving money. However, where some schools may own ICT resources, and some may own human resources (ICT literate teachers), I would suggest that an opportunity may be created for the schools to 'lend' each other these resources.

The data analysis in chapter 4, section 4.2.1.2, also revealed that the younger teachers at the selected schools played an integral role in enhancing the functioning of a school community by providing older colleagues with professional support with ICT use. Therefore, as the data indicated, despite younger teachers lacking teaching experience, their presence in schools was bringing not only shared ICT competence, but also new and fresh ideas to the creative pedagogical use of ICTs. Thus, the existence of these teachers carries the promise of a contribution to a renewed and innovative teaching culture. As described in chapter 2, Gray (2005), and Lave and Wenger (1991) (section 2.2.6), found that less experienced teachers in terms of the number of years of teaching, were also learning professionally from experienced teachers. While in many or most schools this may be the case, in the current study, and in the specific context of learning ICT skills and their pedagogical use, I found it to be the other way around: novice teachers tended to be the most experienced in ICT use. This makes them core members of both a teaching/school community and a community of practice. Umugiraneza et al. (2018), as reported in chapter 2, 2.3.1, found in their KwaZulu-Natal study that younger teachers who had recently completed their BEd degrees had had the opportunity to use ICTs on a regular basis in the course of their studies, and were more confident than older teachers in the use of ICTs. The current study has provided some evidence that teachers who have recently graduated

from university are more likely to use ICTs in their teaching than those who have been teaching for several years ('older' teachers). From my own experience, and according to the literature, younger teachers tend to be more confident using ICTs than older teachers since they are more familiar with the new ICTs being provided to, and used in, schools due to the fact that the ICT competency formed part of their pre-service curriculum at tertiary institutions.

The findings outlined in chapter 4, section 4.2.1.2 suggest that, in terms of the capability approach, a community of practice, together with university training, can afford teachers well-being freedom to deliver curriculum content using ICTs. Thus, the ICT skills obtained through a community of practice, together with university training, can render teachers comfortable with integrating ICTs in their Smart Classrooms. This enables teachers, should they wish, to make use of the available ICTs at any time during and after school hours. Thus, in turn, and as seen through the lens of capability approach, teachers' agency freedom to effectively perform the necessary ICT skills in their Smart Classrooms is enabled. For instance, teachers in this situation have individual freedoms to act independently by deciding which ICT skills are best suited to them to use in their delivery of the curriculum. Teachers in turn come to feel more fulfilled in their work if they are allowed to practise what they have learned from their colleagues. In other words, participating in a community of practice provides teachers with on-going informal training that lasts throughout these teachers' professional careers. Thus, from the findings of the present study, and from the literature, I argue that, whenever teachers learn in context, the possibility exists that they may achieve learning experiences in which both teachers and learners are positively engaged. As a result, learners are more likely to excel in their subject content. Such practices, I would argue, create the possibility for effective teaching and learning through ICTs to take place over a sustained period.

5.1.2 The inadequacy of provincial and local government professional development sessions

The participant teachers expressed dissatisfaction with the WCED ICT training offered to them. This points to the need for professional development workshops to be reviewed and strengthened. As discussed earlier in this chapter, in section 5.1.1, and elsewhere, the reason for the dissatisfaction of the participant teachers with the ICT

training was most probably the short duration of the training programme and the fact that they were trained only in the use of ICT, and not shown how to integrate ICTs in their teaching. In other words, the training was limited to information to help them to understand technology.

Therefore, it is reasonable to argue from the findings that the participant teachers, and possibly other teachers who are expected to make use of the ICTs in the Smart Classrooms provided by the WCED, would be frustrated about the inadequacy of the WCED ICT training. The findings provide a strong indication that, if teachers were to receive adequate training that lasts longer that one day, and includes the pedagogical use of ICTs, their well-being and agency freedoms would be improved, as argued by Bingimlas (2009), De Silva (2015), and Tiba (2018) (chapter 2, section 2.2.6). These researchers concluded from their respective studies that those teachers who take part in ongoing rather than once-off training sessions, and training that includes pedagogical use of ICTs, tend more frequently to integrate ICTs in their classrooms, and more successfully, than do teachers who have not received this kind of ICT training. Given that the participant teachers were of the view that they had not received enough ICT training from the WCED, one could argue, according to the capability approach, that they had been deprived of their well-being freedom to use ICTs effectively in their Smart Classrooms. Consequently, their agency freedom to teach effectively with ICTs was also affected. The participant teachers reported that they were limited in, or prevented from, using ICTs as often as they would like in their Smart Classrooms due to their limited ICT skills, and clearly indicated their unhappiness and frustration with this situation. From this, one could argue that, if teachers are not confident using ICTs, the possibility exists that blended learning will either not take place or take place ineffectively.

What the current study's data analysis suggests is that the needs of the schools selected for the study concerning their teachers' ICT use, and the training programmes offered by the WCED for their teachers, are misaligned. Since some of the participant teachers had no background in any ICT use or training, both the university and the WCED programmes, while having the pedagogical limitations already mentioned, may be too advanced for these teachers in terms of training in ICT skills. The fact that some of the younger participant teachers had to do ICT skills related modules as part of their

studies at university, meant that they possessed certain basic ICT skills which they were able to use to deliver the curriculum effectively in their Smart Classrooms. This finding is in line with that of Madoda (2018) (chapter 2, section 2.2.6), who found that some of the teachers who were ICT literate in some private schools in Western Cape had obtained their ICT skills while pre-service teacher trainees.

The findings in this study differ from those of Buzuzi (2020), as documented in chapter 2, section 2.2.6. He argued from his findings that, although some teachers spend many years being trained as teachers in tertiary institutions, they may still be unwilling to use ICTs in their classrooms. The findings of the current study suggest that, if the ICT training offered to pre-service teachers during the university period is deemed to have been of poor quality, schools and the WCED must see it as an absolute necessity to provide ICT training immediately new teachers start teaching. Thus, in terms of the capability approach, I contend that quality university training in ICT use for student teachers has the potential to enhance their well-being freedom to use ICTs to deliver the curriculum when they start working as novice teachers. This also means that, if in-service teachers already possess some ICT skills, they would be likely to use those skills to deliver the curriculum. If, according to the capability approach, ICT skills afford teachers the opportunity and freedom to use ICTs, this leads to their enhanced agency freedom to perform and use basic ICT skills effectively in the Smart Classroom. In other words, if teachers possess basic ICT skills, they will have the capacity to act independently and be able to make their free choice concerning the use of ICTs in the Smart Classrooms. Thus, it follows that their possession of ICT skills results in the enhancement of teachers' well-being and agency, and this in turn suggests the high likelihood of teaching and learning with ICTs taking place effectively. Moreover, this would in turn create a positive atmosphere in the classroom, one that will contribute to learners' well-being and their successful academic achievements.

5.1.3 The attitudes of older generation teachers towards ICTs and their use

As has been mentioned, the observation and interview data analysed in chapter 4, section 4.2.1.1, indicate that some older teachers were reluctant to use ICTs in their Smart Classrooms due to their ‘underlying age’. This finding was reiterated by three (*n=3*) teachers and one (*n=1*) principal in the interviews. The implication for learners of such resistance is that it may lead to learners' poor academic achievement. The use

of ICTs both by teachers and learners in the classroom has been found to promote the shift from teacher-centred classrooms to learner-centred classrooms, as was concluded from studies done by Benjamin (2019), Buzuzi (2020), Makwela (2019), and Waghid and Waghid (2018) (chapter 2, section 2.4). From the experiences and views expressed by some of the participants, the current study's findings suggest that teachers' resistance to using ICTs in classrooms may detract from learners' academic performance. The implications of this for learners is that they could also be deprived of the benefits derived from their teachers' use of ICTs, given that the integration of ICTs has been shown to result in the advancement of effective teaching and learning in the classroom (Mukhari, 2016).

For some teachers (particularly older teachers) attempts to integrate the available ICTs in their Smart Classrooms may result in poor or ineffective ICT integration by teachers who may have begun to see the value of using ICTs. Older or technophobic teachers' negative attitudes have the potential to create and spread contempt for, and resistance to, ICT use amongst other teachers at the school who may also come to see no value in trying to use ICTs since no-one else is using them. From my own experience in such an environment, colleagues tend not to trust or support one another, and teaching, and learning does not take place as effectively as it should. However, some studies have shown that, since the introduction of the use of ICTs in schools, encouraged and assisted by the WCG through WCED, the culture of teaching and learning has been noticeably changing for the better (Buzuzi, 2020; Madoda, 2018; Waghid & Waghid, 2018). Thus, both the findings of the current study, and the literature, suggest an urgent need to shift older generation teachers' attitudes towards ICT use in order to equip both them and their learners with 21st century ICT skills.

in order to avoid discouraging those teachers who are already actively using ICTs, school principals urgently need to seek and implement the means to empower older teachers with the skills for integrating ICTs in their teaching. Empowerment of these teachers should initially focus on changing their negative attitudes towards the adoption of ICTs. Regan et al. (2019) (chapter 2, section 2.3.1), found in their study of teachers' perceptions of using ICTs, that the attitudes and beliefs of the participating teachers about technology was a deciding factor for whether these and other teachers would adopt and use ICTs in their classrooms. Therefore, based on the findings of

such studies, and on the data collected from the participant teachers in this study, I would conclude that teachers' positive attitudes towards ICT use can generate the possibility of their being willing and able to integrate ICT in their teaching. Thus, inadequate ICT training received by teachers in the past could be one reason many teachers fail to see value in the use of ICTs. This finding aligns with that of Umuguiraneza et al. (2018), as reported in chapter 2, section 2.3.4. They found that older teachers in their study tended to be naturally unenthusiastic about using ICTs in their classrooms as some of these teachers had never been trained to teach with ICTs.

Based on the observations of the participant teachers at one of the two selected schools (particularly Teachers E and H at School B) as summarised in chapter 4, I found that, while these teachers were unsure as to how to start to operate the ICTs available to them, they seemed to be keen to learn to use ICTs. This finding indicates a lack of support by the principal for her teachers' use of ICTs. Based on this finding, it is, therefore, important to point out that there is a high possibility that teachers who are considered to be old may still be willing and enthusiastic to use ICTs in their classrooms, once they are provided with the opportunity to have the value of ICT use in their teaching and learning demonstrated to them.

5.1.4 Limited technical skills of some in-service teachers

The observation and interview data analysis in chapter 4, section 4.2.1.2, reveals a general lack of technical skills among teachers at the two schools as another factor that may have caused their capability deprivation, made apparent in their failure to solve technical problems in their Smart Classrooms. In the interviews, six (n=6) teachers (A, B, D, F, G, and H) revealed that they lacked the technical skills to use ICTs in their Smart Classrooms. This was in spite of the fact that the two sampled schools had IT committees made up of teachers who were considered to be ICT literate, and these teachers in theory were providing support to other teachers concerning ICT related issues.

Thus, despite the IT committees' existence at the two sampled public primary schools, the participant teachers were concerned about the lack of technical support they received. The findings recorded in chapter 4 suggest the need for schools to focus on

developing teachers' technical skills in order to create and strengthen more teachers' capabilities. Establishing a community of practice within the school and with other schools in the area could be one possible way to create a community and pool of technical skills for teachers. The literature has indicated that if teachers work together and help each other the chances are that they may gain and strengthen their ICT skills, as Wenger (1991) and Bandura and Walters (1977) (chapter 2, section 2.2.6) indicated decades ago. Where and whenever teachers use or attempt to use ICTs in their Smart Classrooms, there are bound to be technical issues arising and interrupting the use of ICTs in teaching and learning. Thus, unaddressed technical problems would be likely to generate resistance towards ICT use by teachers and reluctance to use ICTs into the future. This finding aligns with that of Tiba (2018), who found in his study (chapter 2, section 2.2.3), that the poor quality of technical support available for teachers in schools may be one reason teachers choose not to integrate ICTs in their teaching.

The failure of the IT committee at one of the selected schools to perform effectively may have been due to the fact that the teachers on the committee were expected to perform their teaching duties in addition to serving on the committee; they may thus have had limited time to assist teachers with ICT problems. The many technical problems faced by teachers attempting to use ICTs could include poor and interrupted or no internet connections, laptops running too slowly, and users not being able to log in. Since teachers cannot solve some or many of the technical problems independently, they are deprived of their capability to deliver content without being constrained by technical issues. Consequently, teachers' agency freedom, such as solving technical issues in curriculum delivery, would also be affected. In other words, teachers may avoid using ICTs due to the continuous burden of facing technical errors, which they are unable to solve due to lack of technical skills and support available at schools. This finding aligns with that of Chigona and Chigona (2010), who stated similar concerns, as reported in chapter 2, section 2.2.3.

5.1.5 The desirability of learners' learning outside the context of the classroom and the school

With reference to the findings reported in chapter 4, external factors such as load shedding continued to hamper effective teaching and learning in historically disadvantaged public primary schools in the Western Cape at the time of the current

study, including in the two schools selected for the study. The study findings revealed that some of the participants in the sampled public primary schools, as indicated in their interview responses, experienced load shedding to be disturbing their and other teachers' effective and regular use of ICTs in their Smart Classrooms. These teachers were concerned about the negative impact load shedding has had, and continues to have, on their uninterrupted and successful use of ICTs in their Smart Classrooms.

While in the context of frequent and ongoing load shedding it may prove necessary for teachers to avoid using ICTs, this may have a significant influence on teaching and learning: teachers are deprived of performing their ICT teaching activities, and learners are robbed of their freedom to experience effective blended learning. Frequent load shedding could cause teachers to hold on to traditional teaching and learning methods, such as teacher centred chalk and talk, which are in theory becoming increasingly irrelevant in the 21st century.

These findings related to external factors are in line with those of Mukhari (2016) as reported in chapter 2, section 2.2.5. This researcher discovered, at the time of his study, that some schools in Gauteng Province were experiencing power disruptions during school hours and, as a result, similar to the case of the current study, teachers were being deprived of their well-being freedom to live and work in an environment without facing hardships in their use ICTs. This also affected their agency freedom to be able to use ICTs in a convenient and conducive environment. It was apparent that some teachers at the two selected public primary schools were not happy with power disruptions occurring during school hours disrupting regular use of ICTs. Thus, in order to counter the disrupting consequences of load shedding for teachers' use of ICTs, the WCED and schools need to ensure continuous blended learning during school hours by providing schools with generators or solar power.

5.1.6 The influence of bureaucratic and outdated school policies on ICT use

From the findings in chapter 4, section 4.2.2.2, I noted that the policies designed by the two schools (in particular School B) concerning ICT access and use were affecting the integration of ICTs by teachers in their Smart Classrooms. Responses from participant teachers at the selected schools confirmed school policy to be a social conversion factor that limited their use of ICTs. Moreover, a particularly poorly

designed and implemented ICT policy at School B confirmed that teachers were not being provided with adequate support to integrate ICTs in their Smart Classrooms. This finding is consistent with that of Mathipa and Mukhari (2014) and Mukhari (2016), as was reported in chapter 2, section 2.2.4. While the School Management Teams (SMTs) at the respective sampled public primary schools in the current study had developed policies which they thought would promote effective use of ICTs in a school context, the members of these teams did not appear to have realised that these same rigid, bureaucratic policies were in fact contributing to their teachers' limited use of ICTs. This finding is consistent with results reported by Dube et al. (2018) as described in chapter 2, section 2.2.4.

One possible reason for poor ICT policy could be that teachers were excluded from the decision-making process involved in their schools' designing of ICT policies, as summarised in chapter 4, section 4.2.2.2. This means that teachers' agency freedom to participate in the schools' management decisions was denied. While the poor ICT policy at School B affected all of the participant teachers at that school, it appears that female teachers were the most affected. For instance, using ICTs at School B was physically challenging since – in line with the policy stipulations - it required teachers to fit projectors onto the ceiling frame whenever they needed to use them. To avoid enduring such a burdensome task, teachers, particularly women teachers, at the school chose not to embark on using ICTs in their Smart Classrooms.

Given such ill-thought-out ICT policies at School B, it was evident that teachers at this school were being denied the capability to live in an environment that enabled them to access the available ICTs at any time convenient for them during school hours. From my own experience, if teachers are denied the opportunity to access the ICTs available in schools, learners are also denied the benefits that would have been created by their teachers' use of ICTs in the Smart Classroom. This finding, together with findings in the literature, would seem to indicate that the inclusion of all employees in school policy design processes is crucial, given that they are the ones who stand to be directly affected by these policies once implemented, as advocated by Kozma (2011) (chapter 2, section 2.2.4).

5.1.7 The benefits for both teachers and learners of using ICTs in public primary schools

The findings of the current study, analysed in chapter 4, section 4.3.1, and according to the capability approach, reveal that, in spite of the constraints leading to teachers'' unfreedoms described above, most of the teachers at these schools were using, or attempting to use, ICTs to achieve certain important outcomes, including efficiency, creativity, pedagogical flexibility, and a sense of agency.

First, in terms of efficiency, most of the participant teachers indicated that their use of ICTs, even though limited, helped them to save teaching time, and that this enhanced their point of efficiency. For example, in the interviews, five of the selected teachers (A, B, E, G, and H) who were using ICTs with relative success, seemed to appreciate that they no longer had to write notes on the board using the chalk board method. Instead, they could prepare PowerPoints slides in advance and use them later – and with more than one class in a grade - in their Smart Classrooms. This finding is consistent with that of Lewis (2004) in his study, as outlined in chapter 2, section 2.5.3. Thus, my conclusion from this finding is that, through the use of ICTs, teachers are able to become more productive in their work and need use relatively little time and effort generating teaching resources. In other words, for these participant teachers, this meant that they could spend more time on teaching and ensuring that curriculum content was covered within a shorter period of time in comparison to what would have been accomplished using traditional teaching methods.

Second, the data analysis revealed that the participant teachers (B, C, G, and E) saw their use of ICTs, even though limited, to have heightened their creativity levels. These teachers felt that their integrating of multimedia effects in their lessons, such as sound, video, pictures, and words in PowerPoint slides, had heightened their creativity. For example, these teachers described incorporating these multimedia effects on one PowerPoint presentation to make their lessons more interesting and attention grabbing for their learners., Birch and Gardiner (2010) found in their study (chapter 2, section 2.5.3) that multimedia effects jointly used in PowerPoint slides opened up the possibility for effective learning to take place. Teachers' creativity in the use of ICTs helps to create an inclusive learning environment where learners learn in different

ways. Thus, incorporating different multimedia effects in a lesson is an opportunity to accommodate and encourage all learners.

Third, their use of ICTs afforded three of the participant teachers (B, D, and G) increased pedagogical flexibility. Although these teachers had limited access to ICTs, they seemed to appreciate the fact that whenever they were provided with a chance, they could use ICTs in any way they wanted in their Smart Classrooms. Most importantly, Wi-Fi availability made it possible for some of the teachers to be more flexible in their ICT pedagogical practices. As described in Chapter 4.3.1.3, I observed that, while one participant teacher was playing a YouTube video, she paused the video and posed questions to learners about the video's content. An additional benefit of ICTs once teachers have access to them, revealed by the data, was the availability of relevant ICT software application tools such as online videos (YouTube App) stored in the laptops affording the participant teachers (at both sampled public primary schools) opportunities to learn and adapt different teaching styles from other teachers worldwide. The use of ICTs, in particular multimedia videos, played a vital role in learners' successful blended learning. These findings are also consistent with those of Indrasari (2015) (chapter 2, section 2.5.4). He argued that in his study videos were shown to be useful in improving learners' narrative writing skills. I observed a similar learning process taking place where a participant teacher used a video to assist learners to develop and improve their writing skills.

Fourth, the use of Smart Classroom ICTs afforded some, although not all, of the participant teachers a sense of agency. These teachers (B, D, G, and F), and the two participant principals (A and B), believed that ICTs boosted teachers' confidence. In other words, as much as the participant teachers had limited access to ICTs, they implied that the use of ICTs in their teaching and other teachers' teaching has the potential to make teachers feel more in control of their pedagogical practices, which in turn contributes to successful curriculum delivery. One possible piece of evidence of successful curriculum delivery from the interviews was the expressed view of some of the participating teachers that ICTs allowed them to secure and sustain their learners' attention in the classroom, a phenomenon Indrasari (2015) alluded to (chapter 2, section 2.5.4). Thus I conclude that ICTs have high potential to change the classroom from being teacher-centred to being learner-centred.

5.2 Recommendations

5.2.1 The role of the school principal in driving a digital literacy intervention strategy

It lies with principals as school leaders to regard the provision of adequate ICT training as an absolute necessity for empowering teachers in their attempts to integrate ICTs in their teaching. It can be argued then, that professional development of teachers in the use of ICTs for pedagogy is essential, and one of the aims of such training programmes should be to eliminate teachers' negative attitudes towards using ICTs. This professional development in the use of ICTs is not necessarily primarily about the technology tools. It is also about the change in attitude that needs to be achieved if teachers are to be up to date with the latest trend of new technology and its pedagogical benefits. School principals should thus not excuse themselves from attending professional development training in ICTs. This training is a necessity for every principal, not excluding a principal such as the one at School B, who appeared to be less than enthusiastic about using ICTs for teaching and learning. Perhaps principals' attendance at professional development training courses would encourage teachers to see the value in using ICTs and would reassure them of their principal's support in their attempts to use these in their teaching. School principals should also see it as their responsibility to ensure that they have budgets allocated for teachers' training programmes for the entire academic year. I would argue that if training of teachers in the use of ICTs is adequate and is ongoing over a period of a year, teachers would be more likely to have positive attitudes towards ICT use in their Smart Classrooms and feel freer in their use of ICTs.

As a teacher and a researcher, I would recommend that schools form structures that support teachers in the solving of technical problems, perhaps in the form of an IT maintenance department with ICT trained teachers, or teachers considered to be ICT literate and who would be freed up from some of their teaching. Such departments could be based in schools, rather than at the district offices, to respond to technical (IT) problems at the school without delays, as advocated by Dzansi and Amedzo (2014) (chapter 2, section 2.2.3). With this kind of technical support structure, schools could avoid spending money they do not have on hiring independent technical assistants. In this context, as has been mentioned, instead of using scarce funds on

hiring independent ICT trainers, and on buying replacement ICTs, they could begin to promote communities of practice with neighbouring schools which would also benefit.

In addition, to avoid the possibility of wasting teaching time on learning how to use new ICTs, I would recommend that the number of teaching periods per teacher be reduced, and instead the length of teaching periods be increased. In this way, teachers would have enough time for teaching using ICTs and assisting learners in using, or engaging with, ICTs. Teachers would also have time to learn how to teach using the new ICTs, thus removing one of the barriers to the use of ICTs in teaching alluded to by Bingimlas (2009) (chapter 2, section 2.2.2).

Chapter 4, section 4.2.2.2 described the inconvenience and burden to teachers at School B caused by their having to access ICTs stored in the administration building for security reasons, and how this discouraged them from using Smart Classroom ICTs in their teaching and learning. Based on this finding, which may apply to many 'disadvantaged' schools, I would recommend that schools encourage and increase the use of ICTs among their teachers by having ICTs installed and stored securely and permanently in their classrooms. School principals should pay more attention to having safe Smart Classrooms with the necessary security systems to ensure the safety of ICT equipment when left unattended after school hours.

5.2.2 The development/implementation of a sustainable professional development programmes

I would argue, from the findings, that teachers' capabilities could be developed if teachers' professional development training programmes were to continue beyond the one-day training session model and include the pedagogic use of ICT. Follow up training sessions and both technical and pedagogic support to ensure teachers are empowered, and continue to integrate ICTs in their teaching is essential. If teachers see value in using ICTs, then the chances are that they are likely to integrate these in their teaching for curriculum delivery and other purposes. According to the findings set out in chapter 4, section 4.2.1.2, teachers would highly appreciate continuous professional development training in ICT use for pedagogy throughout the year. I recommend that the WCED design and implement professional development training programmes that make it compulsory for all teachers, including novice teachers, to

attend at least for a few hours every weekend over the school year. The venue for such a professional development training programme should be geographically convenient for all teachers. so that teachers spend minimum time traveling to the venue and more time at the training site. After completing the training, teachers should be monitored on an ongoing basis to identify gaps and create room for improvement. Perhaps, whenever teachers are to be provided with ICT training by WCED, the training programmes should initially be necessary and compulsory in terms of providing those teachers with no previous ICT experience or knowledge, with a solid foundation in ICT before embarking on advanced training which would develop teachers' pedagogical ICT knowledge and skills.

I would also recommend that professional development programmes include training that enables teachers to troubleshoot and solve any technical problems they encounter when attempting to use ICTs in their classrooms. As was described in Chapter 4, I observed a teacher at School A having to waste valuable teaching time trying to fix an internet problem. What was even more problematic, was that the lesson did not continue as planned since the learners missed the opportunity of watching the online video integrated into, and essential to understanding, the lesson content.

5.2.3 [Re]designing ICT policies

As mentioned in section 5.4.1 above, the findings of the study indicate a lack of teacher involvement in their schools' policy design. I would therefore recommend that schools consider redesigning and updating their policies on the use of ICTs for pedagogy with the involvement and collaboration of all teachers at the school. When developing ICT policies, I recommend that schools avoid the use of a forward mapping approach. Graves and Bowers (2018) (chapter 2, section 2.2.6) concluded from their survey conducted in United State (US) that the reason many policies fail could be because they are planned and implemented using the forward mapping approach, a planning model which does not involve or allow employees, at the lower level of employment to participate in the design of policies (Graves & Bowers, 2018). Based on the findings of the current study, and on those of Graves and Bowers (2018), I would strongly recommend that schools develop ICT policies that benefit all teachers, not only some teachers or subjects. The school's ICT policy should state clearly and unambiguously that the use of ICTs for pedagogy is compulsory for all teachers who are sufficiently

knowledgeable and or competent in the use of ICTs, regardless of what subjects they teach and that all resources must be shared among teachers and learners. WCED provincial policies on teacher ICT training should move from a uni-focus in terms of the number of resource materials available or provided for improving ICT skills, to a wider focus on how teachers use these resources to acquire ICT pedagogic skills, as emphasised by Rowsell et al. (2017) in chapter 2. This kind of initiative would enable WCED officials to identify areas for improvement in the teaching of school-based teachers in their use of ICTs. In conclusion, the findings of this study gave me the impression that there is a considerable need for schools to revisit their professional development policies. In other words, these policies should be amended and updated in accordance with teachers' current professional needs, and technical training be made a priority and be clearly defined.

5.2.4 Developing a Fourth Industrial Revolution (4IR) curriculum in primary schools

The arrival of the Fourth Industrial Revolution (4IR) places pressure on schools to move away from traditional teaching methods and towards developing new flexible curricula relevant to 21st-century skills, particularly ICT skills. This is essential to prepare learners for the demands and challenges of the 4IR within a competitive global context. Figure 5.1 below is a graphic representation of my recommendations for schools' preparation for teacher education and training concerning 4IR curriculum, based on the two important areas identified in the findings, in chapter 4, sections 4.2.1; 4.2.2; 4.2.3.

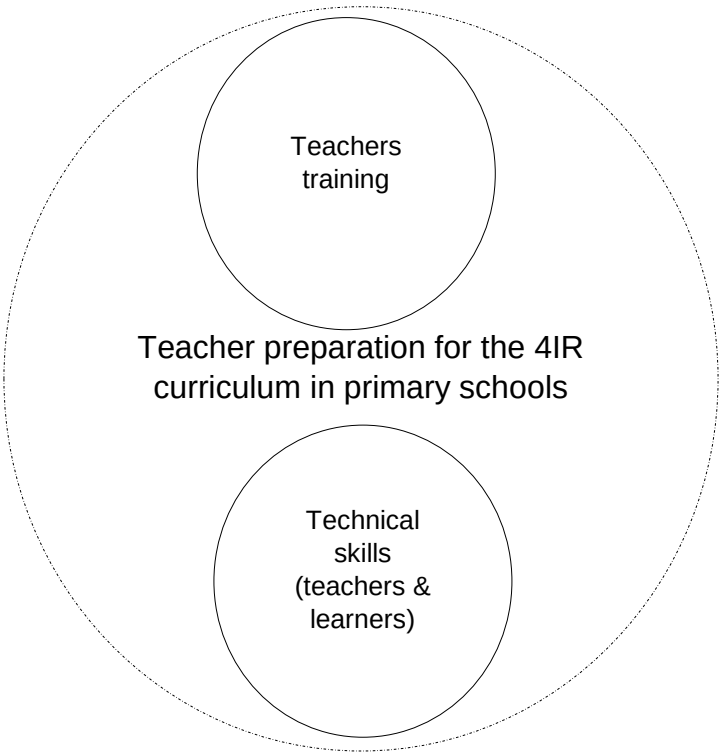


Figure 5.1: Identified components recommended to realise the fourth industrial revolution curriculum.

As illustrated in figure 5.1, I recommend that the WCED provide teachers with sufficient training and support in the use of ICTs in their classrooms to meet their learners' present and future digital competency needs. Through sufficient training, opportunities would be created for teachers to gain the depth of knowledge needed to develop both learners' content knowledge and their critical thinking processes through the use of ICTs in classrooms. Teachers' professional development training is essential in equipping teachers with strong ICT skills, which in turn are essential in preparing learners for taking up opportunities in the 4IR information society.

The study findings revealed a general lack of technical skills and support for the participant teachers in their attempts to use ICTs in their teaching, one of the major factors limiting these teachers' use of ICTs in their teaching. This creates the possibility of this same problem manifesting among learners. Therefore, in working towards meeting the demands of the 4IR, I recommend that the present curriculum focus on

equipping both teachers and learners with technical skills. A suggestion would be that technical skills and/or computer skills could be part of an existing subject curriculum, such as Life Skills (grades 1 – 6) and Life Orientation (grade 7) offered at primary school level.

5.3 Limitations of the study

I anticipated certain challenges arising in the conducting of this research. I foresaw that these could be wide-ranging, from time constraints, to access to the site, financial constraints, and the difficulty of generalising from the findings (Cohen et al., 2007; Creswell & Guetterman, 2019; Gilbert, 2008). For this study, four limitations were identified: the time frame, gatekeepers' trust, generalisation of the findings, and secondary sources.

5.3.1 Time frame

It was challenging for me to adhere to the time frame/plan, particularly within the time period allocated to the one-on-one interview sessions, while at the same time allowing interviewees some flexibility. This resulted from some participants speaking for longer than the allocated time when responding to the interview questions. Creswell and Guetterman (2019) emphasise that researchers should be realistic about the amount of time they anticipate for each data collection session, and should communicate this time frame clearly to participants. To prevent such incidents for future studies, I am mindful that I should, as far as possible, regularly inform participants of the interview schedules and the time allocated for these, and assign a reasonable time frame for each interview session, as well as one which judiciously balances time constraints and flexibility.

5.3.2 Gatekeepers' trust

A gatekeeper could be an official or unofficial person who provides access to a site and assists researchers in locating participants (Creswell & Guetterman, 2019:211). Winning the gatekeepers' trust and support was another limitation of this study. When I approached some schools, I had the clear impression that these schools were uncomfortable with allowing me to conduct research at their schools. I sent a letter of request to conduct my research to 15 schools. However, none of the schools responded to these emails. I then had to physically visit the schools and make

appointments with the principals. This whole time-consuming process had to be undertaken before two schools agreed to my using their schools as research sites, and only after much convincing. According to the definition of Creswell and Guetterman (2019), school principals and departmental heads were identified as gatekeepers. To identify participants, the research required the assistance of the departmental head at each school. However, on one occasion one of the departmental heads at one of the two schools was nowhere to be found. This seriously delayed the data collection process.

In the case of the sampling process, the potential participants also hindered my access to the site. There were practical reasons for this. Several of the selected teachers to be interviewed did not have time to spend with me, and some participants kept postponing interviews.

5.3.3 Generalisation of the findings

The use of case studies in research has its own limitations related to the lack of generalisability of findings (Cohen et al., 2007). Cohen et al. (2007) define generalisability as the belief that a research study's findings may also be used in other similar situations. When undertaking the current study, I was mindful that case studies take place in a specific situation in time and space, and most importantly, the size of the sample is smaller compared to that in other research designs like phenomenology and narrative research (Okeke, 2015:220).

For this reason, the findings of this study can only be generalised to theoretical position and/or other similar contexts such as other relatively ‘disadvantaged’ public primary schools in similar socio-economic contexts. This means that they cannot be generalised to a range of different education contexts. In this study, I chose a case study research design in order to be able to gain a deeper understanding of the experiences and perceptions of a small group of sampled public primary school teachers regarding ICT integration in their teaching.

5.3.4 Secondary sources

The fact that learners were not part of the sample for this study could be said to represent another limitation. Learners were excluded from participating in this study as my interest was limited to studying teachers' experiences and perceptions. However, some information about learners' ICT experiences was obtained indirectly through the participating teachers' perceptions of these. In this sense, the teachers became secondary sources since they were asked to give their views or perceptions of other people's experiences. A secondary source, according to Cohen et al. (2007) would thus be the person who describes the event but did not participate in the event). If learners were to be interviewed about their own 'ICT experiences' in their learning, they would obviously be considered primary sources as they would have first-hand experiences of their own learning. In addition, Cohen et al. (2007) define a primary source as one in which something has been directly and concretely linked with the event. Hence one of the 'events' being described by teachers, in this case, was their learners' experiences. This limitation would have rendered this research study invalid since the participating teachers could not be said to have first-hand knowledge of their learners' experiences. Therefore, there was a high possibility that teachers would be subjective and biased/dishonest in answering questions about how their learners actually felt, or what they experienced, when learning with ICTs. To counteract this possible limitation, I attempted, to the best of my ability, to explain to the participants the importance of the truthfulness and trustworthiness (and objectivity) of their responses to interview questions.

5.4 Recommendations for further research

This study looked at teachers' and principals' perspectives of teachers' access and use of ICTs in the two selected public primary schools. Given that the sample size of this study was small, and included only two schools and ten participants (eight teachers and two principals), there could be a need for an in-depth empirical study of a larger sample and one conducted in a different context, that also explores teachers' capabilities concerning ICT use. A different context may produce different results. It is recommended that future research look at larger sample sizes, and perhaps at a high school context, to ascertain whether there would be similar or different findings to those of the current study. Or a study could be undertaken that specifically looks at

the development and importance of communities of practice between teachers that focus on the collaborative development of their skills and confidence in using ICTs in their teaching when delivering curriculum content to their learners.

5.5 Summary

This chapter drew conclusions from the analysis of the findings outlined in chapter 4. The findings responded to the two subsidiary research questions and provided insights into the conversion factors that could lead to the enabling and/or deprivation of the capabilities of participant teachers. These were capabilities concerning participating teachers' ICT use in two public primary schools in Khayelitsha, Western Cape. While some conversion factors, such as community of practice and university training skills were found to have enabled the participating teachers' capabilities, most of the conversion factors appeared to have had a limiting effect on teachers' capabilities, hindering them from using ICTs confidently, freely, or wholly effectively in their teaching. The findings give a clear indication that the level of ICT use for teaching in a small sample of public primary schools in the Western Cape is relatively low for a variety of reasons. Recommendations were that the several external and internal factors hindering teachers in their effective use of ICTs in their teaching and for learning, need to be urgently addressed if learners are to meet the demands of the 4IR.

LIST OF REFERENCES

Adagideli, O.E. & Ozsevgec, L.C. 2019. Views of primary school teachers about Smart Board: A Sample from Ağrı. *The Eurasia Proceedings of Educational and Social Sciences,* 14:128-133.

Adu, P. 2019. *A step-by-step guide to qualitative data coding*. Abingdon: Routledge.

Afshari, M., Bakar, K.A., Luan, W.S., Samah, B.A. & Fooi, F.S. 2008. School leadership and information communication technology. *Turkish Online Journal of Educational Technology – TOJET*, 7(4):82-91.

Afshari, M., Ghavifekr, S., Siraj, S. & Ab Samad, R.S. 2012. Transformational leadership role of principals in implementing informational and communication technologies in schools. *Life Science Journal – Acta Zhengzhou University Overseas Edition*, 9(1):281-284.

Alampay, E. 2003. Using the capabilities approach to analyze access to information and communication technologies (ICTs) by the poor. Paper presented at the National Academy of Science and Technology (NAST), Philippines, 9–10 July.

Alampay, E. 2006. Beyond access to ICTs: Measuring capabilities in the information society. *International Journal of Education and Development using Information and Communication Technology*, 2(3):4–22.

Al-Samarraie, H. 2019. A scoping review of videoconferencing systems in higher education: Learning paradigms, opportunities, and challenges. *International Review of Research in Open and Distributed Learning*, 20(3).

Anil, A. & Jayakumar, M.S. 2019, March 8. ICT integration in education: The case of secondary schools in Kerala. *International Journal of Social Sciences*, 4(3):1948-1962.

Bakkabulindi, F. 2015. Positivism and interpretivism: Distinguishing characteristics, criteria and methodology. In C. Okeke & M. Van Wyk (Eds.), *Educational research: An African approach*. Cape Town: Oxford University Press:19-38.

Bandura, A. & Walters, R.H. 1977. *Social learning theory* (Vol. 1). Englewood Cliffs, NJ: Prentice-Hall.

Bas, G. 2017. Perceptions of teachers about information and communication technologies (ICT): A study of metaphor analysis. *Contemporary Educational Technology*, 8(4):319–337.

Basit, T. 2003. Manual or electronic? The role of coding in qualitative data analysis. *Educational Research*, 45(2): 143–154.

Benjamin, J. 2019. e-Mentoring as a platform for the development of novice teacher competencies at a rural school in the Western Cape. MEd thesis, Cape Peninsula University of Technology, Cape Town.

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

Bladergroen, M., Chigona, W., Bytheway, A., Cox, S. Dumas, C. & Van Zyl, I. 2012. Educator discourses on ICT in education: A critical analysis. *International Journal of Education and Development using Information and Communication Technology*, 8(2):107–119.

Bladergroen, M.C. & Chigona, W. 2019. Managing Information and Communication Technology in South African classrooms: Pre-service teachers' experiences. *Africa Education Review*, 16(3):22–35. https://doi.org/10.1080/18146627.2016.1224589

Blaikie, N. & Priest, J. 2017. *Social research: Paradigms in action*. Hoboken, NJ: John Wiley & Sons.

Blessing, L.T.M. & Chakrabarti, A. 2009. *DRM: A design research methodology*. Berlin: Springer Science & Business Media.

Bozdogan, D. & Ozen, R. 2014. Use of ICT technologies and factors affecting pre-service ELT teachers' perceived ICT self-efficacy. *Turkish Online Journal of Educational Technology*, 13(2):186–196.

Brand South Africa. 2015. *South Africa's Western Cape invests in e-learning*. Retrieved from https://www.brandsouthafrica.com/governance/education/elearning-230215 [Accessed 15 March 2019].

Brown, J.D. 2001. *Using surveys in language programs*. Cambridge: Cambridge University Press.

Bryman, A. 2008. *Social research methods.* Third edition. New York, NY: Oxford University Press.

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

Businesstech. 2019. This is what happens when load shedding hits during a matric exam. Retrieved from https://businesstech.co.za/news/government/346900/this-is-what-happens-when-load-shedding-hits-during-a-matric-exam/ [Accessed 18 July 2020].

Buzuzi, A.N. 2020. Mathematics teachers' integration of technology for pedagogical use in a less affluent high school in the Western Cape. MEd thesis, Cape Peninsula University of Technology, Cape Town.

Chigona, A. & Chigona, W. 2010. An investigation of factors affecting the use of ICT for teaching in the Western Cape schools. *ECIS 2010 Proceedings*:61.

Chigona, A. 2015. Pedagogical shift in the twenty-first century: Preparing teachers to teach with new technologies. *African Education Review*, 12(3):478–492. Retrieved from http://hdl.handle.net/11189/4531 [Accessed 28 February 2019].

Chigona, A., Chigona, W. & Davids, Z. 2010. Motivating factors: Educators' use of ICT in schools in disadvantaged areas in the Western Cape. *Paper presented at the International Conference on Information Management and Evaluation*, University of Cape Town, Cape Town, 25-26 March.

Chigona, A., Chigona, W. & Davids, Z. 2014. Educators' motivation on integration of ICTs into pedagogy: A case of disadvantaged areas. *South African Journal of Education*, 34(3).

Chilisa, B. & Preece, J. 2005. *Research methods for adult educators in Africa*. Cape Town: Pearson.

Chisango, G. & Lesame, C. 2019. Exploring accessibility to information and communication technology (ICT) at disadvantaged secondary schools in Gauteng Province – South Africa. *11th International Conference on Education and New Learning Technologies*: 1-3 July. Palma, Spain.

Chitiyo, G., Taukeni, S. & Chitiyo, M. 2015. The observation method. In C. Okeke & M. van Wyk (Eds.), *Educational research: An African approach*. Cape Town: Oxford University Press:280-294.

Choung, M.E. & Manamela, M.G. 2018. Digital Inequality in Rural and Urban settings: Challenges of Education and Information in South African Youth Context. *Bangladesh e-Journal of Sociology*, 15(2):186-197. Retrieved from http://www.bangladeshsociology.org/BEJS15.2.pdf#page=186

Cohen, L., Manion, L. & Morrison, K. 2007. *Research methods in education.* 6th ed. New York: Routledge.

Correia, A.P., Liu, C. & Xu, F. 2020. Evaluating videoconferencing systems for the quality of the educational experience. *Distance Education*, 41(4):429-452.

Creswell, J.W. & Guetterman, T.C. 2019. *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. 6th ed. New York: Pearson.

Creswell, J.W. 2014. *Research design: Qualitative, quantitative and mixed methods approaches*. 4th ed. Thousand Oaks, CA: Sage.

De Silva, C.R. 2015. Technology integration: Tracing in-service primary teachers' technological, pedagogical and content knowledge development. PhD thesis. Cape Peninsula University of Technology, Cape Town.

Demirci, A., Karaburun, A. & Kılar, H. 2013. Using Google Earth as an educational tool in secondary school geography lessons. *International Research in Geographical and Environmental Education*, 22(4):277-290. https://doi.org/10.1080/10382046.2013.846700

Department of Education [DoE]. 2004. Draft White Paper on e-Education: Transforming learning and teaching through ICT. Pretoria: Government Printers. Retrieved from http://www.gov.za/sites/www.gov.za/files/26734_1.pdf

Department of Education [DoE]. 2007. Guidelines for Teacher Training and Professional Development in ICT. Pretoria: Government Printers.

Donnelly, T. & Arora, K. 2015. *Research methods: The essential knowledge base*. Boston, MA: Cengage Learning.

Dube, B.A., Nhamo, E. & Magonde, S. 2018. Factors affecting ICT integration in the teaching and learning of physical education in South Africa: A case of Johannesburg East Cluster primary schools in the Gauteng Province. *International Journal of Sport, Exercise and Health Research,* 2(1):88–92.

Duck, S. & McMahan, S. 2016*. Essential of publishing qualitative research: Qualitative essentials*. Abingdon: Routledge.

Dzansi, D.Y. & Amedzo, E.K. 2014. Integrating ICT into rural South African schools: Possible solutions for challenges. *International Journal of Educational Sciences*, 6(2):341–348. doi: 10.1080/09751122.2014.11890145

Embong, A.M., Azelin, M.N., Mohd Hashim, H. & Shaari, Z. 2012. E-Books as Textbooks in the Classroom. *Procedia - Social and Behavioral Sciences,* 47:1802-1809.

Eskom. n.d. What is load shedding? Retrieved from http://loadshedding.eskom.co.za/LoadShedding/Description [Accessed July 2020].

Farjon, D., Smits, A. & Voogt, J. 2019. Technology integration of pre-service teachers explained by attitudes and beliefs, competency, access, and experience. *Computers & Education*, 130(March):81-93.

Farnsworth, V., Kleanthous, I. & Wenger-Trayner, E. 2016. Communities of practice as a social theory of learning: A conversation with Etienne Wenger. *British Journal of Educational Studies*, 64(2):139-160.

Fergusson, J., Gibbs, D., Gosper, M. & Philip, R. 2009. E-Learning in schools: Making successful connections. In J. Zajda, & D. Gibbs (Eds.), *Comparative information technology: Languages, societies and the internet.* Berlin: Springer Science & Business Media:33-48.

Feza, N. 2015. Qualitative dada analysis. In C. Okeke & M. van Wyk (Eds.), *Educational research: An African approach.* Cape Town: Oxford University Press:458-475.

Flick, U. 2008. Design and process in qualitative research. In U. Flick, E. von Kardoff & I. Steinke (Eds.), *A companion to qualitative research*. Thousand Oaks, CA: Sage:146–152.

Fortner, K., Normore, A.H. & Brooks, J.S. 2018. Digital equity and its role in the digital divide. In A.H. Normore & A.I. Lahera (Eds.), *Crossing the bridge of the digital divide: A walk with global leaders.* Charlotte, NC: Information Age Publishing.

Friese, S. 2014. *Qualitative data analysis with ATLAS.ti*. Thousand Oaks, CA: Sage.

Galletta, A. 2013*. Mastering the semi-structured interview and beyond: From research design to analysis and publication*. New York, NY: NYU Press.

Gay, L.R. 1992. *Educational research*. New York, NY: Maxwell Macmillan International.

Gilbert, N. 2008. Research, theory and method. In N. Gilbert (Eds.), *Researching social life*. 3rd ed. Thousand Oaks, CA: Sage:21-40.

Graham, M.A., Stols, G. & Kapp, R. 2020. Teacher practice and integration of ICT: Why are or aren't South African teachers using ICTs in their classrooms? *International Journal of Instruction*, 13(2):749-766.

Graves, K.E. & Bowers, A.J. 2018. Toward a typology of technology-using teachers in the "New Digital Divide": A latent class analysis of the NCES Fast Response Survey System teachers' use of educational technology in US public schools, 2009 (FRSS 95). *Teachers College Record*, 120(8, August):1-42. Retrieved from http://www.tcrecord.org/Content.asp?contentid=22277

Gray, B. 2005. Informal learning in an online community of practice. *International Journal of E-Learning & Distance Education*, 19(1).

Grbich, C. 2012. *Qualitative data analysis: An introduction*. Thousand Oaks, CA: Sage.

Grunfeld, H., Hak, S., & Pin, T. (2011). Understanding benefits realisation of iREACH from a capability approach perspective. *Ethics and Information Technology*, 13(2), 151-172.

Gumbo, M. 2015. The pilot study. In C. Okeke, & M. van Wyk (Eds.), *Educational research: An African approach*. Cape Town: Oxford University Press:371-387.

Gunduz, H.B. 2010. Digital divide in Turkish primary schools: Sakarya sample. *Turkish Online Journal of Educational Technology-TOJET*, 9(1):43-53.

Gunzo, F.T. 2020. Teachers' perceptions, experiences and challenges related to using ICTs in teaching Social Sciences in marginalised classrooms in the Eastern Cape Province, South Africa. PhD thesis, Rhodes University, Grahamstown.

Guthrie, G. 2010. *Basic research methods: An entry to Social Science*. Thousand Oaks, CA: Sage.

Hammersley, M. 2012*. What is qualitative research?* London: A&C Black.

Hardman, J. (2005). An exploratory case study of computer use in a primary school mathematics classroom: New technology, new pedagogy? *Perspectives in Education*, 23(4):99-111.

Hopper, S.B. 2014. Bringing the world to the classroom through videoconferencing and project-based learning. *TechTrends*, 58(3):78-89.

Hung, D. & Nichani, M.R. 2002. Bringing communities of practice into schools: Implications for instructional technologies from Vygotskian perspectives. *International Journal of Instructional Media*, 29(2):171.

Indrasari, N. 2015. Improving students' writing skill of narrative texts by using short videos (A Classroom Action Research at the Eighth Grade Students of SMP Negeri 2 Temanggung in the Academic Year of 2009/2010). *English Education: Jurnal Tadris Bahasa Inggris*, 7(1):42-63.

International ICT Literacy Panel. 2002. Digital transformation: A framework for ICT literacy. *Educational Testing Service*. Retrieved from https://www.ets.org/Media/Research/pdf/ICTREPORT.pdf

İstifçi, İ., Keser, A.D., Serpil, R., Önal, M.A., Alan, B. & Türkyılmaz, S. 2018. An Analysis of Teachers' and Students' Perceptions on the use of Smart Boards in Foreign Language Classrooms. *Turkish Online Journal of Language Teaching*, 2(3):83-110.

Johnson, D. 2014. *Reading, Writing, and Literacy 2.0: Teaching with Online Texts, Tools, and Resources, K-8*. New York: Teachers College Press.

Johnston, T. 2015. Training teachers to bridge the digital divide. *The William & Mary Educational Review*, 3(2):14-17. https://scholarworks.wm.edu/wmer/vol3/iss2/4

Jung, M.Y. 2013. Videoconferencing improves students' language learning in the EFL classroom. *TESOL Journal*, 4(4):743-751. https://doi.org/10.1002/tesj.112

Kabooha, R. & Elyas, T. 2015. The impacts of using YouTube videos on learning vocabulary in Saudi EFL classrooms. *The 8th annual International Conference of Education, Research and Innovation*. Seville, Spain. November:3525-3531.

Kerski, J.J. 2011. Sleepwalking into the future: The case for spatial analysis throughout education. In T. Jekel, A. Koller, K. Donert & R. Vogler (Eds.),

Learning with GI: Implementing digital earth in education. Berlin: Wichmann:2-11.

Khosla, R., Hasan, S., Samuels, J. & Mulyawan, B. 2002. *Removing Unfreedoms: Citizens as Agents of Change*. Brussels: United Nations Habitat Program Liaison Office.

Kozma, R.B. 2011. A framework for ICT policies to transform education. In R.B. Kozma & S. Isaacs (Eds.), *Transforming education: The power of ICT policies*. Paris: UNESCO.

Kuhumba, S. 2018. Amartya Sen's capability approach as theoretical foundation of human development. *Journal of Sociology and Development*, 1(1):127-147.

Lamb, A. & Johnson, L. 2010. Virtual expeditions: Google Earth, GIS, and geovisualization technologies in teaching and learning. *ProQuest Central,* 37(3):81-85.

Landicho, C.J.B. 2020. Senior High School students' perceptions and attitudes toward the use of Google Maps as instructional tool in Earth Science. *The Normal Lights,* 14(1):141-168.

Lave, J. & Wenger, E. 1991. *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.

Leavy, P. 2017. *Research Design: Quantitative, qualitative, mixed methods, arts-based, and community-based participatory research approaches*. New York: Guilford Publications.

Lewis, S. 2004. *Using ICT to Enhance Teaching and Learning in Chemistry*. London: Royal Society of Chemistry.

Li, S., Yamaguchi, S. & Takada, J. 2018. Understanding factors affecting primary school teachers' use of ICT for student-centered education in Mongolia. *International Journal of Education and Development using Information and Communication Technology*, 14(1):103–117.

Lumadi, M.W. 2015. The logic of sampling. In C. Okeke & M. van Wyk (Eds.), *Educational research: An African approach*. Cape Town: Oxford University Press:224-241.

Maceviciute, E. & Wilson, T.D. 2018. Digital means for reducing digital inequality: Literature review. *Informing science: The International Journal of an Emerging Transdiscipline*, 21:269-287. https://doi.org/10.28945/4117

Madoda, P. 2018. The adoption and use of information and communication technologies in private high schools in the Western Cape. MEd thesis. Cape Peninsula University of Technology, Cape Town.

Madon, S. 2004. Evaluating the developmental impact of e-governance initiatives: An exploratory framework. *The Electronic Journal on Information Systems in Developing Countries*, 20(5):1–13. doi: 1002/j.1681-4835.2004.tb00132.x

Makwela, V.N. 2019. Paperless classroom experiences in Grade 7 Science in township schools. MEd thesis. University of Pretoria, Pretoria.

Marshall, C. & Rossman, G.B. 2010. *Qualitative research design*. Thousand Oaks, CA: Sage.

Mathipa, E.R. & Mukhari, S. 2014. Teacher factors influencing the use of ICT in teaching and learning in South African urban schools. *Mediterranean Journal of Social Sciences,* 5(23):1213–1220.

Mdlongwa, T. 2012. *Information and communication technology as a means of enhancing education in schools in South Africa: Challenges, benefits and recommendations*. Policy brief no. 80. Pretoria: Africa Institute of South Africa.

Mestry, R. 2017. Empowering principals to lead and manage public schools effectively in the 21st century. *South African Journal of Education*, 37(1):1-11.

Miles, M.B., Huberman, A.M. & Saldana, J. 2019. *Qualitative data analysis: A methods sourcebook*. Thousand Oaks, CA: Sage.

Mooketsi, B.E. & Chigona, W. 2016. The impact of contextual factors on the implementation of government e-Strategy in previously disadvantaged areas in

Cape Town. *The Electronic Journal of Information Systems in Developing Countries*, 73(1):1-20.

Mugani, P. 2020. The pedagogical impact of Smart Classrooms on teaching and learning of grade 11 in the Tshwane South District. MEd thesis. University of South Africa, Pretoria.

Mukhari, S.S. 2016. Teachers' experience of information and communication technology use for teaching and learning in urban schools. PhD thesis. University of South Africa, Pretoria.

Mwapwele, S.D., Marais, M., Dlamini, S. & Van Biljon, J. 2019. Teachers' ICT adoption in South African rural schools: A Study of Technology Readiness and Implications for the South Africa connect broadband policy. *The African Journal of Information and Communication*, 24:1-21.

Newton, L. 2012. Management and the use of ICT in subject teaching. In I.D. Selwood, A. Fung & C.D. O'Mahoney (Eds.), *Management of education in the information age: The role of ICT.* New York, NY: Springer:11–20.

Nordlof, C., Hallstrom, J. & Host, G.E. 2019. Self-efficacy or context dependency? Exploring teachers' perceptions of and attitudes towards technology education. *International Journal of Technology and Design Education*, 29(1):23-141.

Nudelman, Z., Moodley, D. & Berman, S. 2018. Using Bayesian networks and machine learning to predict computer science network. In S. Kabanda, H. Suleman & S. Gruner (Eds.), *ICT Education: 47th Annual Conference of the Southern African Computer Lecturers' Association, SACLA, Gordon's Bay, South Africa, 18–20 June, Revised Selected Papers.* Johannesburg: Springer.

Nussbaum, M. 2000. Women's capabilities and social justice. *Journal of Human Development*, 1(2):219-247.

Nussbaum, M. 2003. Capabilities as fundamental entitlements: Sen and social justice. *Feminist economics*, 9(2-3):33-59.

Nussbaum, M. 2007. Human Rights and Human Capabilities. *Harvard Human Rights Journal*, 20:21–24

Ogbonnaya, U.I. & Awuah, F.K. 2019. Quintile ranking of schools in South Africa and learners' achievement in probability. *Statistics Education Research Journal*, 18(1):106-119. Retrieved from http://www.stat.auckland.ac.nz/serj [Accessed 17 January 2020].

Ojo, O.A. & Adu, E.O. 2018. The effectiveness of information and communication technologies (ICTs) in teaching and learning in high schools in Eastern Cape Province. *South African Journal of Education*, 38(2):1–11. doi: 10.15700/saje.v3ns2a1483

Okeke, C. 2015. Achieving qualitative validity, reliability and generalisation. In C. Okeke & M. van Wyk (Eds.), *Educational research: An African approach*. Cape Town: Oxford University Press:207-223.

Oxford English Dictionary (3rd ed). 2010. Oxford: Oxford University Press.

Pan, Y. 2011. *Illustrated science and technology*. Taipei: Shu Quan Press.

Pandey, J. 2018. Deductive approach to content analysis. In M. Gupta, M. Shaheen, & K.P. Reddy (Eds.), *Qualitative techniques for workplace data analysis*. Hershey: IGI Global:145-169.

Ragnedda, M. 2017. *The third digital divide: A Weberian approach to digital inequalities*. Abingdon: Taylor & Francis.

Regan, K., Evmenova, A.S., Sacco, D., Schwartzer, J., Chirinos, D.S. & Hughes, M.D. 2019. Teacher perceptions of integrating technology in writing. *Technology, Pedagogy and Education*, 28(1):1-19. https://doi.org/10.1080/1475939X.2018.1561507

Reich, J. & Daccord, T. 2015. *Best Ideas for Teaching with Technology: A Practical Guide for Teachers, by Teachers*. New York: Routledge.

Republic of South Africa [RSA]. 2004. White Paper on e-Education for South Africa. Notice 1869 of 2004. *Government Gazette*, 3(26734), 26 August.

Republic of South African [RSA]. 2015. *Media alert: Free high-speed internet at all Western Cape schools by end 2016*. Retrieved from https://www.gov.za/speeches/free-high-speed-internet-all-western-cape-schools-end-2016-elearning-game-changer-8-sep [Accessed 28 February 2019].

Rijo, D. 2020. Google Maps now used by over 1 billion people every month. Retrieved from https://ppc.land/google-maps-now-used-by-over-1-billion-people-every-month/ [Accessed 14 October 2020].

Ritvanen, T., Louhevaara, V., Helin, P., Vaisanen, S. & Hanninen, O. 2006. Responses of the autonomic nervous system during periods of perceived high and low work stress in younger and older female teachers. *Applied Ergonomics*, 37(3):311-318.

Ritzhaupt, A.D., Liu, F., Dawson, K. & Barron, A.E. 2013. Differences in student information and communication technology literacy based on socio-economic status, ethnicity, and gender: Evidence of a digital divide in Florida schools. *Journal of Research on Technology in Education*, 45(4):291-307.

Robson, M. 2011. *Real world research*. Third edition. Chichester: Wiley.

Robyens, I. (2011). *The capability approach*. Stanford.

Robyens, I. 2005. The capability approach: a theoretical survey. *Journal of human development*, 6(1):93-117.

Robyens, I. 2011. The capability approach. In S. Olsaretti (Eds.), *The Oxford Handbook of Distributive Justice*. Oxford: Oxford University Press.

Rowsell, J., Morrell, E. & Alvermann, D.E. 2017. Confronting the digital divide: Debunking brave new world discourses. *The Reading Teacher*, 71(2):157-165.

Sadeck, O.G. 2016. An exploration of e-learning practices of teachers at selected schools in the Western Cape. MEd thesis. Cape Peninsula University of Technology, Cape Town.

Sahin-Kizil, A. 2014. Blended instruction for EFL learners: Engagement, learning and course satisfaction. *Jalt Call Journal*, *10*(3):175-188.

Salam, S., Zeng, J., Pathen, Z.H., Latif, Z. & Shaheen, A. 2017. Impediments to the integration of ICT in public schools of contemporary societies: A review of literature. *Journal of Information Processing Systems*, 14(1):252–269. doi: 10.3745/JIPS.04.0062

Saldana, J. 2015. *The coding manual for qualitative researchers*. 3rd ed. Thousand Oaks, CA: Sage.

Salehi, H. & Salehi, Z. 2012. Challenges for using ICT in education: Teachers' insights. *International Journal of e-Education, e-Business, e-Management and e-Learning*, 2(1):40–43.

Sankey, M., Birch, D. & Gardiner, M. 2010. Engaging students through multimodal learning environments: The journey continues. In *Proceedings ASCILITE 2010: 27th annual conference of the Australasian Society for Computers in Learning in Tertiary Education: Curriculum, technology and transformation for an unknown future*. University of Queensland:852-863.

Schmidt, M.J. & Mestry, R. 2019. Through the looking glass: An intersectional lens of South African education policy. In O. Hankivsky & J.S. Jordan-Zachery (Eds.), *The Palgrave Handbook of Intersectionality in Public Policy*. Cham: Palgrave Macmillan:347-365.

Sen, A. 1981. *Poverty and Famines: An essay on entitlement and deprivation*. Oxford: Clarendon Press.

Sen, A. 1985. Well-being, agency and freedom: The Dewey Lectures. *Journal of Philosophy*, 82(4):169–221.

Sen, A. 1987. *Standard of living: The Tanner Lectures*. Cambridge: Cambridge University Press.

Sen, A. 1992. *Inequality reexamined*. Oxford: Oxford University Press.

Sen, A. 1995. *Inequality reexamin*ed. Cambridge, MA: Harvard University Press.

Sen, A. 1999. *Development as freedom*. Oxford: Oxford University Press.

Sen, A. 2000. Social exclusion concept, application and scrutiny. *Social Development Papers*. No. 1, Asia Development Bank, Tokyo.

Sotuku, N. & Duku, S. 2015. Ethics in human science research. In C. Okeke & M. van Wyk (Eds.), *Educational research: An African approach*. Cape Town: Oxford University Press:112-130.

Sunday Times. 2020. Smart Boards and computer classes may be affected by load-shedding, but teaching continues. Retrieved from https://www.timeslive.co.za/news/south-africa/2020-02-04-smartboards-and-computer-classes-may-be-affected-by-load-shedding-but-teaching-continues/ [Accessed 18 July 2020].

Suryani, A. 2010. ICT in education: Its benefits, difficulties, and organizational Issues. *Jurnal Sosial Humaniora*, 3(1):106–123.

Thomas, G. 2011. *How to do your case study: A guide for students & researchers*. Thousand Oaks, CA: Sage.

Thomas, G. 2017. *Doing research*. New York: Macmillan International Higher Education.

Thornberg, R. & Charmaz, K. 2013. Grounded theory and theoretical coding. In U. Flick (Ed.), *The SAGE Handbook of Qualitative Data Analysis*. Thousand Oaks, CA: Sage:153-169.

Tiba, C.A. 2018. The ability of newly qualified teachers to integrate technology into their pedagogical practice. PhD thesis, Cape Peninsula University of Technology, Cape Town.

Tight, M. 2017. *Understanding case study research: Small scale research with meaning*. Thousand Oaks, CA: Sage.

Tsayang, G., Batane, T. & Majuta, A. 2020. The impact of interactive Smart Boards on students' learning in secondary schools in Botswana: A students' perspective.

International Journal of Education and Development using Information and Communication Technology, 16(2):22-39.

Umugiraneza, O., Bansilal, S. & North, D. 2018. Exploring teachers' use of technology in teaching and learning Mathematics in KwaZulu-Natal schools. *Pythagoras,* 39(1):1-13. doi: 10.4102/pythagoras.v39i1.342

Uzunboylu, H. & Tuncay, N. 2010. Divergence of digital world of teachers. *Educational Technology & Societ*y, 13(1, January):186-194.

Vajargah, K.F. & Saadattlab, A. 2014. A feasibility study of using ICT in Iranian secondary schools: The case of Tehran province. *The Turkish Online Journal of Educational Technology,* 13(3):1–11.

Van den Beemt, A. & Diepstraten, I. 2016. Teacher perspectives on ICT: A learning ecology approach. *Computers & Education,* 92:161–170.

Van der Poll, A.E. 2014. Multiple symbolism of information and communication technology (ICT) in academia: A case study of Technical Vocational Education and Training institutions in Cape Town, South Africa. MEd thesis. Cape Peninsula University of Technology, Cape Town.

Van Dijk, J.A.G.M. 2005. *The network society: Social aspects of new media*. Thousand Oaks, CA: Sage.

Van Wyk, C. 2012. Survey of ICT in schools in South Africa. Public expenditure analysis for the Department of Basic Education: Report 8. Stellenbosch: University of Stellenbosch.

Van Wyk, M. & Taole, M. 2015. Research design. In C. Okeke & M. van Wyk (Eds.), *Educational research: An African approach*. Cape Town: Oxford University Press:164-184.

Van Zyl, I. & Sabiescu, A. 2016. Symbolic narratives and the role of meaning: Encountering technology in South African primary education. *The African Journal of Information and Communication*, 18:95–115. doi: 10.23962/10539/21654

Waghid, Y., Waghid, F. & Waghid, Z. 2016. *Educational technology and pedagogic encounters: Democratic education in potentiality*. New York, NY: Springer.

Waghid, Z. & Waghid, F. 2018. [Re]examining the role of technology in education through a deliberative decision-making approach: In the quest towards democratic education in South African schools. In Y. Waghid & N. Davids (Eds.), *African democratic citizenship education revisited*. New York: Palgrave Macmillan:133-156.

Waghid, Z. 2019. Examining an education for decoloniality through a Senian notion of democratic education: Towards cultivating social justice in higher education. In C.H. Manthula & Y. Waghid (Eds.). *Education for Decoloniality and Decolonisation in Africa*. New York: Palgrave Macmillan:155-173.

Walker, M. & McLean, M. 2013. *Professional Education, Capabilities and the Public Good: The role of universities in promoting human development*. New York: Routledge.

Walker, M. & Unterhalter, E. 2007. The Capability Approach: Its potential for work in education. In M. Walker & E. Unterhalter (Eds.), *Amartya Sen's Capability Approach and Social Justice in Education, 1-18*. New York: Palgrave Macmillan.

Walker, M. 2010. Capabilities and social justice in education. In H.U. Otto & H. Ziegler (Eds.), *Education, welfare and the capabilities approach: A European perspective*. Opladen & Farmington Hills: Barbara Budrich.

Waller, V., Farquharson, K. & Dempsey, D. 2015. *Qualitative social research: Contemporary methods for the digital age*. Thousand Oaks, CA: Sage.

Wang, L., Lu, J. & Lee, K. 2011. A study on elementary students' preferences for fish image revealed on interfaces of ocean e-books. *Journal of CAGST*, 485-499.

WCG, see Western Cape Government.

Wenger, E. 1999. *Communities of practice: Learning, meaning, and identity.* Cambridge: Cambridge University Press.

Wenger, E., 1998. Communities of practice: Learning as a social system. *Systems thinker*, 9(5):2-3.

Wenger, E., McDermott, R.A. & Snyder, W. 2002. *Cultivating Communities of Practice: A Guide to Managing Knowledge*. Boston, MA: Harvard Business Press.

Western Cape Education Department [WCED]. n.d. *The ICT adoption strategy: ICT visibility.* Retrieved from https://wcedeteacher.wixsite.com/adoption-online/copy-of-start-course [Accessed 26 August 2020].

Western Cape Government [WCG]. 2014. *Khanya Project: Western Education Department*. Retrieved from https://www.westerncape.gov.za/dept/department-premier/documents/public_info/F/19802?toc_page=9 [Accessed 16 February 2019].

Western Cape Government [WCG]. 2019. *Technology in classrooms: What are Smart Classrooms?* Retrieved from https://www.westerncape.gov.za/general-publication/technology-classrooms-what-are-smart-classrooms [Accessed 30 April 2020].

Western Cape Government [WCG]. n.d. WCG Game Changers. Retrieved from https://www.westerncape.gov.za/game-changers/game-changers/elearning [Accessed 15 March 2019].

Williams, J., Maddock, L. & Carruthers, S. 2018. *The Griffith Learning and Teaching Capabilities Framework*. Brisbane: Griffith University.

Willis, J.W. 2007. *Foundations of qualitative research: Interpretive and critical approaches*. Thousand Oaks, CA: Sage.

Yin, R.K. 2009. *Case study research: Design and methods*. Thousand Oaks, CA: Sage.

Yin, R.K. 2010. Collecting qualitative data. In B. Thyer (Ed.), *The handbook of social work research methods.* Thousand Oaks, CA: Sage.

Zheng, Y. & Walsham, G. 2008. Inequality of what? Social exclusion in the e-society as capability deprivation. *Information Technology & People*, 21(3):222–243.

APPENDICES

Appendix A

OBSERVATION PROTOCOL

TITLE**: THE CAPABILITIES NECESSARY FOR EFFECTIVE ICT INTEGRATION IN TEACHING IN TWO PUBLIC PRIMARY SCHOOLS IN KHAYELITSHA IN WESTERN CAPE.**

Teacher: Subject & topic:

School: Grade:

Date of class visit: Time start: time end:

This observation protocol is provided to facilitate the observation of teaching during an observation.

Before the observation:

- When and where is the session to be observed.
- Review your observer guidelines.
- Pre-observation dialogue between observer and teacher (i.e. the person being observed) should explore which criteria are appropriate for the circumstances of the session to be observed.

During the observation:

- Observer should complete the cover section of the Observation Score Sheet.
- Remind the teacher that not all indicators will be observable and a time of approximately 30 minutes will be needed to ask questions once the observation is complete.
- Aspects should be judged based primarily on what is observed in the classroom during the observation.

After the observation:

- Observer should provide feedback before further comments are made.
- Allow the teacher to describe the session and say how they felt it went before the observer makes any further comment. The teacher might reflect on whether the observation process had affected the session in any way, for example, in his/her behavior or that of the learners.

Class/lesson observations were mainly conducted to determine how the participating teachers integrate ICTs in their teaching?

O = Observed NO = Not Observed	O	NO	Comments
Teachers			
1. ICT available in the e-learning classroom;			
• Smart Board			
• Laptop			
• projector			
• visualizer			
• internet			
• E-beam			
2. Teacher uses ICT.			
3. Time used effectively to provide maximum access to ICT resources.			
4. ICT resources prepared and ready for the lesson.			
5. Teacher can solve ICT problems when they arise.			

6. ICT resources in good condition? Not Brocken/works as intended.			
7. Classroom in a good condition for ICT integration/environment does not interrupt the integration of ICTs.			
8. Teacher shows positive attitude towards ICT resources.			
9. Teacher uses technology for administration. E.g. learner register.			
Learner			
10. Learners remain fully engaged throughout the lesson when teacher uses ICT.			
Other comments			

Appendix B

INTERVIEW SCHEDULE FOR TEACHERS

The aim to determine the necessary capabilities do teachers need for effective ICT integration in teaching in two public primary schools in Khayelitsha in Western Cape.

School: _____ Grade: _____ Interview number: _____

Date: _____ Time: _____ Venue: _____

Interviewer: _____

Interviews were mainly conducted to investigate their experiences and perceptions concerning the use of ICTs in their Smart Classrooms

INSTRUCTIONS

- Thank you for agreeing to participate in the interview.
- The aim of the study is to examine teachers' experiences on using ICT for teaching.
- The interview will be taped-recorded, with your kind permission in order for me to grasp accurately what was said.
- The interview session consists 17 questions and will not last for more than 30 minutes.
- All the information you provide will be treated with the highest confidentiality and your name will not be exposed in the research.
- If you require any clarity on any of the questions, please feel free to ask.
- Please answer all questions as honestly as possible.

QUESTIONS:

---

1. To which type of ICT resources are you exposed in your class?
2. How often do you use these resources?
3. Are you comfortable teaching with technology? Why? Why not?
4. In your own opinion, how does the use of ICT enhance teaching and learning?
5. How do you get support from your school in terms of your skills' development?

6. Which ICT skills do you have?
7. How did you obtain your ICT skills?
8. Do you think that the training provided by WCED is sufficient enough to equip teachers with the necessary ICT skills?
9. What do you think could be the cause of insufficient and poor ICT skills among primary school teachers?
10. What are some of the challenges you and other teachers come across in your school with regard to the effective use of ICT in the classroom, and how are these addressed?
11. In your own opinion, do you think your school can do anything to overcome some of these challenges?
12. Do you feel that sufficient technology is provided by the Western Cape Education Department (WCED) to enhance teaching and learning?
13. In your own opinion, what would you suggest should be done to enhance integration of ICT in teaching and learning in public primary schools in the Western Cape?

Appendix C

INTERVIEW SCHEDULE (protocol) FOR PRINCIPALS

School: _____ Grade: _____ Interview number: _____

Date: _____ Time: _____ Venue: _____

Interviewer: _____

INSTRUCTIONS

- Thank you for agreeing to participate in the interview.
- The aim of the study is to examine teachers' experiences on using ICT for teaching.
- The interview will be taped-recorded, with your kind permission. The purpose of this is for me to be able to grasp accurately what was said.
- The interview session consists 14 questions and will not last for more than 20 minutes.
- All the information you provide will be treated with the utmost confidentiality.
- If you require any clarity on any of the questions, please feel free to ask.
- Please answer all questions as honestly as possible.

QUESTIONS:

---

1. To which type of ICT resources are your teachers exposed in their classes?
2. How often do you think teachers use these resources?
3. In your own opinion, how does the use of ICT enhance teaching and learning?
4. How do you support your teachers in terms of ICT skills' development?
5. Do you think that the training provided by WCED is sufficient to motivate teachers to use ICTs in their teaching?
6. What do you think could be the cause of insufficient and poor ICT use among your teachers?
7. Do you think your teachers are comfortable teaching with technology? Why? Why not?
8. What are some of the challenges teachers come across in your school with regard to the effective use of ICT in the classroom?

9. In your own opinion, do you think your school can do anything to overcome some of these challenges?
10. Do you feel that sufficient and appropriate technology is provided by the Western Cape Education Department (WCED) to enhance teaching and learning?
11. Apart from teaching, what do your teachers use ICT for?
12. In your own opinion, what would you suggest should be done to enhance integration of ICT in teaching and learning in public primary schools in the Western Cape?
14. Do you think the management or school policies affect teachers' decisions not to use ICT in their Smart Classrooms?

Appendix D

CONSENT FORM

18 February 2020

Title of research project

The capabilities necessary for effective ICT integration In teaching in two public primary schools in Khayelitsha in Western Cape.

I am **Lebohang Mahlo** and I am a student at the Cape Peninsula University of Technology (CPUT), currently doing my master's degree in education, specialising in the area of Information and Communication Technology (ICT).

The research I wish to conduct is based on teachers' experiences of using ICTs for teaching and learning. This research could help improve teachers' use of technology for curriculum delivery.

I will be conducting one-on-one interviews and non-participant observations. The interviews will take place on any day between February 2020 to March 2020 (**first term**).

Your participation in this research will be entirely voluntary. If you choose not to participate, no questions will be asked and you will not be observed or judged for withdrawing from the study.

I undertake not to share any personal information I receive from anyone, and the information collected from you for my research project will be kept private. Any information you volunteer or contribute during our one-on-one interviews and observations will be recorded under a false name instead of your real name. After my write-up, all information that I have collected will be kept electronically in the cloud.

I _____ (participant name)

- I have been given, and have understood, a description and an explanation of this research project.
- I have had an opportunity to ask questions of the researcher, and he has answered them to my satisfaction.

- I understand that any information I provide will be done so anonymously, and I will not be identified in any of the analyses or reports resulting from data collection.
- I understand that I may withdraw myself or any information traceable to me, without giving a reason, at any stage for up to one month from the date of my participation.
- I agree to take part in this research.

Signed : _____

Print name: _____

Date :

Appendix E

METROPOLE EAST

EDUCATION DISTRICT
CURRICULUM SUPPORT
eLEARNING Unit

Western Cape Government
Education

ATTENTION: Principals and Smart Classroom teachers

SUBJECT: SMART Classroom Training: - (Wireless Data Projector, eBeam device and Visualizer

Following the receipt of your SMART Classroom hardware and installation completed already. The next step is the training for the identified teachers to use SmartClassroom devices.

The purpose of the training is to equip **all** Smart Classroom teachers with skills and knowledge on how to use the above devices for productive teaching and learning.

Please find the training schedule (**Annexure A, B & C**) below indicating the venue and date for your school.
Please complete the on-line registration on or before **Friday, 26 July 2019** by using the following link or scanning the QR code via a smartphone:

Link (please use Google Chrome)	**QR code**
https://forms.gle/6n644R8GaUGLYaJo8	

Please bring along the following:

- **SMART Classroom laptop (All participants)**

Should you require any additional information, kindly contact us :-

J. Joseph - Tel: 021 900 7106 Email: Jaco.Joseph@westerncape.gov.za

S. Didiza - Tel: 021 900 7103 Email: Sipho.Didiza@westerncape.gov.za

Kind regards

Trevor Daniels
Head: CURRICULUM SUPPORT

Appendix F

Western Cape Government
Education

Directorate: Research

Audrey.wyngaard@westerncape.gov.za
tel: +27 021 467 9272
Fax: 0865902282
Private Bag x9114, Cape Town, 8000
wced.wcape.gov.za

REFERENCE: 20191009-130
ENQUIRIES: Dr A T Wyngaard

Mr Lebohang Mahlo
54456 Dyakalashe Street
Kuyasa
Khayelitsha
7784

Dear Mr Lebohang Mahlo

RESEARCH PROPOSAL: THE CAPABILITIES NECESSARY FOR EFFECTIVE ICT INTEGRATION IN TEACHING IN TWO PRIMARY SCHOOLS IN KHAYELITSHA

Your application to conduct the above-mentioned research in schools in the Western Cape has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Educators' programmes are not to be interrupted.
5. The Study is to be conducted from **20 January 2020 till 12 June 2020**
6. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December).
7. Should you wish to extend the period of your survey, please contact Dr A.T Wyngaard at the contact numbers above quoting the reference number?
8. A photocopy of this letter is submitted to the principal where the intended research is to be conducted.
9. Your research will be limited to the list of schools as forwarded to the Western Cape Education Department.
10. A brief summary of the content, findings and recommendations is provided to the Director: Research Services.
11. The Department receives a copy of the completed report/dissertation/thesis addressed to:

    The Director: Research Services
    Western Cape Education Department
    Private Bag X9114
    CAPE TOWN
    8000

We wish you success in your research.

Kind regards.
Signed: Dr Audrey T Wyngaard
Directorate: Research
DATE: 09 October 2019

Appendix G

Cape Peninsula University of Technology

***For office use only	
Date submitted	3/10/2019
Meeting date	15/10/2019
Approval	P/Y/N
Ethical Clearance number	EFEC 2-10/2019

FACULTY OF EDUCATION

RESEARCH ETHICS CLEARANCE CERTIFICATE

This certificate is issued by the Education Faculty Ethics Committee (EFEC) at Cape Peninsula University of Technology to the applicant/s whose details appear below.

1. **Applicant and project details (Applicant to complete this section of the certificate and submit with application as a Word document)**

Name(s) of applicant(s):	LEBOHANG MAHLO		
Project/study Title:	THE CAPABILITIES NECESSARY FOR EFFECTIVE ICT INTEGRATION IN TEACHING IN TWO PRIMARY SCHOOLS IN KHAYELITSHA.		
Is this a staff research project, i.e. not for degree purposes?	STUDENT RESEARCH PROJECT		
If for degree purposes the degree is indicated:	MED		
If for degree purposes, the proposal has been approved by the FRC	YES		
Funding sources:	N/A		

2. **Remarks by Education Faculty Ethics Committee:**

Ethical clearance is granted until the 31 December 2024		
Approved: X	**Referred back:**	**Approved subject to adaptations:**
Chairperson Name: Dr Candice Livingston **Chairperson Signature:** Livingston	**Date: 15 October 2019**	
Approval Certificate/Reference: EFEC 2-10/2019		

EFEC Form V3_updated 2016