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The implementation of Information Communication Technology for teaching and learning in Tshwane West District

By

Mafampe Mokware Sarah

A mini-dissertation submitted in partial fulfilment of the requirements for the degree

MASTERS OF EDUCATION LEADERSHIP

(Management, Law and Policy)

In the

FACULTY OF EDUCATION

At the

UNIVERSITY OF PRETORIA

Pretoria

Supervisor:

Dr. E.M Kgwete

May 2024

ETHICS CERTIFICATE

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Faculty of Education

Ethics Committee
7 July 2022

Dear Ms MS Mafampe

The application for ethical clearance for the research project described below served before this committee on 15 June 2022:

Ethics Protocol No:	**EDU035/22**
Principal Investigator:	**Ms MS Mafampe**
Student/Staff No:	**18311262**
Degree:	**Masters**
Supervisor/Promoter:	**Dr EM Kgwete**
Department:	**Education Management and Policy Studies**

The decision by the committee is reflected below:

Decision:	**Approved**
Comments:	
Period of approval:	**Two years**

The approval by the Ethics Committee is subject to the following conditions being met:

1. The research will be conducted as stipulated on the application form submitted to the Ethics Committee with the supporting documents.
2. Proof of how you adhered to the Department of Basic Education (DBE) policy for research must be submitted where relevant.
3. In the event that the research protocol changed for whatever reason the Ethics Committee must be notified thereof by submitting an amendment to the application, together with all the supporting documentation that will be used for data collection namely; questionnaires, interview schedules and observation schedules, for further approval before data can be collected. The changes may include the following but are not limited to:
    - Change of Investigator,
    - Research methods any other aspect therefore and,
    - Participants.

The Ethics Committee of the Faculty of Education does not accept any liability for research misconduct, of whatsoever nature, committed by the researcher(s) in the implementation of the approved protocol.

Best wishes

_____
Prof Funke Omidire
Chair: Ethics Committee
Faculty of Education

Room 3-05, Level 3, Aldoo I Building
University of Pretoria, Private Bag X20
Hatfield 0028, South Africa
Tel +27 (0)12 420 5555
Email edu.ethicsadmin@up.ac.za
www.up.ac.za

DECLARATION FORM FROM THE EDITOR

10 August 2023

TO WHOM IT MAY CONCERN

I Malebo Ramatshekgisa hereby confirm that I have edited and proofread a research proposal titled: The implementation of Information Communication Technology to promote teaching and learning in Tshwane West District, written by Mafampe Mokware Sarah with student number: 18311262.

Yours faithfully,

Professional EDITORS Guild 30 1993–2023 Editing in the Digital Age

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Accradited Text Editor (English)

Membership number: RAM006

Membership year March 2023-February 2024

0760 288 485

gratitudemalebo@gmail.com

DECLARATION

I Mokware Sara Mafampe, student number 18311262, declare that the dissertation titled, "*The implementation of Information Communication Technology for teaching and learning in Tshwane West District "*, which I hereby submit for the Master's Degree in Education Management, Law and Policy in Education at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at any tertiary institution.

Mafampe Mokware Sara

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ACRONYMS

ICT:	Information Communication Technology
IT:	Information Technology
NGO:	Non - Profit Organization
IEP:	Individualized Education Program
GDE:	Gauteng Department of Education
DBE:	Department of Basic Education
GoL:	Gauteng Online
TNC:	Tshwane North College
Wi-Fi:	Wireless Fidelity
SAITIS:	South African Information Technology Industry Strategy
IJEDICT:	International Journal of Education and Development using Information and Communication Technology
UNESCO:	United Nations Educational, Scientific and Cultural Organization
NCES:	National Center for Education Statistics
USA:	United States of America
ICT4AD:	Information and Communication Technology for Accelerated Development

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Abstract

The development of information and communication technology (ICT) has fundamentally altered how we teach and learn. This study investigates the implementation of ICT to promote teaching and learning in Tshwane West District. Theresearch questions were: How do teachers perceive the implementation of ICT to promote teaching and learning in the classroom? What strategies do teachers use in ICT implementation to promote teaching and learning? What are the challenges experienced by teachers when implementing ICT to promote teaching and learning in the classroom? The study sample consisted of 12 secondary school teachers. The participating teachers were from t wo secondary schools in the Tshwane West District in Gauteng province. The participants were selected using a purposive sampling method. A multiple-case study design was used in this study and the data collection instrument used was semi-structured interviews. The interviews were analyzed using a thematic data analysis technique. The research findings identified that ICT implementation was beneficial to some participants since they indicated that ICT makes the class lesson interesting and exciting wherein the learners who used to be bored in class tendto feel excited and show keenness to learn using computers and other ICT tools. The study also revealed that some teachers were frustrated when they had to implement ICT using the computer because they said when it gave them problems the technical team seemed not to respond swiftly to the matter. It was also found that teachers use team building as their strategy in ICT implementation and they see it as extremely beneficial for building trust, confidence, and understanding. Further, the study found that among other challenges, load shedding and lack of enough computers for learners was a problem affecting teaching and learning. The study recommended that to create a conducive teaching environment for the effective implementation of ICT in classrooms, schools should ensure the availability of computer resources for all learners and provide generators for use during load-shedding. The study further recommended that there should be well-equipped technical teamsat schools and that teachers ought to stay in charge of the class to prevent learners from using their phones for anything other than academic purposes.

Keywords: Teachers , ICT, Learners, classrooms, Tshwane West District, teaching and learning

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CHAPTER 1
INTRODUCTION AND BACKGROUND

1 Introduction

The rapid evolution of technology has deeply permeated every aspect of our lives, becoming an indispensable part of modern society. Our reliance on technology has grown to such an extent that it now impacts nearly every facet of our daily routines and interactions (Underwood,2009). This study aims to delve into the perceptions of teachers regarding the integration of Information and Communications Technology (ICT) in schools within the Tshwane West District. Given the pervasive presence of technology in society, there is a natural inclination to incorporate it into educational settings.

Research has consistently shown that technology can be a powerful tool for enhancing teaching and learning outcomes (Negi and Pandey, 2011; Higgins, Xiao and Katsipataki, 2012). When learners utilize technology, they are actively engaged in the process of receiving information, moving beyond traditional sources such as textbooks and lectures (Sangra, 2010). Moreover, technology enables learners to take on more active roles in their learning by facilitating tasks that require decision-making, goal-setting, and self-evaluation (Singh and Means, 2019). This empowerment allows self-motivated learners to leverage ICT to enhance their knowledge, skills, and ideas (Fazeli, 2007).

The integration of technology has also brought about a paradigm shift in the role of teachers (Peggy, 2021). No longer confined to the role of information providers, teachers now serve as facilitators of learning, offering guidance, resources, and support to learners (Singh and Means, 2019). ICT has revolutionized the teaching and learning process, enabling teachers to use computers for demonstrations and simulations. For instance, a science educator can utilize simulations to illustrate complex concepts such as electron orbitals, providing learners with a more immersive and interactive learning experience (Hurwitz, 1999).

The integration of technology in education has fundamentally transformed the learning landscape, offering new opportunities for student engagement and empowerment. As teachers adapt to these changes, it is crucial to recognize the transformative potential of ICT and its ability to enhance teaching and learning outcomes. By embracing technology and incorporatingit into their teaching practices, teachers can better prepare learners for success in a technology-driven world.

1.1 Background

This study sought to explore educator's perceptions of the implementation of ICT. Cope and Ward (2002) confirm that teachers who have little or no knowledge of the use of technologyare less likely to be comfortable adapting to technological change. Teachers should be trained to be competent in the use of computer technology. The introduction of technology does not replace the role of teachers , it only enhances their skills, (Royer, 2002).

Bransford (2003) emphasizes that active learning means that learners will be independent during teaching and learning. He further asserts that internet access in schools will ensure thatlearners do not depend on the teachers , they will use different websites and web pages available on the internet. This learning system enables the learners to become self-motivated in the process of learning. Gerald and Sue (2002) claim that self-management allows the learners to be self–motivated and quick to respond to information. The Department of Education provided computers to some learners coming from Quintile 1-3 schools which are no-fee schools in townships so that they can work independently (Dzani and Amedzo, 2014). Learners in township schools are now able to do research at home and submit it on the day of schooling.

Kapur (2019) found that ICT has rendered a significant influence in not only the field of teaching but in several fields. It has been investigated that individuals are making the huge practice of technologies in putting into operation, many tasks and activities. These include communicating, sending messages, and information, preparing assignments, reports, articles and projects, and for relaxation and recreation purposes. Jaarsveld (2018) and Dzansi and Amedzo(2014) are of the view that the use of ICT in South African schools is significantin teaching and learning. ICT adds value to the learning processes and organization and administration of educational institutions. The research conducted resonates with what this study is about. Revealing the stark realities of inequalities that exist in the South African education system. Teachers are encouraged and supported to use technology by integrating technology during teaching and learning. There is indeed a need for change in the work that teachers do (Dzansi, 2014; Piccioto, 2012). According to the South African Government Gazette (2004) schools that are using technology have been found to improve their learning outcomes.

This study aimed to investigate the perceptions of secondary school teachers in the Tshwane West District regarding the integration of Information and Communications Technology (ICT)in teaching and learning. The introduction of ICT in schools necessitates that teachers become computer literate, as schools are transitioning from traditional methods to modern approaches. This shift entails replacing chalkboards with smart boards and learners bringing their own devices to school.

1.2 Rationale

The evolution of teaching and learning methods has necessitated that teachers adapt to new approaches in education. However, there appears to be resistance among teachers to transition from conventional teaching methods to more innovative practices (Bingimlas, 2009). Despite the wealth of online resources available through technology, teachers often view ICT as a subject to be taught rather than as a tool to enhance teaching and learning strategies (Loveless, 2003). This perception has hindered the full integration of ICT into educational practices.

One of the key barriers to the effective use of ICT in education is the lack of proper training for teachers . Many teachers do not feel confident in using technology in the classroom, fearing embarrassment when learners display greater proficiency in ICT (Francis-Pelton and Pelton, 1996). This lack of confidence stems from a lack of training and professional development opportunities. Despite these challenges, the importance of ICT in education cannot be overstated. Technology has become an integral part of our lives, and its integration into education is essential for preparing learners for the digital age (Prensky, 2011). Therefore, it is crucial for teachers to embrace ICT and develop the necessary skills to effectively integrate technology into their teaching practices.

This study aimed to contribute to the understanding of teachers' perceptions of ICT in the Tshwane West District. By interviewing teachers in selected secondary schools, the study sought to identify the best ICT practices for teaching and learning. The findings of this study provide valuable insights and guidelines for teachers on how to effectively integrate ICT intotheir teaching practices, ultimately enhancing the learning experience for learners.

1.3 Statement Problem

Teachers ’ attitudes toward the implementation of ICT for teaching and learning, and resistance to change play an important role in ensuring smooth teaching and learning (Mikre, 2011, and

Oladosu, 2012). Such attitudes lead to challenges in the implementation of ICT for effective teaching and learning. There is a need for teachers to be resilient, receptive to change, and motivated in the implementation of ICT to improve and enhance their teaching. Teachers seem not to be confident about moving from the old way of teaching and adapting to change. Some teachers have a negative attitude that some learners might have more knowledge in ICT than them (Clement, 2012).

Teachers are expected to be resilient, and receptive to change. Teachers should be motivated in adopting ICT to enhance their teaching practices (Clement, 2012). However, many teachers struggle with transitioning from traditional teaching methods to more technology-driven approaches. Some teachers may lack confidence in their ability to adapt to new technologies, especially when they perceive that some learners may have more knowledge of ICT than they do. The Covid-19 pandemic has further highlighted the importance of ICT in education, as schools were forced to switch to online teaching and learning to mitigate the spread of the virus. While well-resourced schools were able to adapt to online learning, disadvantaged schools faced significant challenges due to a lack of resources, particularly in terms of ICT infrastructure and support (Dundas and Asbury, 2021). This disparity underscores the importance of providing teachers with the necessary skills and support to effectively utilize technology in teaching and learning.

Addressing teachers ' attitudes toward ICT and resistance to change is essential for ensuring the successful implementation of technology in education. Teachers need to be supported and empowered to embrace ICT and incorporate it into their teaching practices. This requires providing them with the necessary training, resources, and support to effectively integrate technology into their classrooms, ultimately enhancing the teaching and learning experience for all learners.

1.4 Preliminary Literature

The existing literature indicates that teachers use ICT in the classroom for teaching, learning, and assessment, it further finds that teachers have access to computers in schools and at home and they use the computer for different purposes, such as entertainment, communication, and education (Khokhar, 2016). Kozma (2011) indicates that teachers consider ICT as a knowledge source and it is a tool for guiding them in the teaching and learning process. Teachers cannot use ICT competently and use it only as a way of receiving information in the teaching and

learning process, at the same time, teachers believe in ICT as a tool for guiding them. Albirini (2006) mentions that while ICT is not mandatory to direct teachers in the teaching and learning process, however, teachers are obligated to direct ICT in the teaching and learning process in the classroom. Ghavifekr (2016) on the other hand, found that teachers see ICT both as a change and as a problem. Even though few teachers were seen to perceive ICT as a change, this is considered very important to note in this research.

According to Pramanik (2011), ICT is a strength that has transformed many parts of the way we live. It is playing a great role in many disciplines like medicine, tourism, travel, business, law, banking, engineering, and architecture. The influence of ICT over the past two or three years has been huge. However, when one looks at education, there appears to have been non- existence of inspiration and far less change than other fields have experienced but education isone of the most important investments in building human capital in a country and makes a nation technologically innovative and a good path to economic growth.

Rogers (2018:15) points out that there is a lack of qualified teachers to teach ICT-related subjects in schools; the demand for ICT learning has been tremendous and the number of teachers who are trained to teach ICT cannot meet the demand. More learners are willing to be taught computing skills than there are teachers to transfer the skills. Furthermore, he states thatthere is also a lack of computers; because they are still very expensive, and despite spirited efforts by government agencies, NGOs, corporate organizations, and individuals to donate computers to as many schools as possible, there remains a big percentage of the schools unableto purchase computers for use by their learners. The researcher also points out that lack of electricity in many schools, some schools are still not yet connected to electricity; Technologywill not replace teachers' roles. Organization for Economic Co-operation and Development (OECD) (2000), mentions that just like school which always be the formal place for the teaching-learning process, teachers will always play a central role in the teaching-learning process. Teachers will always be needed in education.

1.5 Research Questions

This study was guided by the following questions:

1.5.1 Main Research Question

What are the views of teachers on the implementation of ICT in promoting teaching and learning?

1.5.1.1 Secondary Research Questions

- How do teachers perceive the implementation of ICT to promote teaching and learning in the classroom?
- What strategies do teachers use in ICT implementation to promote teaching and learning?
- What are the challenges experienced by teachers when implementing ICT to promote teaching and learning in the classroom?

1.6 Aim of the study

The study aimed to explore teachers ' views on the implementation of Information Communication Technology for teaching and learning at the Tshwane West District in Gauteng Province of South Africa.

1.7 Research Objectives

The objectives of this study were:

- To understand how teachers , perceive the implementation of ICT to promote teaching and learning in the classroom.
- To explore strategies of how teachers , use ICT implementation to promote teaching and learning.
- To determine the challenges experienced by teachers when implementing ICT to promote teaching and learning in the classroom.

1.8 Significance of the study

Granberg (2000) emphasizes the transformative potential of technology in enhancing teaching and learning experiences. However, Wheeler (2000) highlights a significant challenge: teachers who lack computer literacy may struggle to adapt to incorporating technology into their teaching practices. This suggests that the successful integration of ICT in education depends on teachers ' readiness and ability to embrace technological advancements. The adoption of ICT in teaching

and learning has the potential to simplify teaching methods and enhance the learning process for learners (Aziz and Quraishi, 2018). Teachers who effectively utilize ICT can create more engaging and interactive lessons, catering to diverse learning styles and improving overall student comprehension. By embracing ICT, teachers can also stay abreast of technological advancements and ensure that their teaching remains relevant in a rapidly evolving digital landscape.

This study aimed to provide guidelines for best practices in implementing ICT for teaching and learning, which can serve as a valuable resource for teachers and policymakers. By understanding teachers' perceptions and challenges regarding ICT usage, the Department of Basic Education (DBE) can tailor its policies and initiatives to better support teachers in integrating technology into their classrooms. Additionally, the study will benefit the Gauteng Department of Education by highlighting specific challenges faced by teachers in applying ICTin teaching and learning, enabling the department to provide targeted support and training programs.

Furthermore, the findings of this study will contribute to the existing knowledge base on the implementation and practices of ICT in teaching and learning. By documenting teachers' experiences and perspectives, the study will provide insights into effective strategies for integrating ICT into the curriculum, enhancing teaching methodologies, and improving student outcomes. This knowledge can inform future research and policy development in the field of ICT in education.

The integration of ICT in teaching and learning has the potential to revolutionize education and improve learning outcomes. However, this transformation requires teachers to be equipped with the necessary skills and support to effectively utilize technology in their classrooms. By understanding teachers' perspectives and challenges, this study aims to provide valuable insights and recommendations for enhancing the implementation of ICT in teaching and learning, ultimately benefiting learners, teachers , and educational policymakers alike.

1.9 Research methodology

1.9.1 Research Paradigm.

Qualitative research is a form of social research that gathers and works with non-numerical data and that seeks to interpret meaning from the data that will help realize social life throughthe

study of targeted populations or places (Ashley Crossman, 2020). In this study, the interpretive research paradigm was employed. The interpretive paradigm was helpful becauseit emphasizes that reality is regarded and understood by individuals according to the ideologicalpositions that they hold and knowledge is personally experienced rather than acquired from outside (Nel, 2019).

The interpretive paradigm was relevant because the purpose of this study was to investigate the perceptions of secondary school teachers in the Tshwane West District regarding the integration of ICT in teaching and learning. This is in line with Ediringa (2002) who states that,interpretive paradigm assists to understand and interpret meaning in human behaviour than to generalize and predict cause and effect. Therefore, the researcher adopted a relativist ontological view on the meaning of reality (Pham, 2018). The researcher's view is that, there are multiple, socially-constructed reality as opposed to a singular truth (Rehman and Alharthi, 2016). On the basis of these, the researcher constructed reality on the perceptions of teachers in the implementation of ICT for teaching and learning because they are daily involved in the practice.

Furthermore, the researcher adopted a subjective epistemological assumption on how reality is created (Guba and Lincoln, 1994). Therefore, the researcher believed that knowledge is created by means of interacting with the participants to understand how they perceive the implementation of ICT for teaching and learning in the selected secondary schools through face to face semi structured interviews. The data collected through the face to face semi structured interviews elicited authentic information relevant to the object of research (Pham, 2018).

1.9.2 Research Approach

Research methodology is generally understood as a logical procedure of collecting, evaluating, and understanding information to raise the understanding of the phenomenon in which the researcher is involved. The researcher's understanding of the above is supported by Derek (2020), who states that research methodology refers to the practical "how" of any given pieceof research. More precisely, it's about "how" a researcher systematically plans a study to ensure effective and consistent results that address the research aims and objectives.

In this study, a qualitative research approach was used to gather and analyze the collected data. The sample of this study included twelve purposively selected teachers from two secondary schools classified under quintiles 1-3, known as (disadvantages schools) in the Tshwane West

District. Semi-structured interviews were used to collect data.

This qualitative study included gathering and studying non-numerical data like text, videos, or audio to understand theories, thoughts, or understandings (Prather, 2020). Therefore, the qualitative approach remains proper for this study in the sense that I looked at different perceptions of the participants to acquire facts concerning educator's perceptions on the implementation of Technology. This was a multiple-case study of secondary schools in the Tshwane West District.

1.9.3 Research Design

A multiple-case study design was used in this study. According to Creswell (2013), a multiple case study explores a real-life multi-bounded system through detailed, in-depth data collection involving multiple sources of information. Brink (2018) assert that a multiple-case study enables the researcher to navigate aspects that require to be explored in-depth, and to understand the behavioural conditions of such a system, based on comments inputs and interpretive perspectives of the participants. This study was focussed on 2 secondary schools in quintiles 1-3 in the Tshwane West District of Gauteng Province as cases.

1.9.4 Population and Sampling Procedures

1.9.4.1 Population

Population refers to the entire group of individuals, items, or units that are the focus of a study. This group shares a common characteristic or set of characteristics that are relevant to the research question or objective (Etikan, 2016). The population is the complete set from which a researcher may draw a sample for study (Palinkas et al., 2015). The population in this study consisted of teachers from the Tshwane West District, which includes 56 secondary schools. The population encompassed all the elements that meet the criteria for inclusion in the study.

1.9.4.2 Sampling Procedures

Sampling in research is the process of selecting a subset of individuals, units, or items from a larger population to represent that population (Alicia, 2020). This subset, known as a sample, is used to gather data and make inferences about the entire population. For this study, a purposive sampling technique was used to sample teachers who were willingto participate. Therefore, 6 teachers per school, 3 of whom will be males and 3 females, fromthe selected 2 secondary schools under quintiles 1-3 within the Tshwane West District as participants. Schools in South

Africa are categorized under quintiles 1 to 5 based on their socioeconomic status. According to the Department of Education (2011), Quintile 1 is the group of schools in each province catering for the poorest 20% of learners. This is corroboratedby the writings of Mseleku (2013) who stated that this quintile constitutes the majority of the schools in the country.

This means that these schools depend on the government for financial support. Schools that fall under quintiles 1 to 3 are no-fee-paying schools; quintiles 4 to 5 are fee-paying schools (Ogbonnaya and Awuah, 2019). Most township schools fall under this category. Their resource allocation is low, and hence the availability of computer technology is problematic. Accordingto Ghavifer (2013), training budgets at township institutions are frequently insufficient and thisis supported by the work of (Packard, 2012). The researcher sought to focus on a specific groupthat is preferably knowledgeable about the subject of the study.

1.9.5 Data Collection

1.9.5.1 Data collection strategy

This study employed semi-structured individual interviews with teachers from the selected secondary schools to understand the perceptions of teachers on the implementation of ICT for teaching and learning (Young and Ormrod, 2015). According to Elmusharaf (2012), individual interviews are a data collection instrument that take place through oral questioning of participants. An interview is a formal conversation between an interviewer and an interviewee where the interviewer seeks answers from the latter (Keethana, 2021). Therefore, semi-structured interviews were conducted with each participating teacher at a convenient place and time. Prior appointments were made with the participants. The interviews took place mostly after school. A signage with “Do not disturb, interview in progress” was placed at the door to avoid any potential disturbance.

The interviewer introduced herself and thanked the participantfor participating in the study. The participants were allowed freedom of expression, even to usethe language they are comfortable in during the interview. The researcher presented the permission letter from the Gauteng Department of Education. Further requested the participantsto sign the consent form before the commencement of the interview. The researcher requestedpermission from the participants to audio record the interview for easy transcription at a later stage (Creswell, 2013). The individual face to face interviews allowed me the opportunity to probe further where the researcher felt more clarity was required (Creswell, 2018). The duration of the interview was a maximum of

45 minutes. An interview schedule was used to collect information from the selected teachers regarding their perceptions of the use of ICT forteaching and learning.

1.9.6 Data analysis

According to Flick, (2013), data analysis in qualitative research entails the classification and interpretation of the collected data, especially linguistic and visual material to generate statements and make meaning of what was presented. Data was analysed thematically in this study. According to Guest, MacQueen and Namey (2011), thematic analysis is an instrument to classify themes and analyze qualitative data. Thematic analysis is flexible since it can analyze a variety of data types, and it can be used to analyze face-to-face interviews and focusgroups (Niland, 2014). Information was gathered through individual semi-structured interviews with the participants. Data gathering is the logical methodology for collecting and assessing data from a range of sources to acquire a broad representation of important parts (Emily, 2020). Pritha (2020) states that a qualitative study includes gathering and analysing information. In the context of this study, the statements made by the participants in relation theresearch questions were broken into categories, themes and sub-themes (Young and Hern, 2013). Qualitative data analysis includes an assessment of interview responses arranging the information into logical categories and finding ways of communicating and interpreting them (Sileyew, 2019). This is supported by Battacherjee (2012) who stated that an information study is a procedure for examining information to conclude the investigation.

1.9.7 Trustworthiness

Trustworthiness in research refers to the quality and credibility of the research findings. It ensures that the research is conducted ethically and that the results are valid and reliable (Bryman, 2012). Data honesty is delimited as the "assurance that can be established in the reality of the research"(Schurink, Fouche and De Vos, 2011:49). According to Bryman (2012), honesty exists in fourvarious parts namely, believe: the genuineness of the judgments, transferability: the relevanceof the judgments in other frameworks; stability: dependability of the verdicts later, and confirmability: objectivity of the investigator while completing activity the research. In this case, gathering teachers ’ perspectives on the use of Information Communication Technology was honest, and informed consent was obtained from the participants.

Trustworthiness included four key components: Credibility (Believability), which refers to the genuineness of the research findings and ensures they accurately reflect the reality of the

participants' experiences; Transferability, which involves the extent to which the findings can be applied to other contexts or settings, akin to generalizability in quantitative research (Bryman, 2012). It also encompasses Dependability (Stability), relating to the consistency of the research findings over time, and Confirmability, which pertains to the objectivity of the researcher and ensures that the findings are shaped by the participants rather than researcher bias and can be corroborated by others.

1.9.8 Ethical consideration

Ethical considerations are critical in ensuring the integrity and credibility of research. They involve adhering to guidelines and standards that protect the rights and well-being of research participants (Creswell, 2009). Towsley-Cook and Young (2007:2) outline ethical consideration as, “the order or guideline and standards furthered by the individual or group.” It is therefore important for the researcherto consider ethical concerns throughout the research process, below are some of the ethical considerations which were observed in this study:

1.9.8.1 Voluntary participation

Voluntary Participation means that participants engage in the research from their own free will. Creswell (2009:97) posits "Participation should be intentional and no one should be forced to participate in the study. In this study, participation was voluntary, which means that no one was forced or obliged to form part of the study but did so of their own free will. Participants were free to decline and withdraw their participation at any time if they wish to do so.

1.9.8.2 Informed consent

Informed Consent involves providing potential participants with all the necessary information about the study so they can make an informed decision about their participation. Strydom (2011) states that it is unprofessional to engage in knowledge accumulation outside the acknowledgment of the members or the trustworthy expert. Moreover, it is important to properly advise colleagues, and they concede the possibility of purposely stating their goal to suggest the essential facts (Strydom, 2011). Informed consent in research is normally a composed statement that clarifies the views of a study to colleagues and were asked for their willing agreement to participate in the study before the study commences.

1.9.8.3 The right to privacy

The Right to Privacy ensures that participants' personal information and responses are kept

confidential and are not disclosed without their permission. The participant's rights to privacy were respected and they were informed of their right to withdraw from the process or refuse to answer some of the questions if they felt uncomfortable.In this study, personal and sensitive questions were guarded to respect the participant's privacy (Guest et al., 2011).

1.9.8.4 Confidentiality

Confidentiality means that the information participants provide will be kept private and will not be shared with others in a way that could identify them. The participant's secrecy and identity were considered accompanying significance, meaning that the investigator informed the participants that the information they determined was hopefully treated with isolation, and would never be made public to some other life except thatit was acknowledged. Participants were informed that the research report would not tell their status or the identities of schools, but would wait secretly (Guest et al., 2011).

1.9.8.5 The right to safety

The Right to Safety involves protecting participants from any harm or risk during the research process. The researcher ensured that participants are protected throughout the study. The researcher alsomade sure that the places where the interviews are conducted was free of harm and also conducive to the successful conclusion of the study (Guest et al., 2011). Participants were protected from undue intrusion, distress, indignity, physical discomfort, and personal embarrassment. The principal ethical rule of research is that participants should not be exposedto greater risk than they are exposed to in their day-to-day experiences. This study did not subject participants to any harm or pose unreasonable risks to the participants but was conducted in line with the fundamental ethical obligation to protect the emotional well-being of the participants. The participants were briefed on how their information will be utilized in the research.

1.9.8.6 Equal treatment

Equal Treatment requires that all participants be treated with respect and dignity, regardless of their background or characteristics. This research treated all the participants with dignity and respect regardless of their colour, nationality, gender, or disability to avoid bias and to ensure that no one is harmed emotionally.The research ensured that participants were not victimized. Treating all research participants equally is a fundamental ethical principle. It ensures that no individual or group is unfairly disadvantaged or discriminated against in the research process (Henrickson et al., 2020).

1.9.8.7 Honesty

Honesty in research involves accurately reporting data and findings without fabrication or falsification. The researcher ensured that the data collected was not fabricated or inaccurate in any way butis reported with honesty. In this study, the researcher sidestepped the acts of dishonesty, as it might cause the participants to lose trust. Scholars emphasize the critical importance of honestyin research for maintaining the integrity of the scientific process and ensuring the credibility ofresearch findings. According to Shamoo and Resnik (2015), "Honesty in research is essential because the public invests a great deal of trust in scientists and their work. If that trust is misplaced, the public's willingness to fund and support research may diminish, and the progress of science could be harmed."

1.9.9 Chapter Outline

Chapter 1: Background and Information
Chapter 2: Literature Review and theoretical framework
Chapter 3: Research methodology and empirical findings
Chapter 4: Discussion and analysis of results
Chapter 5: Summary, recommendation, and conclusion

1.9.10 Chapter Summary

This chapter provided the background of the study, research questions, the rationale, the research approach, and the theoretical framework of the study. It further stated the research problem in conjunction with the objectives of the study and additionally offered a chapter division of the study and consequently, concludes the chapter. The next chapter will present areview of the literature with specific references to how the implementation of Information Communication Technology promotes teaching and learning in Tshwane West District.

CHAPTER 2
LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2 Introduction

This chapter reviewed the national and international literature on the use of ICT, defined concepts, and explained the theoretical framework. This review focused on the use of ICT for teaching and learning. It is critical to give a detailed, evidence-based justification to achieve the intended results. As a result, this chapter focused on the investigation, evaluation, and synthesis of diverse references from the literature that have previously been used in similar studies. The material that were reviewed, lends credibility to the study's main topic.

Technology is without no doubt becoming an integral part of our day-to-day lives, and both researchers and practicing teachers are constantly exploring new ways in which technology can help facilitate learning. Without question, technology is integrating more and more into our daily lives, and both researchers and professional teachers are continuously looking for new ways that technology may support teaching and learning (Dabas, 2018). This chapter reviewed the literature on Information Communication Technology within the education sectorand how it could improve the system of teaching and learning. The chapter gives an overviewof ICT, the theoretical frameworks, and models used in other countries. Literature on the perceptions of teachers and how much difference ICT could contribute towards approaches of teaching and learning is also reviewed.

2.1 Clarification of concept and motivation

2.1.1 Information and Communication Technology (ICT)

ICT stands for, Information and Communication Technology. According to Ratheeswari (2018), ICT refers to telecommunications-based technologies that give access to information. ICT is comparable to Information Technology (IT), but it is more focused on communication technology. The internet, wireless networks, cell phones, and other forms of communication are all examples of ICT. It means that we now have more opportunities to incorporate ICT into teacher training programs and increase teacher quality to enhance teaching and learning.

To acquire an understanding of any concept conducted by a researcher, it is always imperative to gather more depth of knowledge regarding what one is researching and to stretch out the

accurate meaning. ICT is the diverse set of technological tools and resources that are used to communicate, create, disseminate, store, and manage information (Kapur, 2019). Through the expansion of ICT, the business environment gets saturated and the governments are provided with effective infrastructure. Asad, Hussain, Wadho, Khand and Churi (2020) state that another aspect that highlights the significance of ICT is that it adds value to the learning processes including the organization and administration of educational institutions.

Technology is capable of unlocking the keys of learning with all learners. This includes learners with special learning needs (Costley, 2014). The Etiwanda School District in California has implemented a technology integration program district-wide (Rasulovna, 2022).Therefore, in that program, teachers received technology training and then began integrating technology into general education lessons daily (Kapur, 2019). This program also included a practical technology support plan for teachers working with learners with special needs. This plan enabled teachers to help the learners by weaving technology resources into instruction inmeaningful ways. The plan proved to be successful in the Etiwanda School District. The learners with special learning needs are now meeting their individualized education program (IEP) goals more quickly due to this technology integration. They are also improving their performance on district benchmarks (Courduff, 2011).

Pitler, Hubbell, and Kuhn (2012) also highlight the advantages of using technology in classroom instruction. Technology can be used as a tool for establishing meaningful projects to engage learners in critical thinking and problem-solving. Technology can be used to restructure and redesign the classroom to produce an environment that promotes the development of higher-order thinking skills (Kurt, 2010). Technology also increases student collaboration. Collaboration is a highly effective tool in learning. Learners cooperatively worktogether to either create projects or they can learn from each other by reading the work of theirpeers (Keser, Huseyin, and Ozdamli, 2012).

Technology is a big part of people's daily lives; it is pertinent and vital that children learn howto use it from an early age. Pitler and colleagues (2012) are of the view that when children use technological tools in elementary schools, a sense of confidence and competence in their computer skills will grow as they get older. Many children today have access to a great deal of technology in their homes, this access will result in learners being comfortable in using technology at school as well (Asad, Hussain, Wadho, Khand, and Churi, 2020). When elementary school teachers use and model different forms of technologies, they actively engage

their learners and create a stimulating work environment (Kenney, 2011). This study focused on the use of ICT in township secondary schools.

2.2 Legislative framework

International law, such as the Universal Declaration of Human Rights (UDHR), indirectly influences the regulation of ICT for teaching and learning in schools by upholding fundamental principles that can be applied to educational contexts. Article 26 of the UDHR asserts the right to education, which implies that access to modern educational tools and technologies is a component of this right (Van Wyk, 2012). This principle supports the integration of ICT in schools to enhance educational opportunities and outcomes. Furthermore, the International Covenant on Economic, Social, and Cultural Rights (ICESCR) builds on this by emphasizing the importance of equal access to all levels of education and promoting the role of technology in achieving this goal.

The ICT Competency Framework for Teachers offers essential guidelines for teachers on effectively integrating ICT into their teaching and learning processes. It underscores the importance of developing digital literacy, pedagogical skills, and knowledge creation abilities among teachers to enhance educational outcomes (Ostrowick, 2016; Marais, 2016). Aligned with the Education 2030 Agenda, which is part of the Sustainable Development Goals (SDGs), this framework supports the broader objective of promoting inclusive and equitable quality education and lifelong learning opportunities for all. The Education 2030 Agenda highlights the critical role of ICT in achieving these educational goals, ensuring that all learners, regardless of their background, have access to quality education and the skills necessary for the future (Agbo, Olaleye, Sanusi, and Dada, 2021).

The International Society for Technology in Education ISTE Standards offer a comprehensive framework designed to help teachers, learners, and administrators effectively integrate technology into education, ensuring that technology enhances learning and teaching (Sife, Lwoga and Sanga, 2007). These standards emphasize essential skills such as digital citizenship, which involves understanding and practicing responsible and ethical behaviour in digital environments. They also highlight the importance of knowledge construction, encouraging learners to use technology to build and apply new knowledge through critical thinking and problem-solving. Furthermore, the standards promote innovative design, urging teachers and learners to use technology creatively to develop new solutions and projects. By adhering to these standards, educational stakeholders can create dynamic, engaging, and future-ready learning environments.

The National Development Plan (NDP) outlines South Africa's vision for socio-economic development and places a strong emphasis on improving the quality of education through the integration of ICT

(Ostrowick, 2016). Recognizing the transformative potential of technology in education, the NDP calls for significant investment in digital infrastructure to ensure that all schools are equipped with the necessary tools and resources. This includes providing reliable internet access, modern devices, and educational software to enhance learning experiences. Additionally, the NDP highlights the crucial need for comprehensive training programs for teachers, enabling them to effectively incorporate ICT into their teaching practices. By equipping teachers with the skills and knowledge to utilize technology, the plan aims to foster innovative and engaging educational environments that can better prepare learners for the demands of the modern world. Through these initiatives, the NDP envisions a more equitable and high-quality education system that contributes to broader socio-economic development in South Africa.

The National e-Education Policy in South Africa aims to harness the potential of ICT to enhance the quality of education (DBE, 2004). This policy includes initiatives such as providing digital content to make learning more interactive and engaging, developing ICT skills among both teachers and learners to prepare them for a technology-driven world, and ensuring access to digital resources to bridge the digital divide. By integrating these elements, the policy seeks to create an educational environment where technology facilitates improved learning outcomes and more efficient teaching methods.

The White Paper on e-Education (2004) serves as a foundational policy document outlining South Africa's vision for using ICT to transform teaching and learning. It emphasizes the critical need for infrastructure development to provide schools with the necessary technology and connectivity (Kroukamp, 2004). Additionally, it underscores the importance of teacher training, ensuring that teachers are equipped with the skills to effectively incorporate ICT into their pedagogy. The creation of digital content is also a key focus, aiming to provide high-quality, relevant, and accessible educational materials. Together, these initiatives reflect a comprehensive approach to integrating ICT in education, aiming to foster a modern, inclusive, and effective educational system in South Africa.

While the South African Schools Act (SASA) is not specifically focused on Information and Communication Technology (ICT), it provides a comprehensive regulatory framework for the governance of schools, which encompasses aspects related to the integration of ICT in school management and administration (Dlamini and Mbatha 2018). SASA mandates that schools must ensure effective governance and administration to provide quality education, a goal that increasingly involves the use of ICT.

The National Integrated ICT Policy White Paper (2016) outlines South Africa's comprehensive approach to harnessing ICT across various sectors, including education. This policy emphasizes the critical need for equitable access to ICT, ensuring that all learners, regardless of their socio-economic background,

can benefit from modern educational technologies. By addressing the digital divide, the policy aims to create a more inclusive education system where technology serves as a tool for levelling the playing field.

Similar to the General Data Protection Regulation (GDPR) in the European Union, the Protection of Personal Information Act (POPIA) in South Africa regulates the processing of personal information, including that of learners and teachers (Dlamini and Mbatha 2018). POPIA mandates that schools implement stringent measures to protect the privacy and security of personal data, which is particularly crucial in the context of increasing ICT use in education. As schools integrate more digital tools and platforms into their teaching, learning, and administrative processes, they handle a significant amount of sensitive personal information. POPIA requires schools to ensure that this data is collected, stored, and processed lawfully, transparently, and securely. This includes implementing robust cybersecurity measures to protect against data breaches and unauthorized access, ensuring data accuracy, and providing individuals with rights to access and control their information.

Table 1: Summary of key concepts

DEFINING KEY CONCEPTS		
Term	**Definition**	**Author**
Information and Communication Technologies	The United Nations Educational, Scientific and Cultural Organisation (UNESCO) defines information and communication technologies (ICTs) as diverse sets of tools and resources usedto communicate, create, disseminate, store and manage information.	(UNESCO, 2008).
Teacher	A teacher is a person who has qualifications or credentials from a university or a college to educate others. The role of the teacher is formal and ongoing, carried out by way of occupation or profession at school or any other place of formal education. DuPlessis, Conley and describe a good teacher as a teacher who helps learners to participate in the process that makes possible the establishment of knowledge.	Du Plessis (2007)
Teaching	Teaching refers to the actions of a real live instructor designed to impart knowledge to the learner. Teaching is ahuman undertaking to help people learn.	Du Plessis (2007)
Learning	Learning can be seen as a lifelong process of skill acquisition and increased fluency. State that learning involves a change in a person as regardstheir insight, behavior, perception, or motivation and that this change leads to added knowledge or the ability to do something that the learner could not do before.	Du Plessis (2007)
Online learning	It is learning using a digital platform,for example watching educational videos, reading articles, etc.	Paulina Fox.(2022)
Web-based learning	Refers to learning that uses the internetas an instructional delivery to carry outvarious activities, it does not involve face-to-face interaction.	Mortera- Gutiérrez, F. (2006)
Computer-based learning	Is the term used for any kind of learningwith the help of computers and it makesuse of the collaborative elements of thecomputer applications and softwareprogram and the ability to present any type of media to the users.	Warschauer, M., and Healey. (1998)
Distance learning	Physical separation of teachers and learners during teaching and the use ofseveral technologies to facilitate student-teacher and student-student communication.	Berg, G. A. andSimonson, Michael (2016)

In the above table, key concepts related to education and technology were defined by various authors. These definitions provided a foundational understanding of terms like ICTs, teaching, learning, and different modes of learning such as online, web-based, computer-based, and distance learning. Understanding these concepts was crucial for navigating the modern educational landscape, especially with the increasing integration of technology into teaching and learning processes.

2.3 Adoption of ICT for teaching and learning

The global adoption of ICT in educational institutions aims to redefine teaching and learning cultures, improve education fairness by closing the digital divide, educate learners and student about the knowledge society, and speed up national development efforts (The Highland Council, 2015; Akbulut, Odabasi and Kuzu, 2007). Connectivism's learning method, according to McLoughlin and Lee (2008:644), is characterized by connecting information sets and assisting learners in seeing the connections between events and ideas. Learning is a process of linking specialized nodes or information sources since knowledge is based on a diversity of viewpoints (Siemens, 2008:2). The literature on ICT for teaching and learning in South Africaprovides a comprehensive overview of the opportunities, challenges, and impacts associated with the integration of digital technologies into the educational landscape. Researchers have explored various dimensions, including the role of ICT in enhancing pedagogy, addressing educational inequalities, and influencing student outcomes.

ICT's role in transforming pedagogical practices is a prominent theme in the literature. Researchers such as Govender (2018) emphasize the potential of ICT to create interactive and student-centred learning environments. Digital technologies, including interactive whiteboards, online resources, and educational software, offer opportunities for innovative teaching methods that cater to diverse learning styles (Hennessy et al., 2014). This shift towardsmore engaging and personalized instruction aligns with global trends in educational technology.

The literature also addresses the potential of ICT to bridge educational inequalities in South Africa. Research by Motsa and Moodley (2017) discusses the digital divide and the challenges of ensuring equitable access to technology across urban and rural schools. ICT has the capacity to provide learners in underserved communities with access to educational resources, narrowing the gap between schools in different socio-economic contexts (Chigona et al., 2013).However, challenges such as infrastructure limitations and disparities in digital literacy skills need to be

addressed to fully harness the potential of ICT for inclusive education (Ng'ambi, 2013).

The impact of ICT on student outcomes is a key focus of the literature. Studies, such as those by Molaodi (2016), highlight the positive correlation between ICT integration and improved academic performance. Digital technologies offer opportunities for interactive and collaborative learning experiences, enhancing learners' critical thinking and problem-solving skills (Westera et al., 2018). However, the literature also acknowledges the importance of effective teacher training and ongoing professional development to maximize the benefits of ICT in the classroom (Botha, 2014).

The literature explores the policy landscape surrounding ICT in South African education. Government initiatives, such as the National Integrated ICT Policy Framework for South African Schools, play a pivotal role in guiding the strategic implementation of ICT in teaching and learning (Department of Basic Education, 2015). The literature emphasizes the need for coherent and flexible policy frameworks that address issues of infrastructure development, teacher training, and digital content creation (Tladi, 2015). Challenges related to ICT in teaching and learning are also discussed in the literature. Issues such as unreliable internet connectivity, insufficient access to devices, and concerns about digital content quality pose obstacles to the effective implementation of ICT in South African schools (Botha, 2014; Ng'ambi, 2013). The literature highlights the importance of addressing these challenges to ensure that the benefits of ICT are realized across diverse educational contexts.

The literature on ICT for teaching and learning in South Africa provides a nuanced understanding of the multifaceted landscape surrounding digital technology integration in education. While there are evident benefits in transforming pedagogy, addressing educational inequalities, and improving student outcomes, challenges related to infrastructure, teacher training, and equitable access must be systematically addressed to fully leverage the potential of ICT in South African classrooms. Ongoing research, policy refinement, and collaborative efforts are essential for navigating the evolving terrain of ICT in education in the country.

2.4 The use of ICT for teaching and learning

The successful integration of ICTs in education depends on teachers' attitudes. Without the right mindset, projects like Gauteng Online (GoL), which aimed to improve teaching and learning through computer and internet access in Gauteng schools, can fail (Sukazi and Ntshingila, 2013:1). The use of ICTs in teaching and learning is becoming increasingly popular around the

world. ICT integration in the classroom is often viewed as a solution to resolving South Africa's education challenge (Padayachee, 2017). According to Oladosu (2012), teachers' attitudes play an important role in the teaching and learning process that utilizes computers and Internet connections. Apart from teachers' lack of capacity and attitude towards the concept of ICT usage, poor infrastructure remains a major obstacle in many developing countries(Ratheeswari, 2018).

To build an effective ICT learning environment, a lot of things need to be prepared, such as the readiness of technology, the readiness of educational institutions, and the readiness of the community. These preparations are important because they will affect the quality of ICT programs when implemented (Maulinda and Lo, 2013). Dube (2020) is of the view that while other countries have passionately integrated technology (such as computers), others have guardedly welcomed it whilst some have outrightly rejected it. The resistance to the acceptance of ICT in the classroom is often said to be primarily based on the "risk of teachers losing influence over the values and directions of classroom activity" (Ramnarain and Hlatswayo, 2018:67). The motivation and confidence to integrate ICT in teaching and learning could only come from having access to ICT equipment and possessing the required ICT skills (Mikre, 2011).

A survey in the USA by the National Centre for Education Statistics (NCES) using the Fast Response Survey System (FRSS) revealed that 99% of full-time regular public-school teachers had access to computers or the internet in their schools, which is a dream still for many schools in developing countries such as South Africa (Makewa, Meremo, and Role, 2013). Many countries (including developing countries such as South Africa) have increased the number of computers in schools in recent years or have plans (such as the Teacher Laptop Initiative in South Africa and Kenya) to increase teachers' and learners' access to computers.

Naturally, the use of ICT in teaching, learning, and managing educational institutions, just like any other innovation, compels the emergence of a new set of skills, attitudes, and pedagogical approaches that require continuous training programs to build sufficient capacity among teachers, developers, teachers and administrators (Rwanda Ministry of Education, 2008). This means that, while most schools (especially in developed countries, and relatively in urban areas of developing countries) are now equipped with computers, Internet access, and occasionally more sophisticated equipment such as interactive whiteboards and effective e-learning requires far more than the mere introduction of hardware in the classroom (van Rij and Warrington,

2010:8). For this ICT equipment to mean anything, teachers must be conversant in utilizing them to implement an integrated approach to ICT use and new approaches (Bialobrzeska and Cohen, 2005:99).

Thus, because of the current scenario characterized by lack of capacity, there is a heightened need to fast-track the training of teachers (Beyers, 2000:52). Some of the South African Government initiatives to deal with ICT training for teachers include the nine centers' being established in each of the provinces as part of the Vodacom Mobile Education Programme. This type of ICT education centre for teachers is the realization of a partnership formed between Vodacom and the Department of Education to help boost teacher training across all nine provinces of South Africa (Ayemoba, 2013). It is the intention of the program to train about 1400 teachers annually in the use of ICT to support teaching and learning, focusing on mathematics and science subjects.

2.5 Quality and Accessibility of Education

Sustainable Development Goals (SDGs) (2030) state that there is a need to ensure that all children, not only those from high-income nations, have access to quality education. The call for Quality Education rather than merely accesses to any education is a significant step. Eloff and Kgwete (2007) are also of the view that teachers in South Africa speak out in favour of accessible education. Mwapwele, Marais, Dlamini and Van Biljon (2019) indicated thatlearners normally find computers and laptops more effective in preparing their assignments, reports, and projects, as compared to hand-writing. Before the advent of technology, individuals used to prepare their assignments and reports by hand-writing. When one hand writes, then one usually experiences problems in making corrections. But when one makes useof computers to type, then one can easily make corrections.

Another vital aspect that promotes the quality and accessibility of education is the task of research and writing. Research and writing are essential parts of the job duties of researchers and educationists. When individuals are pursuing doctoral programs, they are encouraged by their supervisors and professors to write papers (Ramnarain and Hlatswayo, 2018). The tasks of research and writing can be carried out appropriately, only when individuals would have access to technology and the internet. The individuals, employed in the field of education are requiredto upgrade their knowledge and skills in terms of the number of areas and conduct extensive research. In addition to these, they are required to make use of technology to carry out their job duties in an appropriate manner. Therefore, the internet and technology have acquired

significance to a major extent.

The integration of the internet into education has revolutionized teaching methodologies (Smith, 2016). The internet serves as an extensive repository of information, providingteachers with unrestricted access to a myriad of teaching materials, scholarly articles, and educational resources (Johnson, 2018). This accessibility empowers teachers to diversify their teaching methods and enhance curricula, thereby contributing to a more comprehensive and up-to-date educational experience for learners (Brown and Anderson, 2017). Furthermore, online platforms enable collaborative knowledge-sharing among teachers globally, fosteringa community of practice that transcends geographical boundaries (Williams et al., 2019).

In response to the increasing reliance on technology, teachers are encouraged to incorporate innovative teaching methods, including e-learning platforms and interactive multimedia, to enhance student engagement and cater to diverse learning styles (Clark and Mayer, 2016). These dynamic tools also play a crucial role in cultivating critical thinking and problem-solving skills, aligning with the evolving demands of the modern workforce (Johnson and Adams, 2019). The intertwining of technology, the internet, and education signifies a transformative shift in teaching methodologies and the establishment of a globally connected educational community. As education evolves, the internet and technology will continue to play a central role in ensuring accessibility and delivering high-quality education, thereby empowering learners andteachers alike.

2.5.1 Learning Environment

ICT is critical to the current study, it is necessary to describe it and its significance in the teaching and learning process. ICT refers to all technologies that are used to process information and communicate (UNESCO, 2012). ICTs, are technologies that allow for the electronic acquisition, storage, processing, transmission, and dissemination of information (Cavas, Karaoglan, and Kisla, 2009).

Kapur (2019) revealed that the extensive use of ICT has rendered a significant contribution to improving learning environmental conditions. Researchers have indicated that before the advent of technology when learners used to make use of pens and pencils to prepare their assignments, they experienced problems in making corrections (Mwapwele et al. 2019). In some cases, the work turned out to be untidy, as a result of scribbling. This made the teachers feel disappointed and as a consequence, learners experienced academic setbacks. Hence, it canbe stated that with

the use of ICT, learners are making use of computers and preparing their assignments in a well-organized manner. With the advent of technology, there has been an increase in rational and logical thinking among learners and teachers. According to Ramnarainand Hlatswayo (2018), teachers can put into practice the evaluation methods in an appropriate manner and assess the academic performance of learners. With extensive use of technology, individuals can achieve their academic goals.

The social dimension of the learning environment is a key area of investigation, with researchers exploring the impact of peer interactions, teacher-student relationships, and collaborative learning experiences. Wang and Eccles (2013) discuss the significance of a positive social climate in classrooms, emphasizing the role it plays in student motivation and engagement. Furthermore, studies such as those by Wentzel (2018) highlight the importance of supportive teacher-student relationships in creating a nurturing and inclusive learning environment, positively influencing learners' academic and socioemotional development.

The psychological aspects of the learning environment have also garnered attention in the literature. Research by Deci and Ryan (2000) delves into the role of autonomy, competence, and relatedness in fostering intrinsic motivation among learners. The literature suggests that environments that support learners' psychological needs contribute to a sense of ownership and engagement in the learning process. Moreover, the concept of a growth mindset, as explored by Dweck (2006), emphasizes the impact of the learning environment on shaping learners' beliefs about intelligence and their willingness to embrace challenges.

Digital technologies have introduced a new dimension to the learning environment, with a growing body of literature exploring the integration of technology in educational settings. Research by Means et al. (2013) examines the impact of technology on student learning outcomes, emphasizing the potential for personalized and interactive learning experiences. The literature also underscores the importance of equitable access to technology to avoid exacerbating existing disparities in educational opportunities (Warschauer and Matuchniak, 2010).

The literature on the learning environment underscores its multifaceted nature and its profound influence on educational outcomes. As educational settings continue to evolve, understanding and optimizing the physical, social, and psychological components of the learning environment remain crucial for creating inclusive, engaging, and effective educational spaces. Ongoing research in this field is essential to inform educational practices and policies that promote

positive learning environments for diverse student populations.

2.5.2 Network connection and accessibility to ICT resources

According to Lawrence and Tar (2018), lack of access to resources, particularly home access,is another difficult barrier that prevents teachers from integrating new technology into teaching, according to several research papers. Several research studies have identified several factors that contribute to a lack of technological access. Teachers were worried about how difficult it was to always have access to computers (Mercader, 2020). "Computers had to be booked in advance, and the teachers would forget to do so," the author explained, "or they couldn't schedule them for multiple periods in succession when they wanted to work on multiple projects with the pupils" (Lawrence and Tar 2018:78). In other words, because most ICT materials were shared with other teachers, a teacher would not have access to them.

According to Mercader (2020) and Mercader and Gairín (2020), ICT resources are not always inaccessible due to a lack of hardware, software, or other ICT items within the school. It could be due to a variety of factors, including poor resource management, low-quality hardware, incompatible software, or a lack of personal access for teachers (Mercader, 2020). Teachers have a variety of obstacles when it comes to gaining access to new technologies, which range by country. It could be due to a variety of factors, including poor resource management, low-quality hardware, incompatible software, or a lack of personal access for teachers (Mercader, 2020).

In the realm of education, researchers emphasize the significance of reliable network connections and accessible ICT resources for fostering effective learning environments. Al-Senani and AlSaif (2013) contend that a stable and high-speed internet connection is fundamental for the successful implementation of e-learning initiatives. Access to ICT resources, including computers, tablets, and online platforms, is crucial for learners to engagein digital learning modalities. The literature suggests that a lack of network connectivity and limited access to ICT resources can contribute to the digital divide, where certain demographics or regions face disparities in educational opportunities (Warschauer, 2003).

In the business context, the literature underscores the critical role of network infrastructure in facilitating communication, collaboration, and overall organizational efficiency. Authors such as Laudon (2016) discuss how businesses increasingly rely on interconnected systems, cloud computing, and robust network connections to streamline operations and enhance productivity.

Moreover, accessibility to ICT resources empowers employees to leverage digital tools for tasks ranging from data analysis to communication, thereby contributing to the competitiveness of organizations in the digital age. The impact of network connection and ICT accessibility is not limited to developed regions; it holds particular significance in developing countries. Research by Qiang and colleagues (2009) explores the transformative potential of ICT in developing economies, emphasizing the need for adequate network infrastructure and accessible ICT resources to bridge socio-economic gaps. The literature suggests that improvingnetwork connectivity and ensuring widespread access to ICT can contribute to economic development, education, and healthcare in these regions.

Challenges and barriers associated with network connection and ICT accessibility are also discussed in the literature. Issues such as digital literacy, infrastructure gaps, and socio-economic disparities are identified as impediments to achieving universal access to ICT resources (Unwin, 2009). These challenges underscore the need for comprehensive strategies that go beyond mere infrastructure development to address the broader socio-cultural and economic factors influencing ICT accessibility. The literature on network connection and accessibility to ICT resources emphasizes their integral role in shaping various aspects of contemporary society. From education to business and economic development, the availability of reliable network connections and accessible ICTresources is a cornerstone for progress. Addressing challenges and fostering inclusivity in the digital realm are critical considerations for policymakers, teachers , and business leaders aiming to harness the full potential of ICT for societal advancement.

2.6 The Internet of Things (IoT) in education

The integration of the Internet of Things (IoT) in education has garnered increasing attention in the literature as technology continues to transform various aspects of society (Ghashim and Arshad, 2023). The Internet of Things refers to the network of interconnected physical devices embedded with sensors, software, and other technologies that enable them to collect and exchange data (Kopetz and Steiner, 2022). In the realm of education, IoT applications offer promising opportunities for enhancing the learning experience, optimizing educational processes, and fostering innovation (Haleem et al., 2022).

One key area where IoT is making a significant impact in education is in the development of smart classrooms (Terzieva et al., 2022). These classrooms are equipped with IoT devices such as smart boards, interactive learning systems, and connected devices that create a more

dynamic and interactive learning environment (Haleem et al., 2022). Research by authors like Smith (2017) and Chen et al. (2018) highlighted how these technologies contribute to increased student engagement, collaboration, and personalized learning experiences.

The utilization of IoT in educational institutions also extends to campus management and resource optimization (Ghashim and Arshad, 2023). Researchers such as Gupta et al. (2019) discuss how IoT devices can be employed for monitoring and managing campus facilities, tracking attendance, and ensuring the efficient utilization of resources. This not only improves administrative processes but also contributes to cost savings and sustainability efforts (Hermundsdottir and Aspelund, 2021).

Furthermore, IoT plays a crucial role in shaping the concept of smart learning environments. Authors like Al-Fuqaha et al. (2015) emphasize how IoT facilitates the creation of adaptive and context-aware learning spaces. These environments can automatically adjust to the preferences and learning styles of individual learners, providing a more personalized and effective learning experience. Despite the potential benefits, the integration of IoT in educationis not without challenges. Security and privacy concerns, interoperability issues, and the needfor significant infrastructure investment are some of the challenges highlighted by researcherslike Perera et al. (2014) and Roman et al. (2018). Addressing these challenges is crucial for ensuring the successful and sustainable implementation of IoT in education.

The literature on the Internet of Things in education underscores its transformative potential in reshaping the learning landscape. From smart classrooms to campus management and personalized learning environments, IoT offers a range of opportunities for improving educational outcomes. However, careful consideration of challenges and the development of robust strategies are imperative to harness the full potential of IoT in the educational domain. Ongoing research and practical implementations will undoubtedly contribute to refining and expanding our understanding of how IoT can be effectively integrated into educational settings.

2.6.1 Enhancing Learning Environments through IoT Integration

The integration of the Internet of Things (IoT) into education has significantly transformed the learning environment, offering new avenues for personalized and interactive learning experiences. IoT devices such as sensors, smart boards, and wearable technologies are revolutionizing traditional classrooms into connected learning spaces. This review section delves into the impact of IoT integration on enhancing learning environments, focusing on its

benefits, challenges, and best practices in education.

2.6.1.1 Benefits of IoT Integration

One of the primary benefits of integrating IoT into education is personalized learning (Haleemet al., 2022). IoT enables teachers to tailor learning experiences to meet individual student needs (Ghashim and Arshad, 2023). By collecting data on student interactions and progress, teachers can adapt teaching methods and content to cater to diverse learning styles and preferences (Kopetz and Steiner, 2022). Another significant benefit is enhanced student engagement (Kler, 2014). The researcher assumes that IoT create interactive and stimulating learning experiences. For example, smart boards allow learners to interact with digital content, while wearable technologies can track student movements and provide real-time feedback, keeping learners actively engaged in their learning. IoT integration also leads to improved resource management (Ghashim and Arshad, 2023). IoT can help schools optimize resource allocation by using sensors to monitor classroom occupancy and adjust lighting and heating systems accordingly, thus reducing energy consumption and costs (Bhowmik and Tiwari, 2020). Additionally, IoT fosters collaborative learning among learners and teachers (Kopetzand Steiner, 2022). IoT-enabled devices facilitate group projects by enabling learners to shareresources and collaborate on assignments in real-time, promoting a collaborative and inclusivelearning environment (Madni et al., 2022).

2.6.1.2 Challenges of IoT Integration

Despite its benefits, integrating IoT into education poses several challenges. One major challenge is privacy and security concerns (Madni et al., 2022). IoT devices collect vast amounts of sensitive data, raising concerns about data privacy and security (Kopetz and Steiner,2022). Schools must implement robust security measures to protect student data from cyber threats.

Infrastructure and connectivity issues are also significant challenges. IoT relies on a strong network infrastructure and reliable internet connectivity (Ghashim and Arshad, 2023). Schools in remote or underserved areas may struggle with IoT implementation due to limited infrastructure (Haleem et al., 2022). Cost and maintenance are other challenges of IoT integration (Madni et al., 2022). Implementing IoT requires significant investment in devices, infrastructure, and maintenance (Kopetz and Steiner, 2022). Schools must carefully budget for these costs to ensure sustainable IoT integration. Moreover, educator training is crucial for successful IoT integration (Bingimlas, 2009). Many teachers may lack the necessary skills and

training to effectively use IoT devices in their teaching practices, hindering successful integration into the curriculum.

2.6.1.3 Best Practices for IoT Integration

To overcome the challenges mentioned in the previous section, several best practices can be employed. Research shows that one of the best practices is to have a clear strategy for IoT integration, aligning it with educational goals and curriculum objectives (Ghashim and Arshad, 2023). Professional development programs can help teachers develop the necessary skills to integrate IoT into their teaching practices effectively (Kopetz and Steiner, 2022). Schools should also collaborate with technology providers, teachers , and learners to ensure successful IoT integration, involving stakeholders in the decision-making process and gathering feedbackto improve implementation (Al-Masri and Shahrour, 2018).

IoT integration offers numerous benefits for enhancing learning environments. By providing personalized learning experiences, enhancing student engagement, and improving resource management, IoT can be a best practice for integration as it can transform traditional classrooms into dynamic and interactive learning spaces (Kopetz and Steiner, 2022). By following best practices and strategic planning, schools can harness the full potential of IoT tocreate innovative and effective learning environments for learners. Best practices for integrating IoT into systems include prioritizing security through authentication and encryption, ensuring scalability for growth, choosing interoperable devices, managing data efficiently and securely, building reliability with failover mechanisms, optimizing performance, enhancing user experience, implementing monitoring and maintenance processes, complying with regulations, and continuously improving based on feedback and emerging technologies (Cheruvu et al., 2020).

2.7 ICT teaching and learning in developed and developing countries

ICT permeates daily activities, including work, leisure, and education, serving as a crucial support tool in various environments. (Lawrence, and Tar 2018). Technology is becoming a fundamental part of today’s learning environments each day, and researchers as well as practicing teachers are constantly exploring new ways in which technology can help facilitate learning (Mathevula and Uwizeyimana, 2017). According to Mercader et al., (2020) there's been

an exponential growth in the use of information and communication technology (ICT) in education in developed countries. While ICT has been in rapid growth in developed countries, its use remains in a state of fluidity and its integration into the school curriculum remains significantly underdeveloped, however, in developing countries (Makewa, Meremo, and Role, 2013).

According to Amutha (2020) education planners agree that giving learners more exposure to educational ICT through curriculum integration has had a considerable and highly beneficial impact on their academic performance. Its exposure improved their knowledge, comprehension, practical skills, presentation skills, and innovative capabilities to a great extent. It empowered and enhanced the ability, adaptability, knowledge, and survival skills of learners and teachers (Amutha, 2012). Its instructional use improved the progress and development of faculty and learners alike.

Tinio (2003) supports that ICT plays ICT significantly contributes to the development, improvisation, and implementation of social, economic, political, and educational policies as well as to the expansion of educational opportunities for learners and teachers. A comparison of three countries, namely: Canada, Kenya, and South Africa is made in the following discussion. Canada's ICT education is representative of a developed country; Kenya's ICT policy is representative of a Third World country; and South Africa's ICT in education policy is representative of a developing country, with a concentration on Tshwane West district schools (Atabek, 2020).

According to the latest insights mentioned by Raja and Naga Subramani (2018), modern learners of today prefer to use technology and how their learning is impacted if they use technology, it was revealed that the use of modern equipment technology, and tools, the learning and interactivity of learners increases. They also find it much more interactive, as well as full of interesting areas, when aided by technology. The transfer of knowledge becomes very easy and convenient, as well as effective. What this means is, that our minds now tend to work faster when assisted with the use of modern technology, be it any part of life, here we talk about education. The reliance and dependence on such innovation, which simply makes life an easy, smooth journey is completely unavoidable these days even in schools, universities, and colleges.

Impact of ICT on education context, ICT has the potential to increase access to education and improve its relevance and quality. Raja and Naga Subramani (2018) asserted that ICT has a tremendous impact on education in terms of the acquisition and absorption of knowledge to both teachers and learners through the promotion of:

- **Active learning:** ICT tools help with the calculation and analysis of information obtained for examination and also learners' performance reports are being computerized and made easily available for inquiry. In contrast to memorization-based or rote learning, ICT promotes learner engagement as learners choose what to learn at their own pace and work on real-life situations and problems.
- **Collaborative and Cooperative learning:** ICT encourages interaction and cooperation among learners, and teachers regardless of the distance which is between them (Haleem et al., 2022). It also provides learners the chance to work with people from different cultures and work together in groups, hence helping learners to enhance their communication skills as well as their global awareness (Ghavifekr et al., 2016). Researchers have found that typically the use of ICT leads to more cooperation among learners within and beyond school and there exists a more interactive relationship between learners and teachers (Ogbomo, 2011). "Collaboration is a philosophy of interaction and personal lifestyle where individuals are responsible for their actions, including learning and respect the abilities and contributions of their peers" (Laal et al., 2012).
- **Creative Learning:** ICT promotes the manipulation of existing information and the creation of one's knowledge to produce a tangible product or a given instructional purpose (Kim et al., 2022).
- **Integrative learning:** ICT promotes an integrative approach to teaching and learning, by eliminating the synthetic separation between theory and practice unlike in the traditional classroom where emphasis encloses just a particular aspect (Kler, 2014).
- **Evaluative learning:** The use of ICT for learning is student-cantered and provides useful feedback through various interactive features. ICT allows learners to discover and learn through new ways of teaching and learning which are sustained by constructivist theories of learning rather than learners' memorization and rote learning (Alt, 2018).

ICT has revolutionized teaching methods by introducing interactive and engaging approaches that capture learners' attention and promote a deeper understanding of the subject matter (Haleem et al., 2022). Through software demonstrations, videos, cartoons, and simulations, abstract concepts are brought to life, making learning more enjoyable and memorable (Abdulrahaman et al., 2020). These multimedia tools enable learners to visualize complex ideas, leading to better comprehension and retention of information. Additionally, ICT provides opportunities for interactive learning experiences, where learners can actively participate in the learning process through quizzes, games, and online discussions. Overall, ICT has transformed the learning environment, making it more dynamic and stimulating for learners (Nadeem et al., 2023).

2.8 Sustainable Development Goal 4 (Quality Education)

The pursuit of Quality Education, as outlined in Sustainable Development Goal 4 (SDG 4), has become intricately linked with the effective integration of ICT in educational practices (Lim et al., 2022). A substantial body of literature explores how the strategic use of ICT can contribute to achieving the objectives of SDG 4, emphasizing not only access to education but also the enhancement of learning experiences, teacher capacity, and educational outcomes (Saini et al., 2023).

ICT in education is viewed as a catalyst for transforming traditional teaching methodologies. Research by UNESCO (2017) and Trucano (2005) underscores the potential of ICT in creating interactive and engaging learning environments. Digital technologies, including computers, tablets, and interactive whiteboards, offer opportunities for personalized learning, allowing learners to progress at their own pace and catering to diverse learning styles (Westera et al., 2018). This adaptability is particularly crucial in achieving quality education that responds to the individual needs of learners.

The literature highlights the role of ICT in enhancing teacher professional development, a critical component for achieving quality education. Bocconi and Kampylis (2016) emphasize that teachers need support in integrating ICT effectively into their pedagogical practices. Professional development programs that focus on ICT skills empower teachers to create dynamic and innovative learning experiences, fostering a positive impact on student outcomes (Hennessy et al., 2014).

Furthermore, the use of ICT contributes to the creation of inclusive learning environments. As noted by MacBride and Ansine (2019), ICT tools can be leveraged to address diverse learning needs, making education more accessible for learners with disabilities. This inclusivity aligns with the broader vision of SDG 4 to ensure that education is equitable and reaches all segments of the population. The literature also emphasizes the potential of ICT in providing access to quality educational resources. Open Educational Resources (OER) and online platforms enable learners and teachers to access a wealth of information, facilitating independent learning and research (Weller, 2018). The democratization of information through ICT contributes to a more enriched and comprehensive educational experience.

Despite the evident benefits, challenges related to the implementation of ICT in education are also discussed in the literature. Issues such as the digital divide, infrastructural limitations, and the need for teacher training are acknowledged as barriers to achieving quality education through ICT (Hatakka et al., 2018). Addressing these challenges is crucial for ensuring that the benefits of ICT are accessible to all, aligning with the inclusive principles of SDG 4. The literature strongly supports the idea that the strategic use of ICT in education is a key driver for achieving quality education as outlined in SDG 4. From personalized learning experiences and teacher professional development to inclusive education and access to educational resources, ICT plays a transformative role in shaping the future of education. Continued research, innovative practices, and targeted policy interventions are essential to harness the full potential of ICT in advancing the global agenda for quality education.

2.9 ICT teaching and learning in Kenya

The Kenyan government emphasized ICT use in its ICT for Accelerated Development (ICT4AD) policy to bridge the digital divide between Kenya and the developed world. The primary goal of ICT in education is to improve the quality of education and training while also making the educational system more responsive to the demands and requirements of the economy and society, with a focus on the development of an information and knowledge-based economy and society (Kenyaian MoE, 2015; Kenya MoE, 2008; Mangesi, 2007). As a result, the Kenyan Ministry of Education places a greater emphasis on “introducing ICTs at the pre-tertiary level to improve teaching and learning, as well as imparting ICT skills to all learners to prepare the youth for future ICT careers” (Kenya MoE, 2015).

The literature on ICT in teaching and learning in Kenya provides valuable insights into the opportunities, challenges, and impacts associated with the integration of digital technologies into the educational sector. Researchers have explored various aspects, including the role of ICT in pedagogy, the digital divide, policy frameworks, and the overall effectiveness of technology-enhanced learning. A significant focus of the literature is the transformative potential of ICT in reshaping pedagogical practices in Kenya. Studies, such as those by Komba and Nkuyubwatsi (2010) and Githua and Kiggundu (2014), emphasize the role of digital technologies in creating interactive and student-centered learning environments. ICT tools, including computers, tablets, and interactive whiteboards, have the capacity to engage learners in diverse and dynamic ways, fostering critical thinking and collaborative learning (Ondigi, 2016).

The literature also delves into the digital divide in the Kenyan context, examining disparities in access to technology across different regions and socioeconomic backgrounds. Research by Chepkoech and Misigo (2015) highlights the challenges faced by schools in marginalized areas, where inadequate infrastructure and limited access to devices contribute to a digital divide. Bridging this gap is crucial for ensuring that all learners, regardless of their geographical location, have equal access to the benefits of ICT in education. Policy frameworks governing ICT in education are a central theme in the literature. The Kenyan government's commitment to integrating technology in education is evident in policies such as the Kenya Institute of Curriculum Development (KICD) Digital Learning Programme (Republic of Kenya, 2017). Researchers, including Misigo and Kiggundu (2017), discuss the importance of clear and comprehensive policy frameworks to guide the strategic implementation of ICT in teaching and learning.

The effectiveness of technology-enhanced learning in Kenya is a subject of ongoing research. Studies by Simiyu (2015) and Keengwe et al. (2017) explore the impact of ICT on student performance, highlighting positive correlations between technology integration and academic achievement. However, challenges such as teacher preparedness, infrastructure limitations, and the need for sustainable models of ICT implementation are acknowledged as factors influencing the overall effectiveness of digital learning initiatives (Kombo and Misigo, 2018).

The literature also underscores the importance of teacher training and professional development in maximizing the benefits of ICT in Kenyan classrooms. Njagi and Mugambi (2014) emphasize the need for ongoing training programs to enhance teachers' digital literacy

skills and pedagogical strategies. Effective teacher preparation is considered a key factor in ensuring that teachers can integrate technology seamlessly into their instructional practices (Republic of Kenya, 2017). The literature on ICT in teaching and learning in Kenya provides a comprehensive understanding of the current landscape, challenges, and potentials associated with the integration of digital technologies in education. The transformative impact of ICT on pedagogy, the imperative of addressing the digital divide, the role of policy frameworks, and the ongoing efforts to enhance teacher preparedness are key areas of focus. As Kenya continues to navigate the digital age, continued research, policy refinement, and strategic investments will be crucial for realizing the full potential of ICT in shaping the future of education in the country.

2.9.1 Implementation of ICT for teaching and learning in Kenya (under Kenya)

Since network theory emphasizes the use of ICTs and diverse techniques to gain knowledge in order to empower society's members, there are obstacles to the network society's development. These are primarily poverty-related obstacles that prevent some countries from using the network. According to Mlitwa and Koranteng (2013) the majority of schools in rural areas lack electricity and computer facilities. Those who have one or two computers are using them for administrative purposes rather than instructional purposes.

Teachers are technologically phobic, lack skills, and lack confidence. Some urban schools with ICT infrastructure are failing to teach learners how to use computers and other available ICTs. This is demonstrated by Moll and Ndlovu (2010), who discovered that one of the schools chosen for their study employs a full-fledged computer lab as a regular classroom, and the teacher's teachings do not include any ICT. The transformative potential of ICT in reshaping pedagogical practices is a key focus in the literature. Studies, such as those by Chepkoech and Misigo (2015) and Komba and Nkuyubwatsi (2010), emphasize the capacity of digital technologies to create interactive and student-centered learning environments. ICT tools, ranging from computers to tablets and interactive whiteboards, offer opportunities for innovative teaching methods that engage learners in dynamic ways, promoting critical thinking and collaborative learning (Ondigi, 2016).

One prominent theme in the literature is the digital divide in the Kenyan context. Researchers, including Githua and Kiggundu (2014), explore the disparities in access to technology across different regions and socioeconomic backgrounds. Challenges in marginalized areas, such as

inadequate infrastructure and limited access to devices, contribute to a digital divide that can impact the equitable distribution of educational resources. Addressing these disparities is crucial for ensuring that the benefits of ICT are accessible to all learners, regardless of their geographical location (Misigo and Kiggundu, 2017).

Policy frameworks governing ICT in education are examined in the literature. The Kenyan government has shown commitment to technology integration through policies like the Kenya Institute of Curriculum Development (KICD) Digital Learning Programme (Republic ofKenya, 2017). Researchers, including Simiyu (2015), discuss the significance of clear and comprehensive policy frameworks to guide the strategic implementation of ICT in teaching and learning, emphasizing the need for policies that are adaptable to the evolving technological landscape.

The effectiveness of technology-enhanced learning in Kenya is a subject of ongoing research. Studies by Keengwe et al. (2017) and Kombo and Misigo (2018) explore the impact of ICT on student performance, highlighting positive correlations between technology integration and academic achievement. However, challenges such as teacher preparedness, infrastructure limitations, and the need for sustainable models of ICT implementation are acknowledged as factors influencing the overall effectiveness of digital learning initiatives. Teacher training and professional development are crucial components discussed in the literature. Njagi and Mugambi (2014) emphasize the need for ongoing training programs to enhance teachers' digital literacy skills and pedagogical strategies. Effective teacher preparation is considered a key factor in ensuring that teachers can integrate technology seamlessly into their instructional practices, contributing to the successful implementation of ICT in classrooms (Republic of Kenya, 2017).

The literature on ICT for teaching and learning in Kenya provides a comprehensive overview of the opportunities and challenges associated with the integration of digital technologies in education. As Kenya continues to navigate the digital age, ongoing research, policy refinement, and strategic investments will be essential for realizing the full potential of ICT in shaping the future of education in the country.

2.10 ICT policy in South African schools

The literature surrounding ICT policy in South African schools reflects a dynamic landscape shaped by the country's commitment to educational development and technological integration

(Haleem et al., 2022). Researchers have explored various dimensions of ICT policy, addressing issues such as infrastructure development, teacher training, digital resources, and the overall impact on educational outcomes (Madni et al., 2022; Raman and Yamat, 2014).

Infrastructure development is a central theme in the literature on ICT policy in South African schools. According to Ng'ambi (2013), challenges related to inadequate infrastructure, including unreliable connectivity and insufficient access to devices, hinder the effective implementation of ICT policies. Addressing these challenges is crucial for ensuring that schools have the necessary technological foundations to integrate ICT into teaching and learning. Teacher training and professional development emerge as critical aspects of successful ICT policy implementation. Research by Botha (2014) emphasizes the need for comprehensive training programs to equip teachers with the skills and confidence to integrate ICT into their pedagogical practices. The literature underscores that effective teacher training is essential for maximizing the potential of ICT in enhancing classroom instruction and student engagement (Tladi, 2015).

Digital resources and content play a significant role in the success of ICT policies in South African schools. Molaodi (2016) discusses the importance of aligning ICT policies with the development and dissemination of relevant, context-specific digital content. Access to high-quality digital resources is crucial for enriching the curriculum, supporting diverse learning styles, and promoting interactive and student-centered learning experiences. The literature also addresses issues related to equity and accessibility in the implementation of ICT policies. Research by Chigona et al. (2013) highlights disparities in access to ICT resources among schools in different socio-economic contexts. Ensuring equitable access to technology is essential for preventing the exacerbation of existing educational inequalities and promoting inclusive education in line with national goals (Dzvimbo et al., 2015).

In addition to the challenges, the literature explores success stories and best practices in the implementation of ICT policies in South African schools. Research by Mavhandu-Mudzusi and Flo (2015) highlights instances where schools have effectively leveraged ICT to enhance teaching and learning outcomes, providing valuable insights for policy-makers and teachers .

Despite the progress made, the literature acknowledges ongoing challenges and the need for continuous policy refinement. Venter (2018) discusses the dynamic nature of technology and the importance of adapting ICT policies to keep pace with advancements. Flexibility and

responsiveness in policy frameworks are crucial for ensuring that South African schools remainat the forefront of educational innovation and technological integration.

The literature on ICT policy in South African schools reflects the evolving nature of the educational landscape. Infrastructure development, teacher training, digital resources, and issues of equity are central themes in the discourse. Continuous research, informed policymaking, and a commitment to addressing challenges are essential for realizing the full potential of ICT in South African education and aligning with broader national and global goals for educational development.

2.11 ICT for teaching and learning in South Africa

In South Africa, ICTs play a crucial role in transforming education and enhancing teaching and learning experiences. The integration of ICTs in education has been recognized as a key strategy to improve access to quality education, enhance teacher effectiveness, and prepare learners for the digital age. This literature discussion explores the current landscape of ICT forteaching and learning in South Africa, including its benefits, challenges, and future prospects.

The use of ICT in teaching and learning in South Africa offers numerous benefits (Ghavifekr et al., 2016). One of the primary advantages is improved access to educational resources (Cheruvu et al., 2020). ICTs enable learners to access a wide range of educational materials, including online textbooks, educational videos, and interactive simulations, which can enhance their learning experience (Chigona, 2012). Additionally, ICTs can help overcome geographical barriers, particularly in remote and underserved areas, by providing access to educational resources that would otherwise be unavailable (Pimmer, 2014). Furthermore, ICTs can enhance teaching effectiveness by providing teachers with tools to create engaging and interactive learning experiences. For example, interactive whiteboards, educational software, and online collaboration tools can help teachers create dynamic and personalized lessons that cater to diverse learning styles (Govender, 2016). This can lead to increased student engagement and motivation, resulting in improved learning outcomes (Makoe, 2018).

ICTs also have the potential to improve administrative efficiency in education. For instance, electronic attendance systems, digital assessment tools, and online communication platforms can streamline administrative processes and reduce paperwork, allowing teachers to focus more on teaching and learning (Adebesin, 2017). Despite the benefits, the integration of ICTsin teaching and learning in South Africa faces several challenges. One of the main challenges

is the digital divide, which refers to the gap between those who have access to ICTs and those who do not. In South Africa, the digital divide is particularly pronounced in rural and underserved areas, where access to ICT infrastructure and resources is limited (Chigona, 2012). This lack of access can hinder learners' ability to benefit from ICT-enabled learning opportunities. Another challenge is the lack of adequate ICT infrastructure and resources in schools (Madni et al., 2022). Many schools in South Africa lack sufficient ICT equipment, such as computers,tablets, and internet connectivity, which can limit the implementation of ICT-enabled teachingand learning initiatives (Pimmer, 2014). Additionally, there is a shortage of qualified ICT teachers and teachers who are proficient in using ICTs for teaching and learning (Govender, 2016). This can hinder the effective integration of ICTs into the curriculum.

Furthermore, there are challenges related to the integration of ICTs into the curriculum and pedagogy. Teachers may lack the necessary skills and training to effectively integrate ICTs into their teaching practices, leading to ineffective use of ICTs in the classroom (Makoe, 2018). Additionally, there is a need for curriculum reform to ensure that ICTs are integrated in a meaningful and relevant way across all subjects and grade levels (Adebesin, 2017). To overcome these challenges and enhance the use of ICTs for teaching and learning in SouthAfrica, several strategies can be employed. One strategy is to invest in ICT infrastructure and resources in schools, particularly in rural and underserved areas. This includes providing schools with computers, tablets, and internet connectivity, as well as training teachers on howto use ICTs effectively (Chigona, 2012).

Another strategy is to provide ongoing professional development and support for teachers to enhance their ICT skills and pedagogical practices. This can include training programs, workshops, and mentoring initiatives that focus on integrating ICTs into the curriculum and teaching practices (Pimmer, 2014). Furthermore, there is a need for collaboration and partnerships between government, education institutions, and the private sector to support the integration of ICTs in education. This includes developing policies and guidelines for ICT integration, as well as providing funding and resources for ICT initiatives (Govender, 2016).

ICTs are seen as a resource for reorganizing schooling and a tool for whole-school development by the South African government, through the DBE and the Provincial Departments of Education, particularly the GDE (DBE, 2004:8). For this purpose, Goal 1 (GDE, 2007:14) of

the GDE eLearning policy encapsulates the improvement of teaching and learning through the use of ICTs. The goal is to increase access to learning opportunities, reduce inequities, improve learning and teaching quality, and provide lifelong learning in Gauteng. Whilst learning on international platforms is beneficial to social growth, the study's researcher believes that it may pose a challenge because acquiring knowledge generated in other cultures may conflict with local material and values (Atabek, 2020). Despite cultural differences in learning, connectivism occurs when both the cognitive and affective domains are used, as cognition and emotions both play a role in the learning act.

The ICT in education policies of Canada, Kenya, and South Africa were studied, not to compare the three nations, but to lay the groundwork for effective integration and to see how ICTs are used in the three countries. Table 2.1 shows the policies of these three countries regarding ICT in education.

Table 2: Summary of Education Legislation and Policies

Policy stipulations	**Canada**	**Kenya**	**South Africa**
Rationale for ICT integration in teaching and learning	• Preparing learners for successin an ever-changing and digitalworld. • Providing opportunities forlearners to buildICT skills that will benefit themin their educational careers, personallives, and professional lives. • Children and teenagers are encouraged to befuture designers who are both imaginative and critical.	• ICTs are beingused to help Kenya overcome the digital divide with the rest ofthe globe. • Economic andsocietal development based on information. • Learners and teachers will be able to participate in new ways of acquiring and analyzing knowledge as a result of the creation of opportunities for them to do so.	• ICT is a tool forwhole-school development and a resource for reorganizing schooling. Increasing access to learning opportunities, addressing disparities, improving learning and teaching quality,and offering lifelong learningare all goals.
Policy stipulations	**Canada**	**Kenya**	**South Africa**
ICT Infrastructure	• Non-textual approaches are recommended. Toprovide new teaching opportunities and successful learning in all parts of school life, suitable ICT resources must bemade available.	• All Kenyaian schools have ICT facilities, according to the Kenyan Ministry ofEducation.	• GDE set up computer labs and offered tablet computers, butthey are insufficient forlearners and teachers. • Tablets are notbeing used by professors or learners.
Internet access	• For informationand communication,learners have access to the intranet and the internet.	• Internet accessis provided bythe Kenyan Ministry of Education.	• The GDE established GoL for the provisionof internet connections. • Tablets have internet connectivity
School principals asICT leaders	• Principals play an important role in ensuringthe success of ICT integrationin schools. For the relevant information, use the online Head Teacher Toolkit. • Other local structures are established to aid in the development ofICT use within the school. • The formulation ofa school-basedICT policy is the responsibility of the principals.	• ICT leadership skills are lacking among principals. • There is no clearpolicy direction. • There are no ICT policies inplace at the school level.	• Several school principals lack the necessary abilities to serveas role models for ICT leadership in their schools. • There is a scarcity of school-basededucation policy.
Policy stipulations	**Canada**	**Kenya**	**South Africa**

Role of teachers	• Teachers are critical to the successful implementationof ICT in teaching and learning.	• Teachers are recognized as crucial players in the integration of ICT for teaching and learning, but amajor obstacle is ashortage of ICT skills among teachers.	• Teachers are responsible for integrating ICTs; but, manyteachers lack sufficient ICT skills.
Professional development	• Teacher development is carried out to helpteachers acquire ICT skills for use in the classroom and to keep them informed about emerging technologies.	• Professional development programs are few.	• Education policy on ICTs emphasize programs for teachers' professional development however negative attitudes toward ICTs and the tendency to cling • Teachers are hesitant to use ICT in their classrooms because of theiraversion to traditional teaching methods.
Human capital	• Teachers, education authorities, support workers, and parents all play a role in ensuring that learners gain ICT skills that will enable them to find work even ifthey drop out of school.	• To achieve the successful integration of ICT in education, all stakeholders areencouraged to work together. • ICT coordinators' inability to maintain ICT equipment and provide help toteachers,	• To ensure successful integration of ICTs in teachingand learning, all stakeholders are expected to work together.
Policy stipulations	**Canada**	**Kenya**	**South Africa**
		learners, and administrators	

In Canada, the rationale for ICT integration in teaching and learning is to prepare learners for success in an ever-changing and digital world (D'Angelo, 2018). The focus is on providing opportunities for learners to build ICT skills that will benefit them in their educational careers, personal lives, and professional lives. There is an emphasis on encouraging children and teenagers to be future designers who are both imaginative and critical (Haleem et al., 2022). The policy stipulates that suitable ICT resources must be made available to provide new teaching opportunities and successful learning in all parts of school life.

In Kenya, the rationale for ICT integration in teaching and learning is to help the country overcome the digital divide with the rest of the globe (Kerkhoff and Makubuya, 2022). There isa focus on economic and societal development based on information. The policy aims to create opportunities for learners and teachers to participate in new ways of acquiring and analysing knowledge. All Kenyan schools have ICT facilities, and internet access is provided by the Kenyan Ministry of Education. However, there is a shortage of ICT skills among teachers, which hinders the successful integration of ICT in education.

In South Africa, the rationale for ICT integration in teaching and learning is that ICT is a tool for whole-school development and a resource for reorganizing schooling. The goals include increasing access to learning opportunities, addressing disparities, improving learning and teaching quality, and offering lifelong learning. The policy emphasizes the role of school principals as ICT leaders but notes that many principals lack the necessary abilities to serve as role models for ICT leadership in their schools. Professional development programs for teachers are emphasized, but negative attitudes toward ICTs and the tendency to cling to traditional teaching methods are cited as obstacles to ICT integration. All stakeholders are expected to work together to ensure the successful integration of ICTs in teaching and learning. In summary, while all three countries recognize the importance of ICT integration in education, each faces its own set of challenges, including a shortage of ICT skills among teachers, infrastructure issues, and the need for clear policy direction and leadership. However, by addressing these challenges and working together, all stakeholders can ensure the successful integration of ICTs in teaching and learning, ultimately benefiting learners and preparing them for success in a digital world.

The justification for diverse ICT policies in teaching and learning focuses on the development of active, creative, knowing, and ICT-skilled learners who would be able to function in the knowledge society. The relevance of teacher's and principals' vital roles is obvious in the Canadian education system, where training and professional development are sufficiently considered and executed in accordance with the country's ICT in education policy (Mwila, 2018). Although principals and teachers in Kenya and South Africa are enthusiastic about integrating ICTs into teaching and learning, a lack of ICT skills and relevant knowledge in terms of how to institute and support ICT use in schools indicates that workshops and an online toolkit for principals are required.

According to Mthethwa (2018) teachers should be required to participate in communities of practice in order to build the skills and confidence necessary for ICT integration and to be able to implement the country's ICT in education policy. Learners are seen as key stakeholders in the use of ICTs in teaching and learning, and ICTs in schools are designed to support and motivate them in their quest for knowledge, social growth, and job readiness (Mwila, 2018).

2.11.1 ICT infrastructure in South African schools

South Africa is categorized/classified as a developing country, with a high level of educational backlog in schools and a shortage of teachers , especially in the field of Mathematics and Science (Mogano, 2014). Despite the above-mentioned challenges, unfortunately, every year in South African schools when the first term of learning commences, many schools do not have enough study material while others do not have enough teachers (Singh, 2017).

Technology is such a big part of the world in which we live. According to Costley (2014), in the present times, many of the jobs that did not require technology use in years past do require the use of technology today. Dlamini and Mbatha (2018), support that even many more homes have computers than in years past and increasing numbers of people know how to use them. Technology is being used by children and adults daily by way of web surfing, texting, social networking, interactive games, and more ways (Mukhari, 2016). We are an evolving technological society, and in many ways, have become dependent on its use. Therefore, the use of technology for teaching and learning has become a high priority in public schools (Costley, 2014). Strydom, Wessels, and Anley (2021) assert that the conveyance of education and/or curriculum in South African schools is shifting from traditional practice to a digital format of delivery using available technology. However, without Information and Communication

Technology (ICT) infrastructure sufficiency, benefits have the likelihood of not being satisfactory and the probability of failure in adopting ICT will be high (Mosa, Mahrin and Ibrahim, 2016).

The extent of the uses of ICT may be described as, Information and Communication Technologies (ICT) broadly defined as technologies used to convey, manipulate, and store data by electronic means. This may include e-mail, SMS text messaging, video chats (such as Skype, Zoom, Teams), and online social media (e.g., Facebook, WhatsApp, Twitter, Instagram). It also includes all different computing devices (e.g., laptops, desktops, and smartphones) that carry out a wide range of communication and information functions. All these electronic tools constitute "Information and Communication Technology" (ICT) and arefurther used to convey and store information (Perron, Taylor, Glass and Margerum-Leys, 2010:67).

The existence of a wide variety of ICT suggests that Information Communication Technology goes far beyond computers and the internet or even telephony (Perron et al, 2010). However, considering that this research is conducted in a developing country, South Africa, where schools, specifically those in rural areas are still struggling to get even the basic infrastructure. There is a need to bring about improvements in the level of ICT infrastructure in schools, primarily in rural areas. It is unfortunate that in rural communities, learners experience setbacks and encounter barriers during the course of the achievement of academic goals (Kapur, 2019).

Some researchers are of the view that the learners in their lower grades are unable to read for meaning, unable to solve numerical problems, involving basic division, and so forth (Strydom, Wessels and Anley 2021). Mathevula and Uwizeyimana (2014), support this argument and assert that these problems are developing within the system of education due to inadequate teaching and learning methods and instructional strategies. Dube (2020) mentions that another major cause is that, in rural schools, teachers are making use of traditional teaching methods and ICT has not been put into operation. Kapur (2019) further states that, when teachers would not make use of modern and innovative methods, then it is apparent that they would encounter barriers in the course of performing their duties effectively and achieving academic goals. Therefore, the use of ICT in education in urban as well as rural communities is very crucial.

According to (Mukhari, 2016), teachers are often impressed by basic ICT infrastructure, which includes PCs, tablets, educational software incorporated in the tablets, a projector, and in some

schools, a television set, as well as internet connectivity. For all learners enrolled in a school, basic ICT infrastructure is insufficient. According to Mooketsi and Chigona (2014), the ratio of learners to computer access unavoidably leads to intermittent use of technology. As a result, neither teachers nor learners receive the essential exposure to literacy or the incorporation of ICTs into teaching and learning.

The GDE eLearning policy (GDE 2007:5) push to bring ICT into the classroom is being undermined by a lack of money and non-payment of school fees (Themane and Thobejane, 2019). According to Ramoroka (2021), the former Gauteng MEC of Education Mr. Panyasa Lesifi was determined to convert Gauteng schools into paperless schools by giving computer tablets to augment and enhance teaching and learning and raise educational standards. These changes are also driven by a desire to produce learners who can read, write, and calculate, allowing South African learners to compete with those in the most developed countries (Msila, 2015).

It is indicated that the ICT culture in schools should be improved by using ICT among teachers in terms of training (Hussain, Morgan, and Al-Jumeily, 2011). Department of Basic Education (2016) the main goal of ICT implementation in education proclaimed the vision and missions of the government to promote ICT in education for the following intentions:

1. To surround schools with dynamic and innovative learning environments for learners to become more motivated and creative;
2. To enable learners to gain a wider range of knowledge and be able to access the internet for developing a global outlook;
3. To nurture learners with capabilities of processing information more effectively and efficiently; and
4. To develop learners with attitudes and capability of life-long learning.

In South African schools, particularly those located in rural areas, persistent challenges such as educational backlog, a shortage of teachers in critical subjects, and inadequate study materials continue to hinder the quality of education (Msila, 2015). While there is a noticeableshift from traditional to digital education delivery methods, the lack of sufficient ICT infrastructure remains a major obstacle. Despite ICT encompassing a wide array of tools beyond computers and the internet, the absence of basic infrastructure impedes effective

teaching and learning, particularly in rural communities. This deficiency leads to learners facing setbacks due to outdated teaching methods and limited exposure to ICTs.

Efforts to introduce ICT into classrooms, as outlined in the Gauteng Department of Education (GDE) eLearning policy, are hampered by financial constraints and the non-payment of school fees. Despite the commitment to create paperless schools and enhance educational standards, challenges persist in realizing this vision. Improving the ICT culture requires comprehensive teacher training, aligning with the government's objectives to create dynamic learning environments, foster global perspectives, enhance information processing skills, and instill attitudes of lifelong learning among learners (Perron et al., 2010). The journey toward effective ICT integration in South African schools necessitates addressing infrastructure gaps, financial constraints, and the need for comprehensive teacher training.

While there is a clear move towards integrating ICT into South African schools, particularly in rural areas, significant challenges remain. These challenges, including educational backlog, a shortage of critical subject teachers , inadequate study materials, and insufficient ICT infrastructure, hinder the effective implementation of digital education methods. Addressing these challenges requires a multi-faceted approach that includes improving infrastructure, addressing financial constraints, and providing comprehensive teacher training to ensure the successful integration of ICT into teaching and learning practices.

2.12 The integration of ICT for teaching and learning in South Africa

The MEC of Education in Gauteng Province started a project of integrating ICT in teaching and learning (Dlamini, 2022). However, the success of integrating ICTs in teaching and learning is contingent on teachers having the right attitude toward the innovations; otherwise, the project will fail, as was the case with the Gauteng Online (GoL) project, which was established to provide schools in Gauteng with computers and internet connectivity to improve teaching and learning (Sukazi and Ntshingila, 2013:1). The use of ICTs in teaching and learning is becoming increasingly popular around the world. Information Communication Technology (ICT) integration in the classroom is often viewed as a solution to resolving South Africa's education challenge (Padayachee, 2017). According to Oladosu (2012), teachers' attitudes play an important role in the teaching and learning process that utilizes computers and Internet connections. Apart from teachers’ lack of capacity and attitude towards the concept of ICT

usage, poor infrastructure remains a major obstacle in many developing countries(Ratheeswari, 2018).

To build an effective ICT learning environment, a lot of things need to be prepared, such as the readiness of technology, the readiness of educational institutions, and the readiness of the community. These preparations are important because they will affect the quality of ICT programs when implemented (Maulinda and Lo, 2013). Dube (2020) is of the view that while other countries have passionately integrated technology (such as computers), others have guardedly welcomed it whilst some have outrightly rejected it. The resistance to the acceptance of ICT in the classroom is often said to be primarily based on the "risk of teachers losing influence over the values and directions of classroom activity" (Ramnarain and Hlatswayo, 2018:67). The motivation and confidence to integrate ICT in teaching and learning could only come from having access to ICT equipment and possessing the required ICT skills (Mikre, 2011).

A survey in the USA by the National Centre for Education Statistics (NCES) using the Fast Response Survey System (FRSS) revealed that 99% of full-time regular public-school teachers had access to computers or the internet in their schools, which is a dream still for many schools in developing countries such as South Africa (Makewa, Meremo, and Role, 2013). Many countries (including developing countries such as South Africa) have increased the number of computers in schools in recent years or have plans (such as the Teacher Laptop Initiative in South Africa and Kenya) to increase teachers' and learners' access to computers.

Naturally, the use of ICT in teaching, learning, and managing educational institutions, just like any other innovation, compels the emergence of a new set of skills, attitudes, and pedagogical approaches that require continuous training programs to build sufficient capacity among teachers, developers, teachers and administrators (Rwanda Ministry of Education, 2008). This means that, while most schools (especially in developed countries, and relatively in urban areas of developing countries) are now equipped with computers, Internet access, and occasionally more sophisticated equipment such as interactive whiteboards and effective e-learning requires far more than the mere introduction of hardware in the classroom (van Rij and Warrington, 2010). For this ICT equipment to mean anything, teachers must be conversant in utilizing them to implement an integrated approach to ICT use and new approaches (Bialobrzeska and Cohen, 2005).

Thus, because of the current scenario characterized by lack of capacity, there is a heightened need to fast-track the training of teachers (Beyers, 2000). Some of the South African Government initiatives to deal with ICT training for teachers include the nine centers' being established in each of the provinces as part of the Vodacom Mobile Education Programme. This type of ICT education center for teachers is the realization of a partnership formed between Vodacom and the Department of Education to help boost teacher training across all nine provinces of South Africa (Ayemoba, 2013). It is the intention of the program to train about 1400 teachers annually in the use of ICT to support teaching and learning, focusing on mathematics and science subjects.

2.12.1 Digital Content and Curriculum Integration

The integration of digital content into education has brought about significant benefits, but it also presents its challenges (Mhlongo et al., 2023). Digital content refers to educational materials that are accessed through digital technologies, such as computers and the internet. Integrating digital content into the curriculum has several advantages (Nadeem et al., 2023). Firstly, it provides learners with access to a wider range of resources beyond traditional textbooks. This includes multimedia presentations, interactive simulations, and online research materials, which can enhance learners' understanding of complex concepts and cater to diverse learning styles (Johnston, 2016).

Secondly, the use of digital content allows for personalized learning experiences. Teachers can tailor content to meet individual learners' needs and preferences, creating customized learning pathways. This personalized approach can increase student engagement and motivation, leading to improved learning outcomes (Williams, 2018).

Additionally, integrating digital content can enhance collaboration and communication among learners and teachers . Digital tools such as online forums, collaborative documents, and video conferencing enable learners to collaborate on projects, share ideas, and communicate with peers and teachers . This collaborative approach can foster a sense of community and support collaborative learning (Clark, 2019).

However, despite these benefits, integrating digital content into the curriculum poses several challenges. One major challenge is the digital divide, which refers to the gap between those who have access to digital technologies and those who do not. In South Africa, the digital

divide is particularly pronounced in rural and underserved areas, where access to reliable internet connectivity and digital devices is limited (Mphahlele, 2017).

Another challenge is the need for teachers to develop digital literacy skills. Many teachers may lack the necessary skills and training to effectively integrate digital content into their teaching practices. Without adequate training, teachers may struggle to use digital tools and technologies, limiting their ability to leverage digital content for teaching and learning (Walters, 2019). Furthermore, integrating digital content into the curriculum requires careful planning and alignment with educational goals and standards. Teachers need to ensure that digital content is relevant, up-to-date, and aligned with curriculum objectives. This process can be time-consuming and may require additional resources and support (Brown, 2018).

To overcome these challenges, several strategies can be employed. Providing teachers with professional development opportunities to enhance their digital literacy skills is crucial. Professional development programs can help teachers learn how to use digital tools and technologies effectively and integrate digital content into their teaching practices (Smith, 2020). Additionally, providing learners with access to digital devices and reliable internet connectivity is essential. Schools can implement technology initiatives that provide learners with laptops, tablets, or other digital devices, along with access to high-speed internet. This can help bridge the digital divide and ensure that all learners have equal access to digital content (Ngwenya, 2019).

Furthermore, curriculum integration is crucial to ensure that digital content is aligned with educational goals and standards. Teachers should collaborate with curriculum developers and educational technology experts to ensure that digital content is integrated seamlessly into the curriculum (Jones, 2019). This alignment can help ensure that digital content enhances, rather than detracts from, the overall curriculum. Integrating digital content into the curriculum offers several benefits, including increased access to resources, personalized learning experiences, and enhanced collaboration and communication. However, this integration poses challenges, such as the digital divide, the need for educator training, and curriculum alignment. By employing strategies such as providing professional development opportunities, ensuring access to digital devices, and aligning digital content with curriculum objectives, teachers can effectively integrate digital content into the curriculum, enhancing teaching and learning experiences for all learners.

2.13 ICT integration challenges in South African schools

2.13.1 Digital divide in South African schools

The digital divide in South African schools is a multifaceted issue with profound implications for education and socio-economic development (Chisango and Marongwe, 2021). This review section examined the digital divide in South African schools, focusing on its causes, impacts, and potential strategies for addressing it. The digital divide in South African schools can be attributed to various factors. Historically, the country's apartheid system has left a legacy of unequal access to resources, including ICT infrastructure and devices. Rural schools and schools in townships often lack access to basic ICT resources compared to urban schools. Additionally, socio-economic factors such as income inequality and the cost of ICT devices and services contribute to the digital divide (Ogbomo, 2011).

The digital divide has significant impacts on education in South African schools. Learners from disadvantaged backgrounds often lack access to digital resources and tools, putting them at a disadvantage compared to their peers. This can widen existing education inequalities and limit opportunities for socio-economic advancement (Bingimlas, 2009). Furthermore, the digital divide hinders access to quality education and information, impacting learners' academic performance and future prospects.

Addressing the digital divide in South African schools requires a comprehensive approach involving various stakeholders. One key strategy is to improve ICT infrastructure and connectivity in underserved areas (Chisango and Marongwe, 2021). This can be achieved through initiatives to expand broadband coverage and provide schools with access to high-speed internet. Additionally, providing schools with ICT devices such as laptops and tablets can help bridge the digital divide. Another strategy is to promote digital literacy and skills development among learners and teachers. Training programs can help learners and teachers develop the necessary skills to effectively use ICTs in teaching and learning (Villalba, González-Rivera and Díaz-Pulido, 2017). Furthermore, efforts to increase the affordability of ICT devices and services can help ensure that all schools have access to the necessary resources.

The digital divide in South African schools is a complex issue that requires coordinated efforts from government, the private sector, civil society, and international partners. By improving ICT infrastructure, promoting digital literacy, and increasing access to affordable ICT devices

and services, South Africa can bridge the digital divide and ensure that all learners have equal opportunities to succeed in the digital age.

2.13.2 Limited technical assistance at schools

Teachers will not be able to overcome the barriers to ICT use without both competent technical support in the classroom and whole school resources (Lewis, 2003). According to Li, Yamaguchi and Takada, (2018), one of the most significant impediments to ICT adoption in education, according to primary and secondary teachers, is a lack of technical assistance. Technical issues were identified as a major impediment for teachers in (Hashemi and Kew, 2021). Waiting for websites to load, being unable to connect to the Internet, printers not printing, computers malfunctioning and teachers having to work on antiquated computers were all examples of technical hurdles. "Technical obstacles obstructing the smooth delivery of the lesson or the natural flow of classroom activity" (Hashemi and Kew, 2021).

ICT support or maintenance contracts in schools, allow teachers to use ICT in the classroom without wasting time repairing software and hardware problems (Sabiri, 2020). "If there is a shortage of technical support accessible in a school, likely, technical maintenance will not be carried out regularly, resulting in a higher risk of technical breakdowns," (Sabiri, 2020). ICT integration in teaching, according to Gomes (2005), necessitates the presence of a technician, and if one is not accessible, a lack of technical support can be a barrier. Toprakci (2006) reported that in Turkey, a lack of technical support was one of two major impediments to ICT integration in science instruction in schools and that it was "severe." Science professors in Saudi Arabia would consent to use computers in the classroom if they didn't think they'd run into issues with technical support or gear (Ouahidi, 2020).

Studies consistently underscore the crucial role of technical support in ensuring the effective integration of technology into classroom instruction. As noted by Ertmer (1999), ongoing assistance is instrumental for teachers in navigating and leveraging digital tools to enhance pedagogical practices. The literature suggests that when schools lack sufficient technical support, teachers may face obstacles in troubleshooting issues, adapting to new technologies, and fully incorporating digital tools into their teaching methodologies, potentially compromising the quality of instruction (Penuel et al., 2007).

The impact of limited technical assistance extends beyond the classroom to the broader technological infrastructure of educational institutions. Research by Boser et al. (2007) delves

into the challenges faced by schools in maintaining and upgrading technological infrastructure when confronted with inadequate technical support. Schools with limited assistance may encounter difficulties in network maintenance, software updates, and hardwaretroubleshooting, resulting in disruptions to the overall learning environment and hindrances to educational continuity.

Furthermore, the literature addresses the implications of insufficient technical assistance on the digital divide among learners. As highlighted by Warschauer (2004), disparities in technical support can contribute to inequitable access to educational opportunities, especially in underserved communities. Schools facing constraints in technical assistance may struggle to provide all learners with equal access to digital resources, exacerbating existing disparities in educational outcomes. The literature also emphasizes the importance of ongoing professional development for teachers in the context of limited technical assistance. Ertmer et al. (2012) argue that continuous training and support are essential for teachers to adapt to evolving technologies and pedagogical approaches. Schools grappling with constraints in technical assistance may find it challenging to provide teachers with the necessary training, hindering their ability to leverage technology effectively for instructional purposes.

The literature on limited technical assistance at schools underscores its far-reaching impact on educational practices, infrastructure, and equity (Harris et al., 2023). The challenges associated with insufficient technical support can impede the successful integration of technology into teaching and learning, compromise infrastructure maintenance, and contribute to educational disparities (Mhlongo et al., 2023). Addressing these challenges necessitates comprehensive strategies, including professional development for teachers , infrastructure investment, and equitable resource allocation. Continued research in this area is imperative to inform policies and practices that promote robust technical support and foster a technologically inclusive learning environment for all learners.

Another critical challenge in ICT implementation is the lack of technical support and capacity building for teachers . Many teachers in South Africa lack the necessary skills and training to effectively integrate ICT into their teaching practices (Laudon and Laudon, 2016). Without adequate training, teachers may struggle to use ICT tools and technologies, limiting their ability to leverage technology for teaching and learning.

To address this challenge, ongoing professional development programs are essential to ensure that teachers are equipped with the necessary skills and knowledge to effectively integrate ICT into their teaching practices. Programs such as the Microsoft Partners in Learning and theIntel Teach Program have been implemented to provide teachers with training and support inusing ICT tools. However, these programs need to be scaled up and made more accessible to reach a larger number of teachers .

2.13.3 ICT infrastructure in South African schools

South Africa is categorized/classified as a developing country, with a high level of educational backlog in schools and a shortage of teachers , especially in the field of Mathematics and Science (Mogano, 2014). Despite the above-mentioned challenges, unfortunately, every year in South African schools when the first term of learning commences, many schools do not have enough study material while others do not have enough teachers (Singh, 2017).

Technology is such a big part of the world in which we live. According to Costley (2014), in the present times, many of the jobs that did not require technology use in years past do require the use of technology today. Dlamini and Mbatha (2018), support that even many more homes have computers than in years past and increasing numbers of people know how to use them. Technology is being used by children and adults daily by way of web surfing, texting, social networking, interactive games, and more ways (Mukhari, 2016). We are an evolving technological society, and in many ways, have become dependent on its use. Therefore, the use of technology for teaching and learning has become a high priority in public schools (Costley, 2014). Strydom, Wessels, and Anley (2021) assert that the conveyance of education and/or curriculum in South African schools is shifting from traditional practice to a digital format of delivery using available technology. However, without Information and Communication Technology (ICT) infrastructure sufficiency, benefits have the likelihood of not being satisfactory and the probability of failure in adopting ICT will be high (Mosa, Mahrin and Ibrahim, 2016).

The extent of the uses of ICT may be described as, Information and Communication Technologies (ICT) broadly defined as technologies used to convey, manipulate, and store data by electronic means. This may include e-mail, SMS text messaging, video chats (such as Skype, Zoom, Teams), and online social media (e.g., Facebook, WhatsApp, Twitter, Instagram). It also includes all different computing devices (e.g., laptops, desktops, and

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determined to convert Gauteng schools into paperless schools by giving computer tablets to augment and enhance teaching and learning and raise educational standards. These changes are also driven by a desire to produce learners who can read, write, and calculate, allowing South African learners to compete with those in the most developed countries (Msila, 2015).

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In South African schools, particularly those located in rural areas, persistent challenges such as educational backlog, a shortage of teachers in critical subjects, and inadequate study materials continue to hinder the quality of education (Msila, 2015). While there is a noticeable shift from traditional to digital education delivery methods, the lack of sufficient Information and Communications Technology (ICT) infrastructure remains a major obstacle. Despite ICT encompassing a wide array of tools beyond computers and the internet, the absence of basic infrastructure impedes effective teaching and learning, particularly in rural communities. This deficiency leads to learners facing setbacks due to outdated teaching methods and limited exposure to ICTs.

Efforts to introduce ICT into classrooms, as outlined in the Gauteng Department of Education (GDE) eLearning policy, are hampered by financial constraints and the non-payment of school fees. Despite the commitment to create paperless schools and enhance educational standards, challenges persist in realizing this vision. Improving the ICT culture requires comprehensive teacher training, aligning with the government's objectives to create dynamic learning environments, foster global perspectives, enhance information processing skills, and instill attitudes of lifelong learning among learners (Perron et al., 2010). The journey toward effective

ICT integration in South African schools necessitates addressing infrastructure gaps, financial constraints, and the need for comprehensive teacher training.

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2.14 Theoretical framework

According to Rogers (2014), the theory of change is a concept and outcome that people and institutions have about how change results from a series of activities that have taken place. Therefore, the theoretical framework used in this study on the support and how teachers perceive the application of technology is guided by Lewin's three-step theory of change. Lewin's three-step theory examines behaviour as a product of driving and restraining forces, which work in opposing directions (Lewin, 2019). The driving force, however, undermines change in teams by pushing people to move in opposite directions. This theory was developed by Kurt Lewin (Lewin, 2019).

The theory of change is a strategic plan of action to make assumptions about how systematic change occurs. This theory will be used as the lens to analyze how teachers perceive the use of Information Communication Technology. The theory also looks at how individuals or groups adapt to change and scrutinizes the role of the Department of Education and civil society in the implementation of Information technology in secondary township schools. Below is a graphic representation of Lewin's three-step theory of change (Lewin, 2019). The theory of change provides a strategic framework for understanding how systematic change occurs, particularly in the context of implementing Information Communication Technology (ICT) in education. This theory serves as a lens through which to analyze how teachers perceive the use of ICT and how individuals or groups adapt to change within the education system. Additionally, the theory of change scrutinizes the roles of the Department of Education and civil society in the implementation of ICT in secondary township schools.

Lewin's three-step theory of change, depicted in the graphic representation below, provides a model for understanding how change occurs in an organization and how employees react to it (Lewin, 2019). The three steps include unfreezing, change, and refreezing. By applying Lewin's theory of change to the implementation of ICT in education, policymakers and teachers can gain insights into the process of change and identify strategies for effectively integrating ICT into teaching and learning practices. Additionally, this theoretical framework can help to identify potential challenges and barriers to change and inform the development oftargeted interventions to address these issues. Overall, the theory of change provides a valuable framework for understanding how change occurs in the education system and how teachers perceive and adapt to the use of ICT. By applying this theory, stakeholders can work together to ensure that the implementation of ICT in education is successful and leads to improved teaching and learning outcomes. The model below provides a representation of how change occurs in an organization and how employees react to it.

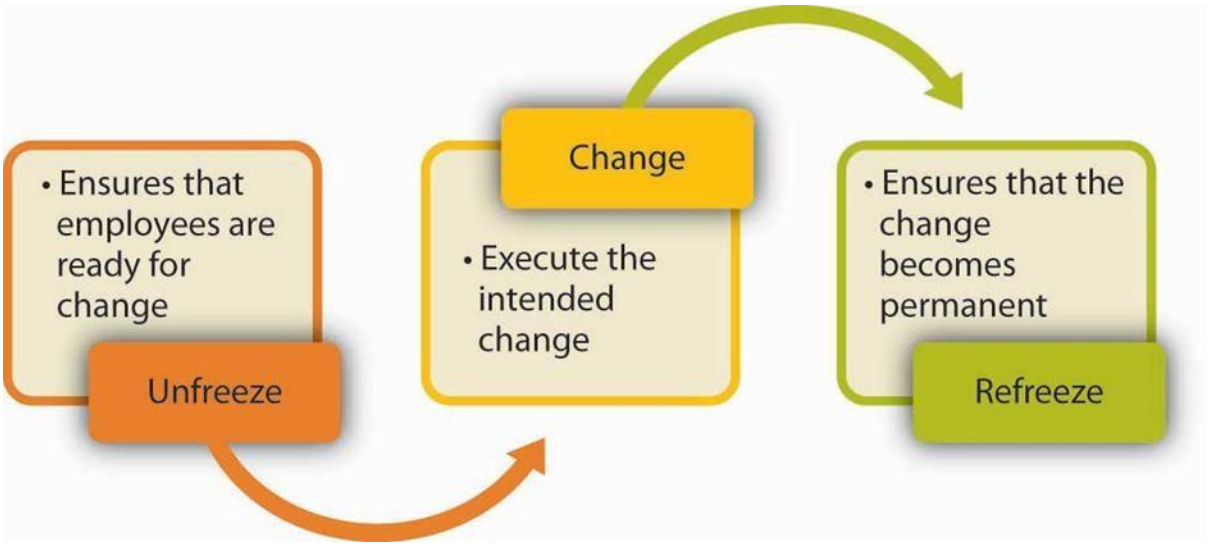

Figure 2.1: Three-Step Theory of Change

2.14.1 Unfreezing

According to the illustration above, the first step in changing the Conduct of people is by Unfreezing the current status. It can be accomplished by various techniques, including increasing the motivating factors and reducing the restraining aspects. This stage is about

ensuring that teachers and learners are ready for a transformation. It involves getting an understanding that change is necessary and getting prepared to move away from a comfort zone. Teachers should prepare to move from a traditional way of doing things to a modern way. It is about preparing teachers or others for transformation, (Lewis, 2019). Unfreezing isa crucial first step in Lewin's theory of change, as it sets the stage for successful transformation.In the context of implementing ICT in education, unfreezing involves preparing teachers and learners for a shift from traditional teaching methods to a more technology-integrated approach. This process requires increasing motivating factors and reducing restraining aspects to create a readiness for change.

Increasing motivating factors may involve highlighting the benefits of ICT in education, such as improved student engagement, enhanced learning outcomes, and increased efficiency in teaching practices. Teachers need to understand how ICT can support their teaching objectives and make their jobs easier and more effective. For example, they may learn how ICT tools can help them create interactive lessons, assess student progress more efficiently, and access a wealth of educational resources online. Reducing restraining aspects involves addressing barriers to change, such as resistance to new technologies, lack of resources or support, and fear of the unknown. Teachers may be apprehensive about using ICT if they feel they lack the necessary skills or if they perceive it as an additional burden on top of their existing workload. Providing training, resources, and support can help alleviate these concerns and create a more positive attitude towards change.

Unfreezing also requires creating a sense of urgency and necessity for change (Zand and Sorensen, 1975). Teachers need to understand why change is necessary and how it will benefit them and their learners. This may involve highlighting current challenges in education, such as low student engagement or outdated teaching methods, and demonstrating how ICT can address these issues. Overall, unfreezing is a critical step in the change process, as it lays the foundation for successful implementation of ICT in education (Zand and Sorensen, 1975). By increasing motivating factors, reducing restraining aspects, and creating a sense of urgency, teachers can be prepared and motivated to embrace change and adopt new technologies in their teaching practices.

2.14.2 Change

The change stage in Lewin's theory of change represents the transition from the old ways of doing things to the new desired state. This phase is often the most challenging, as teachers may feel uncertain, fearful, and resistant to change (Zand and Sorensen, 1975). However, it is also a crucial stage where transformation occurs, and teachers begin to adapt to new ways of teaching and learning. During the change stage, teachers may experience a range of emotions, including anxiety, frustration, and resistance (Zand and Sorensen, 1975). They may feel overwhelmed by the prospect of learning new technologies or adjusting their teaching methods. It is essential for teachers to recognize and acknowledge these feelings and understand that they are a natural part of the change process. Support from school leadership and colleagues is critical during the change stage. Teachers need encouragement, guidance, and resources to help them navigate the challenges of implementing ICT in their teaching practices. Professional development workshops, mentoring programs, and peer support groups can provide valuable opportunities for teachers to learn new skills, share experiences, and seek advice from others who have already undergone similar transformations (Kerkhoff and Makubuya, 2022).

It is also important for teachers to expect mistakes and setbacks during the change process. Learning to use new technologies and integrating them into teaching practices is a gradual and iterative process that requires patience and perseverance. Teachers should embrace a growth mindset and view mistakes as opportunities for learning and improvement rather than failures. Furthermore, effective communication and transparent leadership are essential during the change stage. School leaders should clearly communicate the reasons for change, the benefits of adopting new technologies, and the support available to teachers . They should also listen to teachers ' concerns and feedback and be responsive to their needs.

Despite the challenges, the change stage also presents opportunities for growth and innovation. Teachers have the chance to explore new teaching methods, experiment with different technologies, and tailor their approaches to meet the diverse needs of their learners. By embracing change and stepping out of their comfort zones, teachers can create more engaging, interactive, and effective learning environments for their learners.

The change stage is a critical phase in the process of implementing ICT in education. While it may be challenging and uncertain, it is also a time of growth, learning, and innovation. With the right support, mindset, and approach, teachers can successfully navigate the change stage

and embrace new technologies in their teaching practices. By doing so, they can help create more dynamic, engaging, and effective learning experiences for their learners. As soon as more teachers feel that transformation is necessary, the more they get inspired to change (Mark, 2020). The change stage is the toughest as teachers are uncertain and fearful. It is not an easy phase because it is hard to adjust to transformation. At this stage, the educator's support is necessary for training or facilitation. They must also expect mistakes as part of the process.

2.14.3 Refreezing

Refreezing is the final stage in Lewin's model of change, where the new behaviours, rules, or procedures that have been introduced during the change phase become the norm and are integrated into the organization's culture (Cummings et al., 2016). This stage is crucial for ensuring that the changes made are sustainable and lasting. Refreezing involves reinforcing the new behaviours and practices through formal mechanisms such as policies, procedures, and training programs. It also involves celebrating successes and recognizing the efforts of individuals who have embraced the change (Cummings et al., 2016). The refreezing stage is essential for embedding the changes into the organization's culture and ensuring that they become the new way of doing things. Without refreezing, there is a risk that the changes may not be fully adopted or may revert to the old ways over time. Refreezing helps to solidify the changes and make them a permanent part of the organization's operations.

One of the key challenges of the refreezing stage is resistance to change (Hussain et al., 2018). Even after the change has been implemented, some individuals may still be resistant to the new ways of working. It is essential for leaders to continue to communicate the benefits of the change and provide ongoing support and encouragement to those who may be struggling to adapt. Another challenge of the refreezing stage is complacency. Once the initial excitement of the change has passed, there is a risk that individuals may become complacent and revert to their old habits. It is important for leaders to continue to reinforce the new behaviours and practices and ensure that they are consistently applied throughout the organization.

To effectively refreeze the changes, leaders should focus on several key strategies (Hussain et al., 2018). First, they should ensure that there is clear communication about the changes and the reasons behind them. This helps to create buy-in from employees and reduces resistance. Second, leaders should provide ongoing support and training to help employees adapt to the new ways of working. This can include mentoring programs, coaching, and additional

resources to help employees succeed. Finally, leaders should celebrate successes and recognize the efforts of individuals who have embraced the change. This helps to reinforce the new behaviours and practices and creates a sense of accomplishment among employees.

The refreezing stage is a critical part of the change process, where the changes made during the change phase are solidified and integrated into the organization's culture (Barrow et al., 2024a). By focusing on clear communication, ongoing support, and recognition of success, leaders can effectively refreeze the changes and ensure that they become a permanent part of the organization's operations. Refreezing includes confirming that transformation develops permanently and new behaviours, rules, or procedures become the norm, indicates that the changes happening in society are from the motionless position to the continuous changing and moving again to the static point where the culture in the organization is reformed (Lewis, 2019; Kurt Lewin's Model of Change, 2019).

2.15 The Relevance of the Theory of Change

The theory of change is a valuable framework for understanding and addressing the challenges and opportunities that teachers face daily when using technology in their teaching curriculum. By applying this theory, teachers can effectively plan and implement changes in their teaching practices, with clear goals and outcomes in mind. This approach helps to ensure that all stakeholders, including teachers , learners, and administrators, are on board with the changes and understand the benefits of integrating technology into education.

One of the key benefits of using the theory of change is its focus on achievable goals within a specific timeframe. This helps teachers to set realistic expectations and track their progress towards implementing technology in their teaching. By setting clear goals, teachers can also better understand the steps needed to achieve these goals and overcome any obstacles that may arise along the way. The theory of change also helps to change the perception of teachers towards technology usage. By providing a structured approach to implementing change, teachers can see the tangible benefits of integrating technology into their teaching practices. This can help to increase their enthusiasm and motivation towards using technology in the classroom, leading to improved learning outcomes for learners.

The role of the school principal is crucial in this process, as they play a key role in persuading teachers to adapt to change. According to Ghavifekr and Rosdy (2015), the process of integrating technology into education involves communicating the benefits of the innovation

to all stakeholders and gaining their acceptance. The school principal can help to facilitate this process by providing support and resources to teachers , as well as leading by example in embracing technology in their own practices. The theory of change provides a valuable framework for understanding and addressing the challenges and opportunities of integrating technology into education. By applying this theory, teachers can set achievable goals, change perceptions, and gain buy-in from all stakeholders, leading to more effective and successful integration of technology into teaching practices.

2.16 Summary

This chapter reviewed the literature on the importance of ICTs in teaching and learning, focusing on their potential to change the educator's perspective and the educational landscape and develop ICT-capable teachers . It focused on the definition of ICT, ICT in education policy, and the use of ICTs in education in both developed and developing countries. ICT policy provides the foundation for innovative ICT use, but it requires rigorous planning and preparation to ensure that all requirements for successful ICT integration are in place. The theoretical framework's significance was also demonstrated by the widespread use of ICTs in all parts of life. The conversation revealed the need to use ICTs in pedagogical practices by instructors to obtain and exchange knowledge with their peers, as well as to enhance their teaching tactics so that their learners can achieve 21st-century learning skills.

CHAPTER 3

RESEARCH METHODOLOGY

3 Introduction

In this chapter, the methodology employed to collect data for answering research questions and achieving research objectives was discussed. The focus was on several key components, including research methods, research design, target population, sample and sampling techniques, data collection methods, data analysis, the trustworthiness of the research, and ethical considerations. The research methods utilized in this study were carefully chosen to align with the research questions and objectives. A descriptive research design was adopted, allowing for a detailed exploration of the topic. Data collection methods were chosen for theirability to provide rich, detailed data.

The collected data were then analysed which allowed for a thorough examination of the findings. Ensuring the trustworthiness of the research was a priority. Additionally, ethical considerations were carefully addressed throughout the research process. This included obtaining informed consent from participants, ensuring confidentiality and anonymity, and adhering to ethical guidelines. Overall, the methodology chapter provides a comprehensive overview of how the research was conducted, ensuring that the data collected is reliable, valid,and ethically sound.

3.1 Research Methods

The general definition of research methodology is that it is a logistical process for gathering, analysing, and understanding data, to improve understanding of the phenomena the researcher is investigating. Howes (2000), in Kgwete (2014) points out that, methodology of any type provides a framework for hearing, seeing, and feeling human experience, thus has implications for the knowledge that the researcher will discover about the social world. Derek (2020) affirmed that, the researcher's interpretation of the aforementioned and claims that research methodology pertains to the actual "how" of any particular piece of study. More specifically, it pertains to "how" a researcher systematically plans a study to guarantee successful and reliable outcomes that fulfil the goals and objectives of the investigation.

To collect and analyze the data for this study, a qualitative research methodology was employed. In qualitative research, non-numerical data such as audio, text, and videos are gathered and examined to better comprehend ideas or views (Prather, 2020). Given (2008) explains that as realities are made up of components and already present in people's brains, they must be analyzed thoroughly in their natural setting. As a result, in qualitative research, the study gathers, analyses, and describes the data in detail before reporting the research findings (Given, 2008). In this manner, the phenomenon can be understood and interpreted by the researcher in the context of the meanings which others assign to it (Mbengwa, 2010). Because the usage of ICT entails attitudes, perceptions, feelings, and ultimately intentions, a qualitative approach was utilized in this study. Since this is not quantified, a qualitative methodology to record it is preferred.

According to Hancock, Ockleford, and Windridge (2001), the qualitative technique is appropriate for research that aims to comprehend social phenomena and offer explanations for them. As a result, by using this approach, the researcher was able to create a comprehensive, rich, and multidimensional depiction of ICT usage (Creswell, 2007). The approach also contributed to the comprehension of how ICT is used to enhance learning and teaching. Welman, Kruger, and Mitchell (2006) also endorse the usage of a qualitative approach in this situation since they contend that qualitative research methods can be utilized effectively to describe groups, organizations, and local communities. A qualitative approach made it simple for the researcher to translate and characterize perceptions, emotions, and social processes.

3.2 Research Design

There are various types of research designs, and this study followed a multiple case study research design. According to Mbengwa (2010), the qualitative technique entails "developing and arranging the research methods such that sound conclusions are achieved concerning the research question as well as the issue description." The research design also outlines what or who is participating, when and where the study will occur, as well as the necessary course of action to be undertaken to go on that particular path (Mokoena, 2013). The plan of the research was laid forth in the research design. The form of data the researcher attempted to elicit determined the research plan for qualitative research.

According to Creswell (2013), a multiple case study investigates a mega system in the real world using in-depth data collected from numerous sources. Brink (2018) claims that a

multiple-case study allows the researcher to discover issues that need to be investigated in-depth and to comprehend the behavioural circumstances of such a mechanism using the inputs and interpretive viewpoints of the participants. Unlike a holistic study with integrated components, which aims to comprehend either one particular or crucial case, multiple case studies enable the researcher to analyze both within and across settings (Baxter and Jack 2008). The multiple case study design involves using two or more cases in which the study aims to explore their similarities and differences to find their distinguishing traits (Daymon and Holloway, 2011).

Yin (2009), maintains that these three objectives can be accomplished using any study methodology. The sole thing that sets case studies apart from others is their capacity to respond to "why" and "how" questions whenever the researcher seems to have no influence over behavioural occurrences and to concentrate on a current issue (Yin, 2009). As a result, the 3 main research purposes descriptive, explanatory, and exploratory are explored in the framework of case study research, which, because of the above statement, should be comprehended in the view of the 3 contextual factors.

3.3 Research Paradigm

In this study, the interpretive research paradigm was applied. Weber maintains that all humans attempt to make sense of their worlds and continuously interpret, create, give meaning, define, justify, and rationalize daily actions (Babbie and Mouton, 2008). Dilthey (1833-1911) on the other hand, deals with external experiences which relate to the constructive activity of reason. Understanding of one's inner world is achieved through introspection and understanding of someone else's world, by "living in", "co-experience," and empathy. Interpretivism thus explores the complexity of social phenomena to gain understanding. The purpose of interpretivism in research is to understand and interpret everyday happenings, experiences, and social structures – as well as the values people attach to these phenomena (Collis and Hussey 2009; Rubin and Babbie, 2010). Interpretivists believe that social reality is subjective and nuanced because it is shaped by the perceptions of the participants, as well as the values and aims of the researcher.

The interpretive paradigm in this study is useful because it highlights how people view and understand reality in accordance with the ideologies they possess, and that information is best gained via individual perspective instead of through external learning (Nel, 2019). Because the

researcher wished to understand the educator's opinions on the use of ICT for learning and teaching, therefore the researcher selected the interpretive research paradigm.

3.4 Research Area

The primary focus of this study is on the views of teachers on the use of ICT in two schools in the Gauteng Province of South Africa's Tshwane West District, SoshanguveTownship. A township named Soshanguve is located around 30 kilometers (km) north of Pretoria. Since Soshanguve is an abbreviation for Sotho, Shangaan, Nguni, and Venda, it indicates the multi-ethnic makeup of the community. Soshanguve has speakers of the major African languages spoken in South Africa. When people from Mamelodi and Atteridgeville were moved to Soshanguve in 1974, the government separated them into groups based on theirtribe. The apartheid government intended for this to make administration simple, but it insteadcreated a divided and mistrustful community. Even now, and over twenty years later, there continue to be traces of the history, although cultures have begun to blend. The Soshanguve people speak the most languages of any South Africans.

The Soshanguve North and South Campuses of Tshwane University of Technology and Tshwane North College (TNC) are located in Soshanguve and are home to learners from all over the nation. Approximately 316000 people live in Soshanguve. The hot season of Soshanguve is from October to February, with maximum temperatures typically range from 28°C to 30°C. Summertime lows often range between 16°C and 18°C. Winter temperatures drop to an average low of 5°C and a high of about 19°C. The wettest month in the township is January, which receives the most of its rainfall throughout the summer. There are several government-owned schools in the neighbourhood. This township was chosen because it contains several high schools from which a sample was taken in order to evaluate how they used ICT in both teaching and learning.

Source: https://www.google.com/maps/place/Soshanguve

Figure 3.1: Soshanguve Map

3.5 Population

A population can be described as an extensive collection of people that we are keen to study (Babbie, 2012). According to McMillan and Schumacher (2014), the target population is the complete group that the study is interested in and that it intends to reach conclusions on. The target population for this study was all the secondary schools in Tshwane West district quintile 1-3 teachers and the sample is from 2 secondary schools in the Tshwane West District. The sample is made up of 12 teachers , from the 2 selected schools.

3.5.1 Sampling Procedures

Sampling can be characterized as a numerical selection technique for a subset of an interest population. Probability sampling and non-probability sampling can be used to accomplish sampling of the participants (Bhattacherjee, 2012). This study used a non-probability sampling method. Non-probability sampling is referred to as the purposeful participants' selection to provide information that would help the researcher comprehend the subject under study better (Creswell, 2009). Participants in qualitative studies are chosen on the basis of their encounters with a particular topic of interest (Streubert and Carpenter 1999). The chosen individuals are expected to advance our comprehension of a certain occurrence. According to Mokoena (2013) in qualitative research sampling is typically small, saturation-based, and not representational,

the size of the sample is not defined statistically, and minimal cost. Participants were purposefully sampled for this study. A purposeful sample was chosen from a variety of schools that had been deemed appropriate for achieving the objectives of the study.

The purposive sampling method is the most significant kind of non-probability sampling (Welman, 2006). The researcher first must attentively consider the factors of purposive sampling before selecting the sample. As a result, it is crucial to apply dialectic and symbiotic considerations while choosing participants. According to McMillan and Schumacher (2001) purposive sampling involves choosing small groups or individuals likely to be knowledgeable and informed about a phenomenon of interest and the selection is done without desiring to generalize the findings to all such cases. Mbengwa (2010) adds that "this sampling procedure depends on availability and willingness of people to participate and on the fact that cases that are truly similar to the population are selected". A multi-stage sampling was followed in this study and township, high schools, and teachers were selected. According to McMillan and Schumacher (2001), this approach entails selecting small groups of people who are likely to be educated and engaged about an interesting phenomenon without wishing to generalize the results to all similar cases. According to Mbengwa (2010:84), "this sample process depends on persons being available and ready to participate as well as the fact that instances that are comparable to the selected population." In this study, a multi-stage selection method was used to choose the town, teachers, education institutions, and pupils.

3.5.2 Sample Size

A sample is defined as “a smaller group or subset of a whole population in such a way that knowledge gathered is representative of the total population under study" (Cohen, Manion and Morrison, 2007:54). In order to generate reliable data, the sample was chosen. The sample size was 12 participants from the 2 secondary schools in quintiles 1-3. The selection of the 12 participants and their specific locations for this study was guided by a purposeful sampling method, which aligns with the research objectives and the nature of the study. The decision to use a non-probability sampling approach reflects the intention to carefully select participants from a targeted group that can provide in-depth insights into the study's focus. The sample was drawn from secondary schools located in quintiles 1-3, ensuring a diverse representation of schools with varying socio-economic characteristics.

The rationale behind choosing 12 participants was rooted in the quest for a manageable yet comprehensive sample size. As Cohen, Manion, and Morrison (2007) note, a sample should be of a size that allows for the collection of representative knowledge from the total population under study. In this case, the 12 participants were strategically selected to ensure an adequate representation of the characteristics and perspectives relevant to the study's objectives. The decision to focus on two secondary schools adds depth to the study by incorporating a multi-school perspective.

The geographical locations of the selected participants are spread across quintiles 1-3, emphasizing the importance of capturing a diverse range of school environments. This approach enables a nuanced examination of the impact of ICT in teaching and learning across different socio-economic contexts. By including participants from schools in quintiles 1-3, the study seeks to explore how ICT practices vary or converge within varying resource and infrastructure settings, providing a comprehensive understanding of the challenges and opportunities in diverse educational settings.

In summary, the purposeful sampling technique was chosen to ensure that the selected participants are highly relevant to the study's objectives. The inclusion of 12 participants from secondary schools in quintiles 1-3 allows for a focused investigation into the specific contexts where the impact of ICT in teaching and learning is of particular interest. This approach aligns with the research's goal of generating reliable and meaningful data representative of the total population under study, ultimately contributing to a nuanced understanding of the role of ICT in the educational landscape.

3.6 Data Collection

Data collection is a means for obtaining thorough inputs and assessing information gathered from key components to address a problem (Kabir, 2016). "By using qualitative data collection methods, the researcher obtains the richness and depth of data, gathered from complex and multi-faceted phenomena in a specific social context" (Du Plooy-Cilliers, et al., 2014:32). For this study, the researcher used primary data to address the research objectives and give possible answers to the research questions. Primary data, also referred to by other scholars as primary sources, refers to the data collected first-hand by the researcher for the study; it is raw without interpretation and represents the personal or official opinion or position (Pune, 2013).

In order to gather data in this study, the researcher opted for interviews. Interviews are described as a formal discussion between an interviewee and an interviewer during which the former requests the other's responses (Keethana, 2021). The study made use of semi-structured face-to-face interviews. To get data from the chosen teachers on how they felt about using ICT for learning and teaching, an interview guide with questions was utilized. 12 participants in this study had semi-structured interviews. This made it possible to gather the participants' informed views on the usage of ICT to enhance learning and teaching. Semi-structured interviews have the benefit of having a high rate of responses (Leedy and Ormrod, 2005). Semi-structured interviews may be "time-consuming" and costly to conduct, which is one of their drawbacks. Semi-structured interviews were used for the study's subjects because they allowedthem to both discuss and understand their personal experiences (Cohen, Manion and Morison, 2007: 12). When carrying out the research, the researcher was aware of these positive and negative aspects. The interview with each participant took 45 minutes. Before the commencement of the interviews, I made sure that the interviewees were comfortable and at ease. With the participant's consent, the interview sessions were taped and recorded using a digital voice recorder. The recorded data was later transcribed and then thematically analyzed.

3.7 Data Analysis

Data analysis is the process of reviewing and arranging the transcripts, field notes, and other data from the interviews that were obtained by the researcher, in order to understand the data from interviews and be able to convey the outcomes to others (Boeijie, 2015). Having a comprehensive picture of how participants perceive a phenomenon or a specific circumstance is the goal of the data analysis process. It assists the researcher in developing a thorough comprehension of the information regarding the participants' feelings and perceptions of a topic of interest to them. According to Flick (2018), there are two widely accepted techniques for analyzing qualitative data: categorization and coding.

Flick (2018) asserts that categorizing and coding are the most common techniques for analyzing qualitative data that have been gathered through interviews, focus groups, and observations. Thematic analysis was used to analyze the data in this study to find patterns in the data by identifying recurrent themes. This made it possible for the researcher to understand how these themes are related to one another. This research used Braun and Clarke's (2006) six phases for thematic analysis in qualitative data analysis, which is undoubtedly the most

influential method in the social sciences since it provides a logical framework for thematic analysis (Maguire and Delahunt, 2017).

Step 1: Familiarizing yourself with the data: I familiarised myself with the data by listening carefully to the recorded interviews. The interviews were listened to and then written down. I read the transcription twice and then made a summary. Step 2: Create initial codes. After becoming familiar with the information's contents, I attempted to methodically arrange the data by dividing it up into smaller groups of data to better understand it. The codes were found and afterward recorded based on their meanings to the study questions.

Step 3: Identify themes: I, therefore, looked at the codes to discover how other codes fit and linked into a theme. Step 4: Reviewing the concepts: I then reviewed the themes to assess whether they made sense. I conducted this to make sure the research evidence backed up the themes that had been discovered. As new themes evolved, some of the originally discovered themes were abandoned. Step 5: Describe themes: The themes were named and described during this stage. I had to designate the overarching themes after determining the themes and subthemes. Depending on their meaning and how they are well fit with the objectives of the study, the themes were given names and definitions. Step 6: Putting report together: The last step involved transferring the data of qualitative technique to information that could be analyzed in light of the literature and research questions.

3.8 Trustworthiness of the Research

A thorough approach to research ensures that its findings may be accepted and that it presents a persuasive tale. To get this acceptability, the researcher must demonstrate to the audience the steps taken to ensure that the methodologies are accurate and the findings are sound. According to Kitchin and Tate (2000), this highlights crucial criteria for evaluating qualitative research or trustworthy principles that every researcher should take into consideration while planning a study and analyzing its findings. In this study, the reliability of the research was examined using Guba's (1995) model of reliability, which looks at a) dependability, b) credibility, c) confirmability, and d) transferability.

A comprehensive approach to research is essential for ensuring the acceptance of its findings and presenting a compelling narrative. To achieve this acceptance, researchers must demonstrate to their audience the steps taken to ensure the accuracy of their methodologies and the soundness of their findings. According to Kitchin and Tate (2000), this highlights crucial

criteria for evaluating qualitative research or trustworthy principles that every researcher should consider while planning a study and analysing its findings.

In this study, the reliability of the research was examined using Guba's (1995) model of reliability, which considers four key elements: dependability, credibility, confirmability, and transferability. Dependability refers to the consistency and stability of the research findings over time, ensuring that the results are reliable and can be replicated. Credibility focuses on the believability and trustworthiness of the findings, indicating that the research methods used were appropriate and the results are credible. Confirmability relates to the objectivity and neutrality of the research, ensuring that the findings are not influenced by the researcher's biases or preconceptions. Transferability refers to the generalizability of the findings, indicating the extent to which the results can be applied to other contexts or settings. By applying Guba's model of reliability, this study aimed to ensure that its findings were robust and trustworthy. The research methods were carefully selected and implemented to meet these criteria, enhancing the overall quality and credibility of the study.

3.8.1 Credibility

Assessing the outcomes' truth and the degree to which the data they gathered accurately represent reality is what is meant by credibility. According to Lincoln and Guba (1995), establishing credibility is crucial for making qualitative research credible. This research employed well-organized methods of inquiry whose protocols are explicitly written out to explain how data gathering occurred in order to maintain this credibility. These techniques have been applied to numerous studies on youngsters and educational services and have produced reliable data and outcomes. Purposive sampling was used in this study to gather reliable study data. In order to verify that the data was cross-verified, this study used triangulation. The data, analytical categories, interpretations, and conclusions were tested withthe stakeholders from whom the data were initially acquired in order to establish credibility. Participants were given the chance to respond to the data as a result. Participants recognize theprovided research as reflecting their own experiences to show credibility (Lincoln and Guba, 1995). The researcher spent adequate time on the study and revealed any prejudice experienced, undertaking a relentless, in-depth investigation to gather pertinent data. The credibility of the information was enhanced as a result.

3.8.2 Transferability

Transferability can be described as "the extent to which the conclusions of one study can be transferred to other settings" (Merriam, 1998:39). In order to enable a range of views and deeper data, the study was improved by the deliberate selection of participants from various universities and in various communal situations. By strictly adhering to the research procedure, the researcher established uniformity in the study methodology.

In order to increase the likelihood that the results will be interpreted the same way, transferability was also guaranteed by member checks. Nevertheless, ordinary generalization is impossible because every observation is characterized by the particular context in which it occurs (Erlandson, Harris, Skipper, and Allen, 1993). The results of this study might not be transferrable easily, despite the fact that it may be enticing to employ them to evaluate how ICT is used to enhance learning and teaching. Therefore, the purpose of this study is not to generalize the results to encompass all of Soshanguve, but instead to utilize the study to better comprehend how ICT is used to improve learning and teaching. Therefore, the results will apply to locations with similar contexts to Soshanguve.

3.8.3 Dependability

Dependability guarantees uniformity in the study and reveals the extent to which the data accurately captures the evolving circumstances of the phenomenon being examined. According to Lincoln and Guba (1985), there are connections between credibility and dependability, therefore exhibiting either one inherently demonstrates the other. In order to guarantee dependability, I ensured that the findings would be similar if the study were to be conducted again with the same objectives, the same techniques, and the same participants.

According to Guba (1981), the fact that the shortcomings of one method are concurrently made up for by the strengths of the other helps the dependability and trustworthiness of findings. In order for another researcher to pursue the same approach and produce dependable and credible findings, the researcher additionally dealt with dependability problems by detailing all the methods used in the study and the outcomes analysis. Riege (2003) asserts that in qualitative research dependability is comparable to the idea of reliability. The goal of dependability testing was to provide evidence of consistency and stability in the research process. By providing a retrospective account of the study process, the researcher made sure that everything was taken care of for the study to be logical, traceable, and properly recorded.

3.8.4 Confirmability

Conformability assures that the research outcomes are not influenced by the interests, motivations, views, or biases of the researcher. The degree to which the researcher acknowledges his or her preconceptions, biases, and views is a crucial factor in determining conformability (Miles and Huberman, 2006). In order to ensure conformability, I have included a thorough methodological description, stating which approaches were preferred and why, attempting to outline and explain the processes performed during the study process, while also admitting any flaws in it.

To promote conformability and lessen the impacts of researcher bias, triangulation plays a crucial role. According to Guba (1978), dependability and confirmability are resolved by abandoning a thorough audit log of the interpretation of data, collection of data, and analysis processes. This allows the auditor to follow the progression of the study one step at a time as well as determine whether the interpretations, recommendations, and conclusion can be followed back to their sources and are backed by the investigation. Going both forward and backward through the process of the study, an auditing procedure was put into place to make sure that the results and findings interpretations were reliable and supported conclusions. The goal of the interpretive process was to discover principles and trends accepted pertinent to the issue of the study rather than to generalize the outcomes to the rest of the population.

3.9 Ethical Consideration

Ethics are "the order or guideline and norms furthered by the individual or organization" (Towsley-Cook and Young (2007:2). Therefore, the researcher must take ethical issues into account at all stages of the research process. The following are some of the ethical guidelines that were observed and followed in this study:

3.9.1 Voluntary participation

Creswell (2009:97) emphasizes the importance of voluntary participation in research, stating that individuals should not be forced or coerced into participating. In this study, participation was entirely voluntary, ensuring that individuals were not obligated to take part but chose to do so of their own accord. Participants were informed that they had the freedom to decline or withdraw from the study at any time if they felt uncomfortable or no longer wished to participate.

This approach to participation aligns with ethical principles in research, which prioritize the autonomy and well-being of participants. By allowing individuals to make their own decisions regarding participation, the study upholds principles of respect and dignity. Additionally, voluntary participation helps to ensure the validity and reliability of the research findings, as individuals are more likely to provide honest and genuine responses when they participate willingly. Overall, the emphasis on voluntary participation in this study underscores the commitment to ethical research practices and the protection of participants' rights.

3.9.2 Informed consent

According to Strydom (2011) the importance of professional conduct in knowledge accumulation, highlighting the need for transparency and acknowledgment of sources. Engaging in knowledge accumulation without acknowledging the contributions of others or trustworthy experts is considered unprofessional. Additionally, Strydom (2011) suggests that it is crucial to advise colleagues properly and to be transparent about the purpose of the study, ensuring that they understand and agree to participate willingly.

Informed consent in research typically involves a written statement that explains the purpose of the study to participants and asks for their voluntary agreement to participate before the study begins. This process is essential for ensuring that participants are fully informed about the study and that their rights are respected. By obtaining informed consent, researchers demonstrate respect for participants' autonomy and ensure that they are not coerced or misled into participating. Overall, adherence to ethical principles, such as acknowledging sources and obtaining informed consent, is crucial in research. These practices uphold the integrity of the research process and ensure that the rights and well-being of participants are protected.

3.9.3 The right to privacy

In this study, the rights of participants to privacy were paramount. Participants were informed of their right to withdraw from the study or refuse to answer any questions they felt uncomfortable with. Personal and sensitive questions were treated with utmost care to protect the privacy of participants. Respecting participants' rights to privacy is essential in research ethics. It ensures that participants feel safe and secure in sharing their thoughts and experiences. By safeguarding personal information, researchers uphold the trust placed in them by participants and maintain the integrity of the study.

Participants' privacy was further protected through the use of confidentiality measures. Any information collected from participants was kept confidential and anonymous, with identifiers removed or coded to ensure anonymity. This approach ensured that participants' identities were protected and that their responses could not be traced back to them. Overall, the respect for participants' privacy and confidentiality underscores the ethical conduct of the study and ensures that participants are treated with dignity and respect throughout the research process.

3.9.4 Confidentiality

In this study, the secrecy and identity of participants were considered of utmost importance. Participants were informed that the information they provided would be treated with confidentiality and would never be disclosed to anyone outside the study without their explicit permission (Kaiser, 2009). They were assured that their responses would be kept anonymous and that their identities would not be revealed in any research reports or publications.

Participants were also informed that the research report would not disclose their status or the identities of the schools involved. The information provided by participants would be kept confidential and would only be used for research purposes. This approach ensured that participants felt comfortable sharing their thoughts and experiences, knowing that their privacy would be protected. Respecting the secrecy and identity of participants is crucial in research ethics. It helps to build trust between researchers and participants and ensures that participants feel safe and respected throughout the research process. By maintaining confidentiality, researchers uphold the ethical standards of research and protect the rights and well-being of participants.

3.9.5 The right to safety

In this study, the researcher ensured that participants are protected from any harm or risks throughout the research process. The researcher carefully selected interview locations that were safe and conducive to the successful completion of the study, free from harm and distractions. Participants were protected from undue intrusion, distress, indignity, physical discomfort, and personal embarrassment.

The primary ethical principle guiding this research was that participants should not be exposed to greater risk than they would encounter in their daily lives. Therefore, this study did not subject participants to any harm or pose unreasonable risks. Instead, the research was

conducted in a manner that prioritizes the emotional well-being of the participants. Participants were fully briefed on how their information will be used in the research, ensuring that they are fully informed and can make an educated decision about their participation. This approach upholds the ethical obligation to protect the rights and well-being of research participants, ensuring that they are treated with respect and dignity throughout the study (Barrow et al., 2024b).

3.9.6 Equal treatment

In this research, all participants were treated with dignity and respect, regardless of their colour, nationality, gender, or disability. This approach is essential to avoid bias and ensure that no one is emotionally harmed during the research process. By treating all participants equally and respectfully, the research aimed to create a safe and inclusive environment for everyone involved.

Furthermore, the research took steps to ensure that participants are not victimized in any way. This included protecting their confidentiality and anonymity, as well as ensuring that their personal information is not disclosed without their consent. Additionally, the research will seek to empower participants by giving them a voice in the research process and respecting their opinions and perspectives. By upholding these principles, the research aimed to conduct itself ethically and responsibly, ensuring that participants are treated with dignity and respect throughout the research process. This approach was crucial for maintaining the integrity of the research and protecting the rights and well-being of all participants.

3.9.7 Honesty

In this study, the researcher prioritized the accuracy and honesty of the data collected. It is essential to ensure that the data is not fabricated or manipulated in any way, as this could lead to inaccurate findings and erode the trust of participants. The researcher took steps to verify the accuracy of the data collected and reported the findings with honesty and transparency.

Acts of dishonesty, such as falsifying data or misrepresenting findings, was avoided at all costs. Such actions not only compromise the integrity of the research but also undermine the trust of participants. By maintaining a commitment to honesty and accuracy, the researcher aimed to uphold the ethical standards of research and ensure the credibility of the study. Additionally, the researcher took care to accurately represent the perspectives and experiences of

participants. This included accurately quoting participants and representing their views in a fair and unbiased manner. By reporting the data with honesty and integrity, the researcher ensured that the findings are valid and reliable, and that the trust of participants is maintainedthroughout the research process.

3.10 Summary of the Chapter

The research methodology employed in the research was outlined in this chapter. The study population, the sampling techniques used, and the justification for using these techniques were further discussed in the chapter. The following chapter explores how the empirical evidence gained by the approaches described in this chapter helps to answer the research questions.

CHAPTER 4

ANALYSIS, PRESENTATION AND INTERPRETATION OF STUDY FINDINGS

4 Introduction

The previous chapter was based on the methodology in which the research paradigm, the research design, population and sampling, data collection instruments, data analysis and ethical considerations were presented. In this chapter, the research presents, interprets and analyses the collected data and interprets the findings. The purpose of this study was to investigate the perceptions of teachers on the implementation of Information Communication Technology (ICT) to promote teaching and learning. The data for this study were collected at two secondary schools in Soshanguve under Tshwane West district. Purposive sampling was used to select the participants. The population of the study was comprised of the teachers at the two selected schools. A sample size of 12 teachers , comprising six teachers from each school was used. This study used semi-structured interviews as a data collection tool. The profiles of the participants are presented in Table 4.1 below.

In this study, thematic data analysis was used. The findings are presented under three themes namely: (1) the benefits of ICT implementation to promote teaching and learning; (2) improvement of team building and confidence among learners; and (3) challenges in the implementation of ICT to promote teaching and learning. The data was analyzed considering the theoretical framework. The findings are presented and discussed in this chapter. Finally, a summary chapter is presented. Thematic data analysis was employed in this study to delve into the qualitative data, aiming to address the study's key questions. One, how do teachers perceive the implementation of ICT to promote teaching and learning in the classroom? Two, what strategies do teachers use in ICT implementation to promote teaching and learning? Three, what are the challenges experienced by teachers when implementing ICT to promote teaching and learning in the classroom? This process involved grouping by subject and according to each research question. The outcome of this analytical process revealed four overarching themes, as outlined in Table 4.1.

Table 4.1: Identified Themes

Themes	Sub-themes
The benefits of ICT implementation to promote teaching and learning	• ICT implementation enhances learning among the learners • ICT implementation makes the lessons interesting and exciting in the classroom
Improvement of team building and confidence among learners	• ICT implementation boosts learners' self-confidence and ability to integrate with other learners • Strategy of integrating learners, content exposure, and its mutual benefit in the implementation of ICT
Challenges in the implementation of ICT to promote teaching and learning.	• Big class size in the ICT classroom • Lack of discipline among learners when implementing ICT • Poor technical support for teachers who are implementing ICT to promote teaching and learning

4.1 Data analysis technique

This study drew on Braun and Clarke's (2006) six steps to conduct a thematic analysis in qualitative data analysis, which is arguably the most influential approach in the social sciences as it offers a logical framework for conducting thematic analysis (Maguire and Delahunt, 2017). The Braun and Clarke's (2006) six steps are as follows:

Step 1: Become familiar with the data

I carefully listened to the recorded interviews to become familiar with the data. The interviews were heard and then written down. The transcriptions were read through twice and then condensed.

Step 2: Generate initial codes

I sought to diligently arrange the data by coding it into smaller fragments of information shortly after becoming familiar with the content of the data to better understand it. The codes were found and then recorded based on their significance to the study questions.

Step 3: Search for themes

I then looked at the codes and noticed that some of them matched up with certain themes. For instance, there were codes on the challenges that teachers faced, such as Wi-Fi issues and offline desktop computers. So, I merged the themes to create the load-shedding challenge.

Step 4: Review themes

The topics were subsequently examined to see if they made sense. I conducted this to make sure the research findings backed up the topics that had been established. As new themes evolved, some of the original themes were dropped.

Step 5: Define themes

The themes were named and described during this stage. I had to designate the overarching topic after determining the themes and sub-themes. Based on their significance and how well they fit with the objectives of the research, the themes were given names and definitions.

Step 6: Compile the report

The last step involved transforming the qualitative data into knowledge that could be analyzed in light of the study questions and existing literature. The analyzed data were utilized to describe the qualitative portion of the research.

4.2 Demographic details of the participants

The researcher considered the profiles of the participants which were significant in understanding the application of ICT in promoting teaching and learning through their perspectives. The table below presents the profiles of the participants, namely: gender, qualifications, age, and teaching experience in the school. The researcher ensured that she complied with the ethical procedures and anonymity whereby the names of participants were not mentioned, rather the codes were used as their pseudonyms. Thus, in this study, E1 to E12 stands for educator 1 to educator 12. Table 4.2. Below are the demographic details of the participants.

Table 4.2: Demographic details of the participants

School	Participant	Age category	Gender	Qualification (s)	Experience
1	Educator 1	18-30 years	Female	Bachelor of Arts Degree, Honours Degree	10 years
2	Educator 2	31-35 years	Male	Bachelor of Arts Honours	11 years
2	Educator 3	41-49 years	Female	Bachelor of Education	16 years
2	Educator 4	18-30 years	Female	Bachelor of Education	12 years
1	Educator 5	50+ years	Male	Bachelor of Arts Honours Degree,	22 years
1	Educator 6	50+ years	Female	Bachelor's Degree, Honours, and Masters' degree	25 years
2	Educator 7	18-30 years	Female	Bachelor of Arts and Honours degree	20 years
1	Educator 8	41-49 years	Male	Bachelor of Education	13 years
2	Educator 9	18-30 years	Male	Bachelor of Education	2 years
1	Educator 10	18-30 years	Male	Bachelor of Education	1 year
1	Educator 11	41-49 years	Female	Bachelor of Education	6 years
2	Educator 12	41-49 years	Male	Bachelor of Education	10 years

The results show a diverse range of teachers in terms of age, gender, qualifications, and teaching experience in both School 1 and School 2. In School 1, there is a mix of younger andolder teachers , with Educator 5 and Educator 6 being the oldest, both in the 50+ age category.Educator 5 is male and has extensive teaching experience of 22 years, holding a Bachelor of Arts Honours Degree. On the other hand, Educator 6 is female, holding a Bachelor's Degree, Honours, and Masters' degree, with 25 years of teaching experience. This suggests a wealth of experience and knowledge among these teachers , which can be beneficial in mentoring younger colleagues.

Among the younger teachers in School 1, Educator 1, Educator 11, and Educator 10 are all in the 18-30 age category. Educator 1, a female, holds a Bachelor of Arts Degree and an Honours Degree, with 10 years of teaching experience. Educator 11, also female, holds a Bachelor of Education with 6 years of teaching experience, while Educator 10, a male, holds a Bachelor of Education with 1 year of teaching experience. These younger teachers bring a fresh perspective and enthusiasm to the teaching profession, which can contribute to innovation and creativity in the classroom.

In School 2, there is a similar mix of teachers in terms of age and experience. Educator 2 and Educator 3 are in the 31-35 and 41-49 age categories, respectively. Educator 2, a male, holds a Bachelor of Arts Honours with 11 years of teaching experience, while Educator 3, a female, holds a Bachelor of Education with 16 years of teaching experience. These teachers are likely to have a good balance of experience and adaptability, which can be valuable in implementing new teaching strategies and technologies.

The younger teachers in School 2, including Educator 4, Educator 9, and Educator 12, are all in the 18-30 age category. Educator 4, a female, holds a Bachelor of Education with 12 years of teaching experience, indicating early entry into the profession. Educator 9, a male, holds a Bachelor of Education with 2 years of teaching experience, while Educator 12, also male, holds a Bachelor of Education with 10 years of teaching experience. These teachers represent the future of the profession and can benefit from mentorship and guidance from more experienced colleagues.

Overall, the results demonstrate a diverse mix of teachers in terms of age, gender, qualifications, and teaching experience in both schools. This diversity can contribute to a rich learning

environment, with teachers bringing different perspectives, skills, and experiences to their teaching practice. The following section is the results of the study from the interviews conducted, the researcher analyzed the data according to what the participants said as guided by the research questions. Data was analyzed according to themes that emerged which allowed the researcher to arrive at the findings. Below are the research questions and interview questions which were posed to the participants.

4.3 Research questions and interview questions

The research interviews that served as the study's primary source of data are in line with the interview questions about the application of ICT by teachers to promote teaching and learning. The following table 4.3, presents the research questions and interview questions. The research questions which guided the study are aligned with the interview questions concerning the teachers ' views on the implementation of ICT to promote teaching and learning. The research was anchored on the following research questions.

Table 4.3: Research questions and interview questions concerning the implementation of ICTto promote teaching and learning

Main research question and sub-questions	**Interview Questions**
Main research question What are the views of teachers on the implementation of ICT in promoting teaching andlearning?	
Sub-question 1 How do teachers perceive the implementation of ICT to promote teaching and learning in the classroom?	1. How do you view the implementation of ICT to promote teaching and learning? 2. In what way are the available technologicalresources used to improve teaching and learning?
Sub-question 2 What strategies do teachers use in ICT implementation to promote teaching and learning?	3. What kind of strategies do teachers applyfor effective implementation ofICT to promote teaching and learning?
	4. How effective are the strategies which the teachers applied in the implementation of ICT?
What are the challenges experienced by teachers when implementing ICT to promote teaching and learning in the classroom?	5. What are the challenges that teachers face in the implementation of ICT to promote teaching and learning?

4.4 Emerging themes

To understand the views of the teachers on the implementation of ICT to promote teaching and learning in Tshwane West District, teachers were interviewed from the 2 selected secondary schools in Soshanguve. Their responses led to the findings of this research. Three themes emerged from the data. These themes are summarised below and thereafter extensively discussed:

- Theme 1: The benefits of ICT implementation to promote teaching and learning
- Theme 2: Improvement of team building and confidence among learners
- Theme 3: Challenges in the implementing of ICT to promote teaching and learning

These themes provide valuable insights into the current status of ICT implementation in teaching and learning in the Tshwane West District. They highlight the need for targeted interventions to address challenges and enhance the use of ICT in education.

4.4.1 Theme 1: The benefits of ICT implementation to promote teaching and learning

The researcher wanted to understand the perception of teachers on the implementation of ICT to promote teaching and learning. The majority of the teachers admitted that the implementation of ICT has an impact on their subject area. Most of the teachers make use of ICT tools in conducting research and improving their knowledge in their subject area. Teachers highlighted that using the internet to find materials in their subject domain has exposed them to a wide variety of materials online that have increased their scope of understanding in their various subject areas, thus improving their content knowledge and teaching. Furthermore, teachers indicated that the application of ICT in the preparations of their lessons had simplified their teaching practice as they no longer had to carry heavy textbooks and papers to the classrooms. The finding that teachers have found the application of ICT in lesson preparation to simplify their teaching practice is significant for several reasons. Firstly, it indicates a shift towards more efficient and effective teaching methods. By using ICT tools, teachers can access a wide variety of resources, including digital textbooks, educational websites, and multimedia materials, all of which can enhance the quality of their lessons.

Secondly, this finding highlights the role of ICT in reducing the administrative burden on teachers. Traditionally, teachers had to carry multiple textbooks and papers to the classroom, which could be cumbersome and time-consuming. With ICT, teachers can store all their

materials digitally, making them easily accessible and eliminating the need for physical copies.

Furthermore, the use of ICT in lesson preparation allows for greater flexibility and adaptability in teaching. Teachers can easily modify their lesson plans based on student feedback or incorporate new information and resources as needed. This dynamic approach to teaching can lead to more engaging and relevant lessons for learners. The participants shared how the implementation of ICT enhanced their teaching and learners' learning as follows:

> *"When I am browsing the web, I find much more information that is not available in textbooks because the truth is textbooks are limited. Through the internet, I can get a diversesource of information without spending much". E10*

> *"Using the internet, I found a whole bulk of information concerning my subjects and, in several ways, which make it easier for me to understand. Also, I have become more confidentin class than before because of the distinct kind of information I got through the internet. Now I prepare my lesson using my personal computer which for me has helped in organizingmy teaching."E1*

> *"Using ICT tools facilitates my lessons, for example, a lesson that I used to teach for one hour, now is possible for me to use just 30 minutes. Usually, a practical mathematics lessoninvolves plotting a graph or drawing tables, a teacher has to come to the classroom and useso much time drawing and plotting the various points using a chalkboard. What I do in suchcases now is that I usually prepare that kind of lesson well ahead of time using Microsoft Excel which is easier, practical, and time-saving". E11*

ICT has had a profound impact on the teaching and learning process, as expressed by many teachers. They claimed that ICT has significantly improved their teaching methods. Responses from these teachers indicate that ICT has been beneficial in various aspects of their profession. While some teachers use ICT to prepare their lessons, others noted that it has revolutionized their approach to delivering lessons. Additionally, teachers unanimously agreed that the use of ICT tools in lesson preparation and further research in their respective subjects has increased their confidence in teaching, exposing them to a wide range of information. However, some teachers expressed frustrations with ICT, citing difficulties in using certain tools. Upon investigation, it was discovered that these teachers lacked the necessary ICT skills. Despite these challenges, ICT remains a valuable tool for many teachers, though not universally adopted.

Participants also noted that ICT implementation enhances learning among learners, making lessons more engaging and enjoyable. However, some teachers expressed frustration due to resource shortages in certain schools, leading to learners having to share resources, which can disrupt teaching and learning. Despite these challenges, teachers acknowledged that ICT has improved learners' subject knowledge. Several sub-themes emerged in support of these findings.

One sub-theme highlighted the importance of proper training in ICT for teachers to fully utilize its potential. Teachers who received adequate training reported more positive experiences with ICT and were able to integrate it more effectively into their teaching methods. Another sub-theme emphasized the need for adequate ICT resources in schools to ensure smooth implementation. Schools with sufficient resources reported fewer challenges with ICT implementation compared to those with limited resources.

Furthermore, the role of ICT in facilitating student-centred learning was highlighted. Teachers noted that ICT enables learners to take a more active role in their learning, allowing for personalized learning experiences. This aligns with the broader shift towards student-centred pedagogies in education. The above findings showed that ICT has had a significant impact on teaching and learning, with many teachers and teachers acknowledging its benefits. However, challenges such as inadequate training and resource shortages remain. Addressing these challenges will be crucial in ensuring that ICT continues to enhance teaching and learning outcomes.

4.4.1.1 Sub-theme: ICT implementation enhances learning among the learners

The findings indicating that the majority of teachers view ICT implementation as a means to promote learning and teaching represent a significant shift in educational paradigms. This perspective highlights a recognition of the transformative potential of technology in enhancing the learning experiences of pupils. By enabling access to learning content at any time and from anywhere through platforms like WhatsApp groups, ICT integration offers a new dimension of flexibility and accessibility in education.

One key implication of these findings is the potential to bridge the digital divide by providing learners with access to educational resources regardless of their geographical location or socio-economic background. This is particularly relevant in contexts where traditional educational

infrastructure may be lacking. By leveraging ICT tools such as WhatsApp groups, teachers can create virtual learning environments that extend beyond the physical confines of the classroom, enabling learners to engage with educational content outside of school hours. Furthermore, the use of ICT for learning and teaching opens up new avenues for collaborative and interactive learning experiences. WhatsApp groups, for example, can facilitate communication and collaboration among learners, allowing them to share ideas, discuss concepts, and collaborate on projects. This not only enhances the learning experience but also fosters important 21st-century skills such as communication, collaboration, and digital literacy.

However, it is important to acknowledge that the effective implementation of ICT in education requires more than just access to technology. Teachers play a critical role in integrating ICT into their teaching practices in a meaningful and effective way. This requires adequate training and support to ensure that teachers are equipped with the necessary skills and knowledge to leverage ICT tools effectively. Moreover, the findings suggested that while ICT has the potential to enhance learning and teaching, there may be challenges associated with its implementation. For example, ensuring equitable access to ICT tools and resources for all learners can be a challenge, particularly in resource-constrained settings. Additionally, concerns around data privacy and security may arise when using platforms like WhatsApp for educational purposes. They expressed themselves as follows:

"I don't see ICT as a way for best teaching and learning for learners. ICT in particular can distract them; they can start doing their things during the lessons using ICT resources. I think the traditional way of teaching is relevant for learners". E7

"Using ICT in the classroom I see it as a stimulator for learning, learners can connect online anytime, anywhere using cell phones if they did not make it to school. We record our sessionsand post them on WhatsApp group". E3

This analysis has shown that learners' learning processes have been improved by the implementation of ICT specifically cell phones. Sessions are posted on the WhatsApp group for those who did not make it to the lesson. However, it was apparent that not all agree with the implementation of ICT, one educator had to differ from others saying that the old way of teaching is the best because ICT can be distractive. the findings highlight the transformative potential of ICT in promoting learning and teaching. By enabling access to educational content at any time and from anywhere, ICT integration offers new opportunities for flexible and

accessible learning experiences. However, addressing challenges related to implementation and ensuring equitable access to ICT tools will be critical in realizing the full benefits of ICT in education.

4.4.1.2 Sub-theme: ICT implementation makes the lessons interesting and exciting in the classroom

The participants in this study highlighted the positive impact of ICT implementation on promoting learning and teaching, describing it as making the study more interesting and exciting. This finding underscores the potential of ICT to enhance student engagement and motivation in the learning process. By introducing interactive and multimedia elements into lessons, ICT can help capture learners' attention and make learning more enjoyable. Additionally, participants noted that ICT implementation addresses issues of boredom that can arise from traditional teaching methods. The introduction of ICT provides learners with new and innovative ways to engage with learning materials, keeping them actively involved in the learning process. This suggests that ICT has the potential to reinvigorate teaching practices and create a more dynamic learning environment.

Furthermore, the participants' perspectives highlight the importance of adapting teaching methods to meet the needs and preferences of modern learners. In an era where technology plays an increasingly prominent role in daily life, integrating ICT into teaching practices can help bridge the gap between traditional teaching methods and learners' digital-native expectations. This can lead to increased student satisfaction and better learning outcomes. However, it is important to note that while ICT can enhance learning and teaching, its implementation may also present challenges. For example, ensuring that all learners have access to ICT tools and resources can be a logistical challenge, particularly in resource-constrained settings. Additionally, there may be concerns around the quality and reliability of online information, which can impact the effectiveness of ICT in education. The participants said:

"Most of the learners you will find them bored, just sitting and listening to what the teacher is saying. ICT being incorporated and using their cell phones for learning has got them something exciting to do". E6

"Oh! the integration of ICT in learning and teaching is helping to make the classroom lessons interesting and exciting. We have fun in class with learners. Uhm…it just gets the

learners 'morale up so that they not just overworking". E2

The foregoing outlines how teachers perceive ICT implementation in promoting teaching and learning, the teachers have viewed it positively. Learners find it exciting when they learn to use what they use every day for fun. This is because they are familiar with the device and they enjoy using it. Overall, the findings suggest that ICT implementation has the potential to transform the learning experience, making it more engaging and relevant for learners. By leveraging the power of technology, teachers can create dynamic learning environments that cater to the needs and preferences of modern learners. However, addressing challenges related to access and quality will be crucial in ensuring that ICT can fulfil its potential as a tool for promoting learning and teaching.

4.4.2 Theme 2: ICT implementation improves team building and confidence building among learners

The findings suggest that teachers employ various strategies in the classroom to implement ICT effectively. One such strategy is team building, which teachers use to promote teaching and learning. They view team building as beneficial for building trust and understanding among learners. This approach aligns with research indicating that collaborative learning environments can enhance student engagement and learning outcomes (Johnson and Johnson, 2009). Additionally, teachers mentioned integrating learners and exposing them to content aspart of their ICT implementation strategy. By integrating learners and exposing them to content, teachers aim to create a mutually beneficial learning environment where learners can learn from each other and from the content presented through ICT tools. This strategy is supported by Vygotsky's socio-cultural theory, which emphasizes the importance of social interaction in learning (Vygotsky, 1978).

The finding that the implementation of ICT has had a positive impact on shy learners is significant as it highlights the potential of technology to address barriers to participation and promote inclusivity in the classroom. Shy learners may be hesitant to participate in traditional classroom settings due to factors such as fear of judgment or lack of confidence. However, the use of ICT gadgets such as cell phones can provide a more comfortable and familiar means for shy learners to participate.

One reason for this positive impact could be the perceived anonymity that ICT gadgets provide. Shy learners may feel less exposed when using a device to participate, as opposed to speaking

out in front of their peers. Additionally, ICT tools can provide shy learners with more time to formulate their thoughts and responses, allowing them to contribute more confidently. Moreover, the use of ICT can create a more inclusive learning environment by offering alternative ways for learners to engage with course material. For example, shy learners may feel more comfortable expressing their ideas through written communication, which can be facilitated through ICT tools such as online discussion forums or messaging platforms.

Furthermore, the implementation of ICT in the selected schools has had a positive impact on shy learners. Shy learners are often less confident about participating in class discussions, but the use of ICT gadgets such as cell phones has made them more comfortable participating. This finding suggests that ICT can be a valuable tool for overcoming barriers to participation and promoting inclusivity in the classroom. The participants remarked as follows:

> *"It surprises you as the educator when the quiet learner now flourishes because they can contribute. This is a huge contribution to the learner's life, and this is accomplished becauseI deliberately sit a shy learner with learners that I know would encourage them to contribute". E4*

> *"Sometimes when learners are given time to research certain aspects the quiet learners would now take up the lead because they are fond of ICT, and this leaves the educator inawe". E12*

The quotes provided suggest that the integration of ICT in the classroom can have a transformative effect on shy and quiet learners, leading to increased engagement and participation. This finding underscores the significance of thoughtful planning and strategic implementation when incorporating ICT into teaching practices. One key aspect highlighted in the quotes is the familiarity and affinity that learners have with ICT devices such as cell phones and computers. These technologies are not only familiar to learners but are also tools they enjoy using. This familiarity and comfort can play a crucial role in helping shy learners overcome their inhibitions. When learners are engaged with tools they are comfortable with, they may be more willing to participate and engage in classroom activities.

Moreover, the use of ICT can provide shy learners with a sense of empowerment. ICT tools can give learners more control over their learning process, allowing them to work at their ownpace and explore topics that interest them. This autonomy can help shy learners build confidence and take more ownership of their learning. The findings also emphasize the importance of strategic

planning and implementation strategies when integrating ICT into teaching practices. Teachers can use various strategies to engage shy learners, such as team building activities that encourage collaboration and peer interaction. By creating a supportive and inclusive classroom environment, teachers can help shy learners feel more comfortable and confident in expressing their ideas.

Additionally, integrating learners into the teaching process can help shy learners feel more involved and valued. By incorporating ICT tools that allow for interactive and participatory learning experiences, teachers can create opportunities for shy learners to engage with the material in meaningful ways. Overall, these findings highlight the potential of ICT to transform teaching and learning outcomes, particularly for shy and quiet learners. By strategically integrating ICT into teaching practices and employing engaging and inclusive strategies, teachers can create dynamic and interactive learning environments that cater to the diverse needs of all learners.

4.4.2.1 Sub-theme: ICT implementation boosts learners' self-confidence and ability to integrate with other learners

The findings from this study indicate that the use of cell phones and computers in group work settings has a positive impact on children's overall development. This aligns with previous research that has highlighted the benefits of technology in education, particularly in promoting collaboration and enhancing learning outcomes (Barron et al., 2015; Howland et al., 2012). By integrating technology into group work, teachers can create dynamic and engaging learning environments that cater to the diverse needs of learners.

One key benefit of incorporating technology into group work is its ability to foster creativity among learners. Technology provides learners with tools and resources to explore their creativity, such as multimedia presentations, digital storytelling, and interactive simulations. These tools not only enhance the learning experience but also encourage learners to think critically and creatively about the subject matter (Johnson et al., 2016).

Additionally, the use of technology in group work helps build confidence among learners. Technology allows learners to collaborate on projects, share ideas, and present their work in innovative ways. This collaborative approach can boost learners' confidence in their abilities and improve their communication skills (Means et al., 2013). For learners who may be shy or hesitant to participate in group activities, technology can provide a platform for them to express

themselves and contribute to the group effort.

Moreover, incorporating technology into group work creates a sense of camaraderie among learners. Technology enables learners to connect with their peers, share experiences, and work together towards a common goal. This sense of community can enhance learners' social skills and improve their ability to work collaboratively (Dillenbourg et al., 2009). For learners who may feel isolated or disconnected from their peers, technology can provide a sense of belonging and connection. Here is what a few teachers had to say about the type of strategy they use inthe classroom during the implementation of ICT:

> *"Using cell phones and computers in a group work setting also proved beneficial as it develops the child and provides a huge contribution to their life. It also facilitates creativity and fosters confidence building since all members are placed in the same group for the firsttime. This also assisted learners who did not have cell phones, and this developed a sense of camaraderie". E7*

> *"When I work in groups with my learners, I find that the learners find it easy to open up in small groups and when they have to deliver their responses collectively there is immense team spirit and unity, and this is done by me giving them the space to explore. Furthermore, they are eager to participate as they have access to more than one resource available on their cell phones. They also learn from each other as learners". E3*

The findings unequivocally underscore the affirmative impact of integrating cell phones and computers into group work settings within the classroom. The positive outcomes go beyond the realm of technology utilization, extending to the holistic development of children. This incorporation not only fosters creativity and builds confidence but also creates a tangible sense of camaraderie among learners, particularly benefitting those without direct access to cell phones. The teachers ' testimonials further affirm the effectiveness of this strategy, emphasizing its role in providing learners with a conducive environment to express themselves,encouraging team spirit, and enabling collaborative learning. The study reinforces the notion that leveraging technology in group work not only enhances educational experiences but also contributes significantly to the broader personal and social development of learners.

Overall, the findings suggest that the use of cell phones and computers in group work settings has a range of positive impacts on children's development. By fostering creativity, building

confidence, and creating a sense of camaraderie among learners, technology can enhance the overall learning experience and contribute to learners' academic and social growth. However,it is important for teachers to ensure that the use of technology is purposeful and aligned with learning objectives to maximize its benefits (Mishra and Koehler, 2006).

The integration of cell phones and computers into group work settings has the potential to positively impact children's development. By leveraging technology to foster creativity, build confidence, and create a sense of camaraderie among learners, teachers can create dynamic and engaging learning environments that promote collaboration and enhance learning outcomes. However, it is essential for teachers to approach the use of technology in group work with careful consideration and ensure that it is used in a way that enhances the overall learning experience.

4.4.2.2 Sub-theme: Strategy of integrating learners, content exposure, and its mutual benefit in the implementation of ICT

The findings highlighting the practical value of cell phones in educational settings are in line with broader trends in leveraging technology to address resource constraints and enhance learning experiences. Cell phones, with their ubiquity and versatility, offer a range of benefitsin educational contexts, particularly in areas where resources such as dictionaries or textbooksmay be limited or unavailable. One key advantage of cell phones is their ability to provide access to a wealth of educational resources and information. With internet connectivity, learners can access online dictionaries, e-books, and educational websites, overcoming the limitations imposed by a lack of physical resources. This not only enhances their learning experiences but also encourages self-directed learning and research skills. Furthermore, cell phones can facilitate collaborative learning, enabling learners to work together on projects, share resources, and communicate effectively. Apps and platforms designed for educational purposes can enhance collaboration by providing tools for group work, discussions, and peer feedback. This collaborative approach not only enriches the learning process but also fosters teamwork and communication skills.

The findings also underscore the importance of recognizing and leveraging the existing technological resources available to learners. In many contexts, cell phones are already widely used and familiar to learners, making them a natural tool for educational purposes. By integrating cell phones into the learning process, teachers can harness learners' existing knowledge and skills, making learning more relevant and engaging. However, it is essential to

acknowledge that the use of cell phones in education also presents challenges and considerations. Privacy, security, and digital literacy are crucial aspects that need to beaddressed to ensure responsible and effective use of technology in education. Teachers shouldalso be mindful of the digital divide and ensure that all learners have equitable access to technology and the internet. Here are the perspectives shared by the participants:

"When teaching English Home Language, the use of ICT such as cell phones is God sent, in the sense that if the learners need to find a meaning of a word all they have to do is ask for permission to search for it on their phones. This helps since I have only one dictionary in myclass of 43 learners. This is mutually beneficial for both learner and educator". E7

"I was teaching a poem titled "Vultures", and part of the poem described that the vulture is ugly beyond redemption as well as its head looks like it is bashed in. My learners could not relate as they did not know what a vulture looked like until I asked them to take out their cellphones and search for a vulture and then the poem became more meaningful to them. It proved so successful because whenever the poem is being tested, they choose it to answer despite having other choices". E6

"The learners benefit from each other's knowledge as well as experiences especially if some learners are not exposed to certain aspects, it is then very easy to search for it on their cell phones and then they do not feel left out". E1

"When discussing the prescribed books, the use of cell phones acts as a powerful tool since the learners learn from each other by sharing their research collectively if they are working in groups or the class at large if working individually. It gives them various views other thantheir own. Further to that since there are shortages of textbooks, I send a PDF copy of their prescribed books via WhatsApp so that learners are not disadvantaged". E10

Evidently, efforts are being put in place for teachers to ensure cordial implementation of ICTin teaching and learning. Team building, success, and overcoming shyness are being used as strategies to improve the implementation of ICT in the classroom. By using these strategies in ICT for promoting teaching and learning, learners can use their cell phones and computers ina group work setting which proves to be beneficial as it develops the child and provides a huge contribution to their life since they are able to search for definitions of certain terminologies

during English class. ICT also facilitates creativity and fosters confidence building as well as fostering the learners to engage with one another's knowledge and experience, whereby they teach one another how to use ICT. The findings highlight the potential of cell phones to address resource constraints and enhance learning experiences in educational settings. By leveraging the practical value of cell phones, teachers can create more engaging, collaborative, and effective learning environments. However, it is essential to approach the use of cell phones ineducation thoughtfully, addressing challenges and ensuring that technology is used responsibly and inclusively.

4.4.3 Theme 3: Challenges experienced by the teachers when implementing ICT to promote teaching and learning

This study investigated the challenges that teachers encounter while implementing ICT to promote teaching and learning in their schools. The participants said that they encounter challenges such as lack of discipline whereby learners no longer use the cell phone for lessons rather, they use it to play games during the lessons. Some teachers said huge class size is alsoa problem whereby the computers do not accommodate all the learners during the lessons. Others said the challenge of load shedding is a crisis. During load shedding, they cannot use computers, and this affects teaching and learning negatively. Other teachers reported that theissue of poor technical support is a challenge because they can't fix the problems that arise when they are using ICT tools such as computers in class.

Load shedding has become a significant challenge for schools, impacting their ability to use ICT such as computers and projectors. This issue is part of a broader problem affecting varioussectors, where scheduled power cuts disrupt daily operations. In the education sector, load shedding presents a particular challenge for teachers who rely on ICT for teaching and learning. During power cuts, schools are unable to use computers and projectors, which are essential tools for delivering engaging and interactive lessons. This not only affects the qualityof education but also hampers the effectiveness of teaching methods that depend on technology.

Teachers must find alternative ways to continue teaching during power cuts, which can be challenging and may require adapting their lesson plans. Some schools may have backup power sources such as generators or solar power, but these solutions may not always be sufficient or practical. As load shedding continues to be a problem, teachers and schools must explore innovative strategies to minimize the impact on teaching and learning. The participants said:

“Load-shedding is affecting our lessons a lot; electricity can go on for about 5 hours and at that time I have to be at the computer lab or class for lessons to find out they are offline. Therefore, we end up being behind with our lessons because nothing is working, Wi-Fi is offas well.” E8

Another educator agrees with E8 by saying:

"Lack of generator during load shedding is a huge problem for us, computers are off, andWi-Fi is not working. There's nothing that we can do but just postpone the class, which results in our lessons being disrupted and our learners lagging behind". E8

Another participant said:

"We are experiencing load-shedding now and then, as we are busy with lessons electricity will just cut our lessons short, and we don't have generators at school, which is so stressful". E4

Power cuts/load shedding is evident that it has serious implications for learning and teaching. Teachers find it challenging to go on with their lessons as a result of load-shedding. This is because most of the equipment/tools are offline. As it was found that other teachers prefer traditional ways of teaching, other teachers also stated that ICT implementation is frustrating. Load shedding, or scheduled power cuts, poses significant challenges for teachers and has serious implications for teaching and learning. When power cuts occur, teachers often find it challenging to continue with their lessons, as many of the essential tools and equipment they rely on, such as computers and projectors, are offline. This disruption can significantly impact the flow of lessons and hinder the use of ICT in the classroom.

For teachers who prefer traditional teaching methods, load shedding exacerbates the challenges they already face. These teachers may already be hesitant to incorporate ICT intotheir teaching practices, and the additional hurdle of power cuts only reinforces their preferencefor traditional methods. The frustration experienced by teachers in these circumstances can further hinder the effective implementation of ICT in teaching and learning. Furthermore, loadshedding highlights the importance of having robust backup plans and alternative teaching strategies in place. Teachers need to be prepared to adapt quickly to unexpected challenges like power cuts and ensure that learning continues despite disruptions. This may involve utilizing alternative resources, such as printed materials or interactive activities that do not relyon electricity.

Addressing the issue of load shedding requires a multifaceted approach. Teachers can benefit from training and support to enhance their ability to adapt to disruptions and effectively integrate ICT into their teaching practices. Additionally, investing in alternative power sources, such as generators or solar power, can help mitigate the impact of power cuts on teaching and learning. Overall, load shedding underscores the importance of resilience and flexibility in teaching practices. Teachers must be prepared to navigate challenges like power cuts and find innovative ways to ensure that learning remains uninterrupted. By addressing these challenges proactively, teachers can create more resilient learning environments that are better equipped to handle disruptions.

"ICT integration in learning is sometimes frustrating. Our ICT support team is too lazy to assist us teachers when we need help in class. They come late when they are called to comeand assist. This makes me frustrated about ICT. In the classroom". E12

"Eish, sometimes when I go to class to use the laptop and the projector to show learnersvideos of the algebra equations and expressions, I would feel anxious thinking the laptop might just start to act funny or something. That would make me feel embarrassed hey…, especially before learners, as if I did not prepare". E5

Implementing ICT in education is a transformative process that offers numerous benefits, including enhanced learning experiences and improved educational outcomes. However, the successful integration of ICT into teaching and learning practices is contingent upon teachers ' proficiency and comfort with using these technologies. While some teachers embrace ICT enthusiastically, others may find it challenging or frustrating, leading to barriers in implementation. Therefore, it is crucial to provide teachers with adequate training and supportto ensure they can effectively utilize ICT tools in the classroom.

One of the primary challenges faced by teachers in implementing ICT is a lack of familiarity with the technology. Many teachers may not have had prior experience or training in using ICT tools for teaching purposes. This lack of proficiency can result in feelings of anxiety or frustration when attempting to incorporate ICT into their lessons. Additionally, teachers maybe uncertain about how to integrate ICT effectively into their existing teaching practices, further complicating the implementation process.

Proper training can address these challenges by equipping teachers with the skills and knowledge needed to use ICT effectively in their teaching. Training programs should cover a

range of topics, including basic ICT skills, pedagogical strategies for integrating ICT into lessons, and troubleshooting common technical issues. By providing teachers with comprehensive training, educational institutions can empower them to use ICT confidently and creatively in their teaching practices.

Furthermore, ongoing support is essential to ensure that teachers continue to feel comfortable and competent in using ICT. This support can take various forms, such as access to help desks or online resources, peer mentoring programs, and professional development opportunities. By fostering a culture of continuous learning and support, educational institutions can helpteachers overcome challenges and maximize the benefits of ICT in teaching and learning.

In addition to training and support, it is crucial to consider the usability of ICT tools themselves. Teachers are more likely to embrace ICT if they find the technology user-friendly and intuitive. Therefore, educational institutions should carefully evaluate and select ICT tools thatare easy to use and align with teachers ' teaching needs and preferences. Additionally, regularfeedback from teachers can help identify areas for improvement and inform decisions about the selection and implementation of ICT tools. While ICT implementation offers significant benefits for teaching and learning, it is essential to address the challenges faced by teachers in using these technologies effectively. Providing teachers with proper training, ongoing support, and user-friendly ICT tools can help ensure successful implementation and maximizethe impact of ICT on education. By investing in teachers ' professional development and technology infrastructure, educational institutions can create an environment conducive to innovation, creativity, and student success.

4.4.3.1 Sub-theme: Big class size in the ICT classroom

In the context of modern education, the integration of technology into teaching practices has become increasingly important. However, this integration is not without its challenges, especially in large classrooms with limited access to computers. This sub-theme of the study focuses on the specific challenges faced by teachers in such environments, particularly regarding resource limitations and noise management.

Resource limitations are a significant challenge for teachers in large classrooms. In many cases, schools may not have enough computers or other technology devices to adequately serveall learners. This scarcity of resources can hinder the effective integration of technology into teaching practices. Teachers may struggle to provide hands-on experience with technology,

which is crucial for enhancing digital literacy skills among learners. Furthermore, limited access to computers can lead to unequal learning opportunities, as some learners may have more exposure to technology outside of school than others.

Noise management is another challenge faced by teachers in large classrooms when integrating technology. In a classroom with many learners, noise levels can quickly escalate, making it difficult for teachers to maintain a conducive learning environment. The use of technology can sometimes exacerbate this issue, as learners may become more engaged with their devices and less attentive to classroom rules regarding noise levels. This can impact the effectiveness of teaching practices and the overall learning experience for learners.

To address these challenges, teachers can implement several strategies. First, they canprioritize the use of technology for activities that require individual or small group work, ratherthan whole-class instruction. This can help mitigate noise levels and ensure that all learners have access to technology. Additionally, teachers can create a classroom environment that emphasizes the importance of respectful behaviour and responsible use of technology. Settingclear expectations and providing consistent reinforcement can help manage noise levels and promote positive behaviour.

Furthermore, teachers can collaborate with school administrators and IT staff to advocate for additional resources and support for technology integration. This may include securing funding for new devices, improving infrastructure to support technology use, and providing professional development opportunities for teachers to enhance their technology skills. By working together, teachers and administrators can create a more supportive and conducive environment for integrating technology in large classrooms. A few teachers indicated that thechallenges they encountered was a huge number of learners in one classroom. Here is how they expressed themselves:

> *"My classes are over forty, and as a result, I am faced with a few challenges. Firstly, the classroom does not have enough computers, so other learners tend to have no computers andhave to wait for others to finish using computers. Therefore within 30 minutes lesson, some learners happen not to be covered in the use of computers". E11*

Another educator supported the E11 by stating that:

"Since the classes are large, sometimes the noise levels increase, and the school management

does not approve they come to investigate, and I am told to lower the noise level. When doinggroup activities with the learners using ICT such as their cell phones, we have no control over the other groups. I do not have a problem, as it is constructive noise. Learners are eagerto share the information that they have researched". E2

This challenge relates to challenges when teachers don't have control of the class. Inadequate computers have been a challenge that teachers encounter in the class due to the large numberof learners. The huge size of learners is not easy for teachers whereby they have to assist eachlearner while others have no computer in front of them. Undoubtedly this has affected the classlessons and the teachers since a huge number of learners make learning and teaching a tedioustask. The findings from this sub-theme highlight the challenges faced by teachers in large classrooms with limited access to computers. Resource limitations and noise management aresignificant concerns that can impact the effective integration of technology into teaching practices. However, by implementing strategies to address these challenges and advocating foradditional resources and support, teachers can create a more engaging and effective learningenvironment for all learners.

Teachers often face challenges related to classroom management and access to resources, particularly in large classrooms with limited computer availability. Inadequate access to computers is a common issue, especially in classes with a high number of learners. The sheer size of the class can make it difficult for teachers to ensure that each learner has access to a computer, which can significantly impact the effectiveness of teaching and learning. The lackof sufficient computers can have a direct impact on the quality of lessons delivered in the classroom. Without access to computers, teachers may struggle to incorporate technology into their teaching practices, limiting their ability to create engaging and interactive lessons. This can result in a less dynamic learning environment, making it challenging for teachers to keepall learners actively engaged in the lesson.

Additionally, the noise level in large classrooms can also present a significant challenge for teachers . Managing noise levels can be difficult, especially when trying to ensure that all learners have access to the limited number of computers available. Excessive noise can disrupt the learning process, making it harder for teachers to effectively deliver their lessons and for learners to concentrate on their work. To address these challenges, teachers can implement strategies to manage noise levels and maximize the use of limited resources. For example, teachers can use group work and collaborative learning activities to ensure that all learners have

the opportunity to use computers, even if they do not have one in front of them. This canhelp to create a more inclusive learning environment where all learners are actively engaged inthe lesson.

Advocating for additional resources and support can also help to alleviate some of these challenges. Teachers can work with school administrators and policymakers to secure funding for more computers and to address other resource limitations in the classroom. By advocating for these resources, teachers can create a more conducive learning environment that supportsthe effective integration of technology into teaching practices. In conclusion, teachers face significant challenges in large classrooms with limited access to computers. However, by implementing strategies to address these challenges and advocating for additional resources and support, teachers can create a more engaging and effective learning environment for all learners.

4.4.3.2 Sub-theme: Lack of discipline among learners when implementing ICT

The issue of self-discipline among learners in the context of ICT implementation is a multifaceted one, with implications for both behaviour management and the effective use of technology in education. This finding underscores the importance of addressing self-discipline issues among learners to ensure the successful integration of ICT in the classroom. One of the key challenges associated with a lack of self-discipline among learners is the potential for disruptive behaviour. When learners are not able to manage their behaviour effectively, they may engage in activities that disrupt the learning environment, such as talking out of turn, using electronic devices inappropriately, or engaging in other distracting behaviours. This can negatively impact the learning experience for other learners and make it difficult for teachers to effectively teach using ICT.

Furthermore, a lack of self-discipline among learners can also hinder their ability to use technology effectively for learning purposes. ICT tools such as computers, tablets, and smartphones require a certain level of self-discipline to use responsibly and productively. Learners who lack self-discipline may struggle to stay focused on educational tasks, leading to inefficiencies in learning and reduced academic performance. Addressing self-discipline issues among learners requires a multi-faceted approach that involves teachers , parents, and learners themselves. Teachers can play a key role in promoting self-discipline by setting clear expectations for behaviour and providing positive reinforcement for good behavior. They can also teach learners strategies for managing their behaviour and staying focused when using technology.

Parents also play a crucial role in promoting self-discipline among learners. By setting clear rules and boundaries around technology use at home, parents can help instill good habits that can carry over into the classroom. Additionally, parents can model self-discipline themselves, showing their children the importance of staying focused and responsible when using technology. Finally, learners themselves must take responsibility for their own behavior and learning. By recognizing the importance of self-discipline and actively working to improve it, learners can enhance their academic performance and contribute to a positive learning environment for themselves and their peers. This is evident in an excerpt from the educator. They expressed themselves as follows:

"Some of the learners are not prepared for the introduction of ICT in class, they just do what they like using cell phones and computers in the class from what I as a teacher will be doing. Some will be playing games on the computer and when you come closer, they pretend to be doing what you are doing. Hence, at the end of the year, we have learners who failed certain subjects dismally". E5

This was supported by other teachers who said:

"Learners do come to the school but do not attend classes. I constantly post work on our WhatsApp groups hoping those learners take advantage of it but because of lack of self-discipline they just avoid important messages, and they focus on other things on their cell phones". E6

"The parents are busy working and most of the time, mostly out of town, the learners live in child-headed homes, so they are left to do whatever they please. They stay up late and when they come to school, they are tired and switch off. Hence, WhatsApp groups were introduced to them to check the class notes and important announcements. However, some learners do not use their cell phones for their learning benefits, they avoid the messages and come to school not done the work that was posted on the WhatsApp group". E2

Teachers often observe that some learners are not fully committed to their academic work, which can impact their ability to benefit from the implementation of ICT in the classroom. This lack of commitment may manifest in several ways, such as incomplete assignments, poor attendance, or a lack of engagement during lessons. One of the key reasons behind this lack of commitment may be a lack of understanding or appreciation for the benefits of ICT in learning.

Some learners may not see the relevance of ICT tools to their academic success, leading themto prioritize other activities over their schoolwork. Additionally, learners who struggle academically may feel discouraged and disengaged, further contributing to their lack of commitment.

Moreover, external factors such as family responsibilities, socio-economic challenges, or personal issues may also impact learners' commitment to their academic work. Learners who face significant challenges outside of school may find it difficult to prioritize their studies, leading to a lack of commitment and engagement in the classroom. To address these challenges, teachers can take proactive steps to increase learners' commitment to their academic work andthe implementation of ICT. This may include highlighting the practical benefits of ICT in learning, such as improved access to information, enhanced collaboration, and increased engagement. Teachers can also create a supportive and inclusive learning environment that encourages all learners to participate and engage with ICT tools. Additionally, teachers can work closely with learners to identify and address any underlying issues that may be impactingtheir commitment to their academic work. By providing personalized support and guidance,

teachers can help learners overcome obstacles and develop a greater sense of commitment to their studies and the use of ICT in learning.

4.4.3.3 Sub-theme: Poor technical support for teachers who are implementing ICT to promote teaching and learning

In the context of this study, participants highlighted two key challenges related to the technical support for ICT in schools: a deficiency in a robust technical team and a lack of monitoring by management to assess the team's performance. Firstly, participants noted a deficiency in a robust technical team for ICT. This suggests that schools may not have an adequate number ofskilled personnel to provide technical support for ICT infrastructure. This can lead to delays inresolving technical issues, maintenance backlogs, and overall inefficiencies in ICTmanagement. Without a robust technical team, schools may struggle to maintain and utilize their ICT resources effectively, which can hinder the implementation of ICT in teaching and learning.

Secondly, participants mentioned a lack of monitoring by management to assess the technical team's performance. This indicates a potential gap in oversight and accountability regarding ICT support services. Without proper monitoring, it may be challenging to identify areas for improvement or to ensure that the technical team is meeting the school's ICT needs effectively. Additionally, a lack of monitoring can lead to complacency or inefficiencies within the technical team, as there is no accountability for their performance. To address these challenges,schools can take several steps. Firstly, schools can invest in training and capacity building fortheir technical team to ensure they have the necessary skills and knowledge to support ICT infrastructure effectively. This can help improve the team's efficiency and effectiveness in resolving technical issues.

Secondly, schools should establish clear performance indicators and monitoring mechanisms to assess the technical team's performance regularly. This can include regular reviews of technical support requests, response times, and user satisfaction surveys. By monitoring the team's performance, schools can identify areas for improvement and ensure that the team is meeting the school's ICT needs. Overall, addressing the challenges related to the technical support for ICT requires a proactive approach from schools. By investing in their technical team's capacity and implementing effective monitoring mechanisms, schools can enhance their

ICT support services and improve the overall implementation of ICT in teaching and learning. They said:

"When am busy in class, I sometimes don't know what happened with the projector because of load shedding. I will reach out to the technical team, but they will say they are coming, and I will keep on waiting. Is draining to see that the whole lesson period just finishes without doing what I wanted to do with learners." E7

"The laptop I use sometimes freezes or starts to act slowly, when I have taken it to the IT support team for assistance hoping to get it in a few days, they start saying they were hands-on while everyone knows that they are just making up the stories they are not working at all." E3

It cannot however be overstated that lack of technical support hinges on the implementation of ICT in teaching and learning and failure to do so would have negative implications on learners. Despite the presence of a technical team at school, the teachers experienced technical challenges while they were there at school. This is because this team is not monitored to see whether they do their job or not. The use of ICT such as computers, laptops, projectors, cell phones, and Wi-Fi is important in promoting teaching and learning at schools. The findings ofthis study indicated that there is a lack of technical support that educator's experience which ultimately affects the implementation of ICT.

Technical support plays a crucial role in the successful implementation of ICT in teaching and learning. Without adequate technical support, teachers may face challenges that can hinder the effective use of technology in the classroom, ultimately impacting learners negatively. Despite the presence of a technical team at school, teachers in this study reported experiencingtechnical challenges that affected their ability to use ICT effectively. One of the key issues highlighted by teachers was the lack of monitoring of the technical team. While there is a technical team in place, teachers expressed concerns that this team is not adequately monitored to ensure that they are effectively carrying out their responsibilities. This lack of oversight can lead to technical issues going unresolved, further exacerbating the challenges faced by teachers in using ICT in their teaching practices.

The use of ICT tools such as computers, laptops, projectors, cell phones, and Wi-Fi is essential for promoting teaching and learning in schools. These tools offer teachers and learners accessto a wealth of resources and information, enhancing the teaching and learning experience.

However, without adequate technical support, the full potential of these tools may not be realized. The findings of this study underscore the importance of addressing the issue of technical support in schools. To ensure the effective implementation of ICT in teaching and learning, it is essential to have a well-functioning technical team that is monitored and supported in their work. This can help to address technical challenges quickly and efficiently,allowing teachers to focus on their teaching without being hindered by technical issues.

Furthermore, providing ongoing training and professional development opportunities for teachers can help to build their confidence and skills in using ICT. By investing in the professional development of teachers , schools can empower them to use ICT effectively in their teaching practices, ultimately benefiting learners. Technical support plays a vital role in the successful implementation of ICT in teaching and learning. Schools must ensure that they have a well-functioning technical team that is monitored and supported in their work. Additionally, investing in the professional development of teachers can help to build their confidence and skills in using ICT, ultimately benefiting learners and enhancing the teaching and learning experience.

4.5 Findings Summary

This chapter's focus was on data analysis, presentation, and interpretation. Responses from a semi-structured interview were presented verbatim from the individual participants. Thechapter had three themes that were divided into subthemes. Most of the cracks of presentationand interpretation arose from them. The first theme was based on the benefits of ICTimplementation to promote teaching and learning. The following subheadings arose from it: (1) ICT implementation enhances learning among the learners; and (2) ICT implementation makes the lessons interesting and exciting in the classroom.

The second theme was based on ICT improvement of team building and confidence building among learners. The following sub-themes emerged from this theme: (1) boosts learners' self-confidence and ability to integrate with other learners, and (2) content exposure. The third theme was based on challenges experienced by the teachers when implementing ICT to promote teaching and learning. The following sub-themes emerged from it: (1) Big class size in the ICT classroom; and (2) lack of discipline among learners when implementing ICT; and (3) poor technical support for teachers.

The study collected data about the teachers ' perceptions on the implementation of Information Communication Technology to promote teaching and learning in the selected two secondary schools, in Tshwane West district in Gauteng Province of South Africa. In this section, each finding will be discussed. The findings of this study revealed that teachers encounter various challenges when they implement ICT in the classroom. It was found further that load-shedding, lack of committed technical support team, lack of discipline, class size, and lack of Wi-Fi/Data are the challenges faced by the teachers when implementing ICT in the selected two secondary schools. This shows that it is of paramount importance for teachers to have the resources in place when they are implementing ICT. Without electricity or when other learners have no ICT tools during lessons it is highly unlikely to implement ICT effectively.

Despite the highlighted challenges above, the study revealed that ICT implementation was beneficial to some participants. Some participants expressed that the implementation of ICT enhances their teaching and learning among the learners. Some indicated that ICT makes the class lesson interesting and exciting wherein the learners who used to be bored in class tend to feel excited and show keen interest in learning using computers and other ICT gadgets like tablets and cell phones. The study also revealed some frustrations among teachers whereby teachers do not know what to do when the computer starts to give troubleshooting episodes during the lessons and when they call the technical team they seem not to respond swiftly to the matter. The teachers had to develop strategies to ensure that the implementation of ICT is beneficial in teaching and learning. Some teachers stated that they use team building as their strategy in ICT implementation and they see it as extremely beneficial for building trust, confidence, and understanding. The teachers further stated that when they work in groups with learners, they find that the learners find it easy to open up in small groups and when theyhave to deliver their responses collectively there is immense team spirit and unity.

4.6 Chapter Summary

This chapter presented the findings of the study, the study interviewed 12 teachers from the2 selected secondary schools under Tshwane West district using semi-structured interviews. The data analysis was presented using thematic analysis in this study. The chapter presentationwas done under themes that emerged from the findings of the study, which were informed by the objectives of the study. These themes were the perception of teachers on ICT implementation, the strategies used by teachers in ICT implementation to promote teaching and learning, and the challenges they experienced.

Some of the challenges were that teachers don't have a supportive technical team when implementing ICT in the classroom and the load-shedding facing our country today is also playing a great role in ICT implementation disruptionin class. Other findings are that the teachers are not confident when coming to teaching usingcomputers and the use of ICT gadgets, they sometimes use learners who are knowledgeable toassist them to avoid them not being able to utilize the resources in front of the learners. The next chapter will discuss the conclusion and recommendation of this research on how the implementation of ICT can be improved to promote teaching and learning in the 2 selected secondary schools in the Tshwane West district.

CHAPTER 5

DISCUSSION OF FINDINGS

5 Introduction

This study explored the implementation of ICT for teaching and learning in Tshwane West District. The study further provided empirical evidence on the different approaches that are used by teachers to implement ICT in the classroom. The study was guided by the followingmain research question:

What are the views of teachers on the implementation of ICT in promoting teaching and learning?

This main research question sought to understand teachers ' perspectives on the implementation of ICT to enhance teaching and learning in the classroom, the strategies they employ for this purpose, and the challenges encountered in the process constituted theinvestigation of research questions. The researcher used the discussed theoretical framework as the lenses to understand the phenomenon. The ensuing discussion is structured in alignmentwith the emerging themes of the study, addressing each research question.

5.1 The main issues that were found

5.1.1 How do teachers perceive their implementation of ICT in promoting teaching and learning in the classroom?

The research findings revealed that teachers acknowledge the positive impact of implementing ICT for teaching and learning on their subject areas. This study found that teachers used ICT tools for research, enhancing their knowledge, and simplifying lesson preparations by accessing a wide variety of materials online. This not only improved their content knowledge but also streamlined their teaching practices, eliminating the need for carrying heavy textbooksand papers to classrooms. This finding was consistent with the literature, as one study by Abdul-Razak (2020) found that teachers used ICT to enhance teaching and learning in the classroom. Moreover, Sangrà and González- Sanmamed's (2010) findings further demonstratedthat ICT is used to develop low-level teaching and learning processes.

However, according to Willis et al. (2019), traditional teachers could be less likely to favour the implementation of ICT for teaching and learning in the classroom. Part of the reasons werelack of familiarity and comfort with technology among traditional teachers who have long been accustomed to conventional teaching methods. The shift to incorporating ICT may require them to learn new skills, adapt to technological tools, and alter their established teaching approaches, which could be perceived as a daunting challenge.

Despite prevailing literature suggesting that traditional teachers are inclined to resist ICT implementation in the classroom, this study uncovered a different perspective. The findings indicate that incorporating ICT in the classroom actually assists teachers in diversifying their lesson delivery methods. As a result, teachers reported an increase in confidence, attributing it to exposure to a variety of information facilitated by ICT. This challenges the common assumption about the resistance of traditional teachers and underscores the positive impact of ICT on pedagogical approaches and teacher confidence.

Several previous studies have explored the factors influencing teachers' acceptance and integration of ICT in educational settings. For instance, a study by Ertmer (2005) found that teachers' beliefs about the value of technology, their confidence in using it, and their perceptions of the support they receive are crucial factors affecting their willingness to adopt ICT in teaching. Additionally, a study by Ottenbreit-Leftwich et al. (2010) highlighted that teachers' comfort and competence with technology play a pivotal role in determining their adoption of ICT practices.

The current study's emphasis on the positive outcomes, such as increased confidence, resulting from ICT implementation is consistent with findings from research that highlight the potential benefits of technology integration in education. A study by Tondeur et al. (2012) argued that when teachers perceive ICT as a tool that enhances their pedagogical practices rather than a disruptive force, they are more likely to integrate it effectively.

The research findings of this study revealed that teachers viewed ICT as a tool to enhance pupil learning, offering them access to educational content anytime and anywhere through platforms like WhatsApp groups. Numerous research studies have explored the role of ICT in education, often highlighting its potential to positively impact student learning outcomes. For instance, a study by Davis (2017) emphasized that when effectively integrated into teaching practices, ICT

tools can provide learners with opportunities for personalized and flexible learning, supporting the idea of anytime, anywhere access to educational content.

The notion that ICT, particularly through platforms like WhatsApp groups, offers learners access to educational content beyond the traditional classroom setting is corroborated by research on mobile learning. Mobile technologies have been recognized for their potential to extend learning opportunities beyond the confines of the classroom (Kukulska-Hulme and Traxler, 2005). Mobile learning platforms, including messaging apps like WhatsApp, providea convenient means for learners to engage with educational content, collaborate with peers, and receive support from teachers, enhancing the overall learning experience (Sharples et al., 2007). Furthermore, the current study's findings resonate with the concept of ubiquitous learning, where learners have seamless access to educational resources at any time and from any location (Traxler, 2009). This aligns with the idea that ICT, especially through mobile platforms, contributes to creating a more flexible and learner-centered educational environment.

This study found that IoT is important when it comes to integrating and implementing ICT for teaching and learning. Research shows that one of the best practices is to have a clear strategy for IoT integration, aligning it with educational goals and curriculum objectives (Ghashim & Arshad, 2023). Professional development programs can help educators develop the necessary skills to integrate IoT into their teaching practices effectively (Kopetz and Steiner, 2022). Schools should also collaborate with technology providers, educators, and students to ensure successful IoT integration, involving stakeholders in the decision-making process and gathering feedbackto improve implementation (Al-Masri & Shahrour, 2018). IoT as a strategy in teaching and learning has the potential to revolutionize education by making it more interactive, personalized, and efficient. While the integration of IoT in education comes with challenges, the benefits can significantly enhance the learning experience and educational outcomes. Schools and educational institutions must carefully plan and implement IoT solutions, considering both the opportunities and the potential obstacles to ensure a successful and secure integration.

However, it is essential to acknowledge potential challenges associated with the use of ICT in education, including issues related to equity, digital literacy, and the need for appropriate teacher training (Cuban, 2001; Ertmer, Ottenbreit-Leftwich, and Tondeur, 2015). While the current study emphasizes the positive view of teachers regarding ICT's role in enhancing pupillearning, the broader literature recognizes the importance of addressing these challenges to ensure equitable access and effective utilization of ICT in education. Generally, this study revealed that

teachers perceive the implementation of ICT in promoting teaching and learningas beneficial. The implementation improved their practices, enhanced content knowledge, and increased student engagement. While challenges exist, particularly related to teachers' ICT skills and resistant to change traditional teaching methods, the overall consensus is that ICT positively transforms the teaching and learning environment.

5.1.2 What strategies do teachers use in ICT for teaching and learning?

This study found that a prominent strategy used by teachers to implement ICT for teaching and learning was team building, which teachers view as extremely beneficial for fostering trust and mutual understanding among learners when they work together. This aligns with thenotion that collaborative learning environments, facilitated by ICT, contribute to the overall development of learners by fostering creativity, building confidence, and creating a sense of camaraderie, especially for those who may initially be less engaged or lack access to certain technologies (Burke, 2011).

The incorporation of ICT into group work settings is highlighted as another significant strategy. This study found that there is positive impact for utilizing technology, such as cell phones and computers, in group work. This strategy was found to not only addresses resource constraints, such as shortages of dictionaries or textbooks but also enhances the learning experiences of learners. The study further suggests that familiarizing learners with ICT tools they are comfortable with, such as cell phones, enables them to overcome shyness, as they can actively participate without the fear of judgment or embarrassment.

Research by Angrist and Lavy (2001) supports the idea that technology, when effectively integrated into educational settings, can help overcome resource limitations. The study found that providing schools with computer access positively impacted learners' academic achievements, particularly in schools facing resource constraints. Similarly, the current study suggests that the strategic use of cell phones and computers in group work not only addresses shortages of traditional resources like dictionaries or textbooks but also enhances the overall learning experiences of learners.

The notion that familiarizing learners with ICT tools, such as cell phones, can help overcome shyness aligns with research on the socio-emotional aspects of technology use in education. A study by Davis, Fuller, and Jackson (2016) found that integrating technology into collaborative learning environments contributed to increased student engagement and participation.

Moreover, the use of familiar tools like cell phones provided learners with a sense of autonomy and comfort, reducing inhibitions associated with participation.

The strategies identified in this study align with the principles of effective pedagogy, promoting engagement, creativity, and confidence-building among learners through the strategic integration of ICT tools. This study found that various strategies such as team building and collaborative learning, are used by teachers to effectively implement ICT in teaching and learning. These strategies not only address resource constraints but also contribute to the positive development of learners, fostering confidence, creativity, and collaborative skills.

5.1.3 What are the challenges experienced by teachers when implementing ICT in the classroom?

This study found that one of the prominent challenges experienced by teachers in implementing ICT in the classroom is their inability to use some of the available ICT tools. The identified challenge of teachers facing difficulties in using some available ICT tools aligns with findings from previous studies that have explored teachers' technology proficiencyand readiness for ICT integration in education. Research consistently indicates that teachers' competence with technology is a crucial factor influencing the successful implementation of ICT in the classroom (Ertmer, Ottenbreit-Leftwich, and Tondeur, 2015).

A study by Teo (2009) emphasized the importance of teachers' technological pedagogical content knowledge (TPACK), which involves the intersection of technological knowledge, pedagogical knowledge, and content knowledge. Teachers need to possess the skills to effectively integrate technology into their teaching practices, ensuring that the use of ICT aligns with educational goals and enhances student learning outcomes. The inability of teachers to use certain ICT tools, as highlighted in the current study, may stem from a lack of TPACK, hindering their capacity to integrate technology seamlessly into their teaching practices.

Furthermore, research by Mumtaz (2000) discussed the challenges teachers face in terms of computer anxiety and perceived competence. Teachers who lack confidence in using ICT tools may experience anxiety and resistance, impeding the successful integration of technology in the classroom. In the current study, the challenge of teachers not being able to use some ICTtools may be attributed to a similar lack of confidence or competence.

The findings also resonate with broader discussions on professional development for teachersin

the context of ICT integration. Ertmer et al. (2015) emphasized the need for ongoing professional development programs to enhance teachers' technological skills and confidence. Effective training and support systems are crucial for equipping teachers with the necessary skills to navigate and utilize various ICT tools in their teaching.

One of the prominent challenges highlighted in the study is the issue of discipline among learners. This study found that some learners tend to misuse ICT tools, such as cell phones, by engaging in activities unrelated to lessons, such as playing games. These echoes concerns raised in previous research on technology use in education, emphasizing the importance of fostering responsible use and discipline among learners (Zhao, Pugh, Sheldon, and Byers, 2002). Lack of discipline can significantly detract from the intended educational benefits of ICT, leading to disruptions in the learning process.

The challenge of large class sizes in the ICT classroom was found to be a significant barrier. This study identified that resource limitations, specifically inadequate access to computers, pose a hurdle in classrooms with a substantial number of learners. This aligns with previous research highlighting the impact of class size on effective technology integration (Tedla, 2012).The strain on teachers to assist each learner in a large class with limited computers can hinderthe overall effectiveness of ICT implementation (Constantino, 2014).

Load-shedding, a situation where power cuts disrupt electricity supply, emerged as a critical challenge affecting the implementation of ICT. This aligns with the broader challenge of infrastructure constraints in the education sector, particularly in regions facing energy-related issues (Tondeur et al., 2017). Load-shedding negatively impacts the availability of electricity-dependent ICT tools such as computers and projectors, hindering teaching and learning activities.

The study also highlighted the challenge of poor technical support for teachers implementing ICT. The deficiency in a robust technical team and a lack of monitoring by school management contribute to technical challenges experienced by teachers . Previous research has emphasized the significance of technical support in ensuring the effective use of ICT in education (Ertmer, Ottenbreit-Leftwich, and Tondeur, 2015). Without adequate technical support, teachers face difficulties in resolving technical issues, hindering the seamless integration of ICT tools. Disciplinary issues, large class sizes, load-shedding, and inadequate technical support collectively contribute to the hurdles faced by teachers .

5.2 Chapter summary

This chapter focused on discussing the research findings guided by the three key research questions, which explore the perspectives, strategies, and challenges associated with implementing ICT for teaching and learning in the classroom. In terms of teachers ' perspectives, the study revealed that teachers generally view the implementation of ICT as highly beneficial in promoting teaching and learning. The integration of ICT was reported to enhance teaching practices, augment content knowledge, and increase student engagement. Despite existing challenges, particularly related to teachers ' ICT skills and resistance to transitioning from traditional teaching methods, there is an overall consensus that ICT brings about positive transformations in the teaching and learning environment.

Additionally, the chapter highlighted various strategies employed by teachers , such as team building and collaborative learning, to effectively implement ICT. These strategies not only address resource constraints but also contribute to positive student development by fostering confidence, creativity, and collaborative skills. However, the chapter also underscored that implementing ICT for teaching and learning is not without challenges, and issues such as discipline, educator skill gaps, large class sizes, load-shedding, and inadequate technical support were noted as challenges. Collectively, these factors pose hurdles that teachers mustnavigate in their efforts to successfully implement ICT in the classroom.

CHAPTER 6

SUMMARY, RESEARCH JOURNEY, CONCLUSION AND RECOMMENDATIONS

6 Introduction

This chapter presents a summary, research journey, conclusion and the recommendations of the study. The significance of the study is also presented in this chapter. This chapter serves asa comprehensive culmination of the research study, encapsulating key findings, insights, and implications derived from the investigation into teachers ' attitudes and experiences regardingthe implementation of ICT in teaching and learning. The researcher provides an in-depth summary of the study, elucidating how Braun and Clarke's (2006) six steps were followed forthe thematic analysis.

The unfolding of the research journey is presented, shedding light on the challenges encountered and the strategies employed to address them. Furthermore, the chapter delves intothe conclusions drawn from the study, offering a nuanced understanding of teachers ' perspectives on ICT integration. Finally, relevant recommendations are presented, offering practical strategies to enhance the implementation of ICT in teaching and learning based on thestudy's findings. The chapter serves as a comprehensive synthesis of the entire research endeavour, providing valuable insights for educational practitioners, policymakers, and futureresearch endeavours.

6.1 Review of the research problem

The research problem that this study sought to address revolved around teachers ' attitudes towards implementing ICT in teaching and learning. Further emphasizing the role of resistanceto change in influencing the implementation of ICT in teaching and learning. Mikre (2011), Oladosu (2012), and Clement (2012), strongly emphasized that the problem suggests educator attitudes contribute to challenges in implementing ICT for effective teaching and learning. It underscores the necessity for teachers to be resilient, open to change, and motivated in embracing ICT to improve teaching practices. Literature highlighted a lack of confidence among teachers in transitioning from traditional teaching methods, coupled with a perceptionthat some learners may possess more knowledge than the teachers .

The context of the Covid-19 pandemic introduced a shift in public schools to online teaching and learning in well-resourced schools, while disadvantaged schools struggle due to a lack of resources, especially in technology. This dimension emphasizes the equity issues associated with ICT implementation, suggesting that less-resourced schools face difficulties in catching up with their work. The overall implication is the need for teachers to be equipped with the necessary skills and support to effectively work with technology, particularly in the context of the pandemic-induced changes in education.

6.2 Summary of the study by chapter

Chapter 1

This chapter provided an introduction, and background information about the research study, describes the problem, and outlines the purpose of the study which is to investigate the implementation of ICT in promoting teaching and learning in secondary schools. The chapter also presents research objectives, questions, and the significance of the study.

Chapter 2

This chapter provided a comprehensive account of the pertinent literature reviewed, reflecting the perspectives of various scholars on educator's perception in implementing ICT for teaching and learning. The literature review, focused on the importance of ICTs in teaching and learning, focusing on their potential to change the educator's perspective and the educational landscape and develop ICT-capable teachers . It focused on the definition of ICT, ICT in education policy, and the use of ICTs in education in both developed and developing countries.

Chapter 3

This chapter presented the research methodology that was adopted for this study and why it was chosen over other research methods. The methods used and the reasons for their choice are then discussed in detail.

Chapter 4

This chapter provided the results from the collected and analysed data. This chapter outlines the themes and sub-themes of the study.

Chapter 5

This chapter discussed the findings of this study integrating them within the context of what is known about implementing ICT for teaching and learning.

6.3 Summary of the main findings

This section served as a comprehensive culmination of the summary of the main findings of this study. It encapsulates the main research question of this study which revolved around the exploration of teachers ' perspectives on the implementation of ICT in advancing teaching and learning. The findings of each subsequent research sub-questions are presented which delved into specific aspects, exploring how teachers perceive, implement strategies for, and confront challenges in integrating ICT for teaching and learning. The section serves as a comprehensive synthesis of the entire research findings.

6.3.1 Main research question

The main research question for the study was to explore the views of teachers on the implementation of ICT in promoting teaching and learning. The findings revealed a prevailing sentiment among teachers that the integration of ICT is widely advantageous in promoting teaching and learning. According to the findings, the adoption of ICT enhances teaching practices, enriches content knowledge, and boosts student engagement. Notwithstanding the challenges, notably linked to teachers ' ICT skills and reluctance to shift from conventional teaching methods, a unanimous consensus suggests that ICT contributes positively to transformative shifts in the teaching and learning environment.

The study's main research question, centred on teachers ' views regarding the implementationof ICT in teaching and learning, aligned with the three-step theory of change, providing a conceptual framework that informed the study's approach and interpretation of findings. This theoretical lens helped to understand the transformative potential of ICT integration in education. According to the literature, the three-step theory of change involved recognizing the need for change, implementing interventions to bring about that change, and ultimately observing the impact of the change. In the context of this study, teachers ' recognition of the need for a shift toward ICT integration was evident in their positive views on its advantages, such as enhancing teaching practices, enriching content knowledge, and boosting student engagement.

The literature on technology integration in education, influenced by the three-step theory of change, emphasized the importance of teachers acknowledging the potential benefits of ICT. The findings, showcasing a prevailing sentiment among teachers in favour of ICT integration, aligned with this theoretical perspective. The adoption of ICT was viewed as a positive change that not only enhanced current teaching practices but also contributed to transformative shifts in the teaching and learning environment.

The challenges identified in the study, particularly related to teachers ' ICT skills and reluctance to move away from conventional teaching methods, resonated with the theory of change. Literature suggested that addressing these challenges required interventions at multiplelevels, including professional development programs, changes in attitudes, and support systems. The unanimous consensus among teachers on the positive contributions of ICT implied a collective recognition of the need for change, reflecting the first step of the theory.

The three-step theory of change served as a valuable theoretical lens for understanding the dynamics of teachers ' attitudes toward ICT integration in teaching and learning. It framed the study by emphasizing the recognition of the need for change, the implementation of ICT interventions, and the observed impact on teaching practices and the learning environment. The literature supporting this theory enhanced the study's contextualization, providing a theoretical foundation for interpreting teachers ' views and the transformative potential of ICT in education.

6.3.1.1 Research sub-question 1

Sub-question 1 of the study investigated teachers ' perspectives on the implementation of ICTto enhance teaching and learning in the classroom. The results revealed that teachers generally perceive the integration of ICT as advantageous, citing benefits such as improved teaching practices, enhanced content knowledge, and increased student engagement. This exploration aligns with the theoretical framework of the three-step theory of change, which posits that recognizing the need for change is the initial and crucial step. In the context of sub-question 1, teachers ' positive perceptions of ICT signify a recognition of the necessity for a shift in teaching methodologies. This is consistent with existing literature emphasizing the transformative potential of ICT in education.

The study's findings, in resonance with the literature on technology integration, underscore the importance of teachers acknowledging the advantages of ICT. These positive sentiments align with the first step of the theory, recognizing the need for change, a pivotal factor for successful ICT implementation in educational settings.

Moreover, the literature on the three-step theory of change emphasizes that after recognizing the need for change, subsequent steps involve implementing interventions and observing their impact. In the context of sub-question 1, teachers ' positive views on ICT's advantages suggesta readiness for intervention, such as training programs aimed at enhancing ICT skills and pedagogical strategies. The three-step theory offers a structured framework for understanding how teachers ' perceptions align with the stages of change outlined in the literature.

In conclusion, the examination of teachers ' perceptions in sub-question 1 is illuminated by the three-step theory of change, underscoring the pivotal first step of recognizing the need for change. The literature surrounding this theory provides valuable insights into the transformative potential of ICT in education and contextualizes the study's findings within a theoretical framework that highlights the significance of teachers ' positive attitudes as a precursor to successful implementation.

6.3.1.2 Research sub-question 2

Sub-question 2 of this study investigated the strategies employed by teachers in implementing ICT to enhance teaching and learning. The findings highlighted that teachers employ various strategies, such as team building and collaborative learning, to effectively integrate ICT into teaching practices. Not only do these strategies address resource constraints, but they also contribute to positive student development, fostering attributes like confidence, creativity, and collaborative skills.

Examining the strategies teachers use in the implementation of ICT to promote teaching and learning, sub-question 2 aligns with the three-step theory of change. Building on the positive views of teachers regarding ICT integration observed in sub-question 1 (the first step of the theory), sub-question 2 delves into the implementation of interventions and the subsequent observation of their impact.

The literature on the three-step theory of change emphasizes the significance of strategic interventions to bring about meaningful change. In the context of sub-question 2, teachers '

use of various strategies corresponds with the theory's second step of implementing interventions. Existing research underscores the importance of strategic planning and implementation in successful ICT integration, aligning with the identified strategies such as team building and collaborative learning.

The findings from sub-question 2 align with existing literature on effective ICT implementation strategies. Collaborative learning, recognized as a valuable approach in technology integration, not only enhances resource efficiency but also positively influences student outcomes. The literature supports the idea that collaborative strategies contribute to learners' positive development, improving attributes like confidence, creativity, and collaborative skills. Additionally, the three-step theory of change posits that the third step involves observing the impact of the change. In the context of sub-question 2, the positive development of learners and the effective use of ICT strategies align with the theory's focus on outcomes. The literature emphasizes that observing and measuring the impact of implemented strategies is crucial for refining and optimizing ICT integration efforts.

The exploration of teachers ' strategies in sub-question 2 is enriched by the three-step theory of change. This theoretical lens provides insights into how teachers ' actions align with recognized stages of change, emphasizing the importance of strategic interventions and the need to observe and measure the impact of these interventions. This approach resonates with best practices in ICT implementation.

6.3.1.3 Research sub-question 3

Sub-question 3 of this study investigated the challenges encountered by teachers in the implementation of ICT to enhance teaching and learning in the classroom. The findings highlighted a spectrum of challenges, including learner discipline, teachers ' ICT skills, large class sizes, load-shedding, and inadequate technical support, collectively contributing to the hurdles faced by teachers in utilizing ICT for teaching and learning.

Delving into the challenges faced by teachers in implementing ICT for teaching and learning, sub-question 3 is aptly examined through the lens of the three-step theory of change. This theoretical framework provides valuable insights into the stages of recognizing the need for change, implementing interventions, and observing the impact. Applying the theory of change elucidates how teachers navigate and respond to challenges within the context of ICT integration.

The first step, recognizing the need for change, gains significance in understanding the challenges identified in sub-question 3. Issues such as learner discipline, teachers ' ICT skills, large class sizes, load-shedding, and inadequate technical support collectively underscore the intricate landscape teachers navigate. The literature emphasizes that acknowledging these challenges is a pivotal initial step in the change process. The second step, implementing interventions, mirrors the responses teachers may take to address the identified challenges. Existing literature on teacher professional development programs highlights their role in enhancing teachers ' ICT skills. The theoretical framework aids in understanding how teachers might respond to challenges by seeking additional training or support, aligning with the intervention phase of the theory of change.

The third step, observing the impact of change, is relevant to assessing how teachers cope with and overcome challenges. The literature suggests that the impact of interventions can be measured by improvements in areas such as teachers ' confidence in using ICT, more effective classroom management, and enhanced learning outcomes for learners. Applying the theory of change allows for a nuanced exploration of how teachers navigate these challenges with an eye on positive outcomes.

The three-step theory of change provided a comprehensive lens to understand the dynamics of challenges faced by teachers in ICT implementation. The literature supporting this theory enhanced the study's contextualization by offering a theoretical foundation for interpreting teachers ' responses to challenges. Recognizing the need for change, implementing interventions, and observing the impact collectively contribute to a holistic understanding of how teachers grapple with challenges in the ever-evolving landscape of ICT in education.

6.4 Conclusion

From the evidence gathered in this study, it could be concluded that there is a positive perception of teachers towards the integration of ICT in teaching and learning. Teachers generally viewed ICT implementation as advantageous, and this study showed that it brings about tangible benefits by enhancing teaching practices, enriching content knowledge, and elevating student engagement. This underscores the potential of ICT to positively impact the educational experience for both teachers and learners. The identification of various strategiesutilized by teachers in implementing ICT reflects a proactive approach to address challenges.Strategies such as team building and collaborative learning not only overcome resource constraints but also contribute significantly to the positive development of learners. These strategies go

beyond immediate problem-solving, playing a crucial role in fostering qualities such as confidence, creativity, and collaborative skills among learners.

The findings of this study revealed a positive attitude among teachers towards the integrationof ICT in teaching and learning, highlighting its potential to enhance educational outcomes. However, alongside this optimism, the study also brings to light several challenges that teachers face in implementing ICT effectively. One of the key challenges identified is learnerdiscipline. Teachers reported difficulties in maintaining discipline among learners, particularly when ICT tools are being used. This is a common challenge in many educational settings, as the introduction of new technologies can sometimes lead to distractions and disruptions in the classroom. Addressing this challenge requires a combination of strategies, including clear guidelines for ICT use, effective classroom management techniques, and ongoing support for teachers.

Another significant challenge is the level of ICT skills among teachers. While many teachers are enthusiastic about incorporating ICT into their teaching practices, some may lack the necessary skills and confidence to do so effectively. This highlights the importance of providing ongoing professional development and training opportunities for teachers to enhance their ICT skills and capabilities. Large class sizes also emerged as a challenge in the implementation of ICT. Teachers expressed concerns about managing ICT tools and resourcesin classrooms with a high number of learners. This issue underscores the need for adequate infrastructure and support systems to accommodate the use of ICT in large classrooms.

Load-shedding, a common issue in many countries, was identified as a major obstacle to ICT implementation. Teachers reported difficulties in using ICT tools during power outages, which disrupted teaching and learning activities. To address this challenge, schools may need to invest in alternative power sources, such as generators or solar panels, to ensure continuity of ICT use. Inadequate technical support was also highlighted as a challenge in the implementation of ICT. Teachers expressed frustration with the lack of technical assistance when they encountered problems with ICT tools or infrastructure. This highlights the importance of providing schools with access to reliable technical support services to address issues promptly and minimize disruptions.

Overall, while teachers are optimistic about the benefits of ICT in teaching and learning, it is essential to address these challenges systematically. This requires a multi-faceted approach that includes providing ongoing training and support for teachers, addressing infrastructure issues such as load-shedding, and ensuring access to reliable technical support services. By addressing these challenges, educational policymakers and practitioners can enhance the efficacy of ICT integration in schools, ultimately creating a more enriched teaching and learning environment for learners.

6.5 Recommendations

The integration of ICT in teaching and learning has the potential to revolutionize education by enhancing the effectiveness and efficiency of teaching methods and improving learning outcomes. Building on the findings and insights garnered from this study, several key recommendations are proposed to enhance the integration of ICT in teaching and learning in secondary schools. These recommendations are aimed at addressing challenges identified in the study and maximizing the benefits of ICT in education. Based on the evidence and insightsgained from this study, the following recommendations are proposed to enhance the integrationof ICT in teaching and learning:

6.5.1 Professional Development Programs

Investing in professional development for teachers in the use of ICT for teaching and learningis crucial for enhancing the quality of education and preparing learners for the digital age. The Department of Education and schools can play a pivotal role in this regard by initiating and promoting professional development programs tailored to enhance teachers' ICT skills. One of the key strategies is to provide workshops and training sessions specifically focused on ICT integration in teaching. These sessions can cover various aspects such as using educational software, incorporating multimedia tools in lessons, and leveraging online resources forteaching purposes. By equipping teachers with practical skills and knowledge, they can effectively integrate ICT into their teaching practices and create more engaging and interactivelearning environments for learners.

Continuous learning opportunities should also be provided to ensure that teachers stay updated with the latest advancements in technology and pedagogy. This can include access to online courses, webinars, and conferences focused on ICT in education. By encouraging and supporting teachers' continuous professional development, schools can foster a culture of

lifelong learning among teachers and ensure that they remain abreast of best practices in ICT integration. Furthermore, mentorship programs can be established where experienced teachers proficient in ICT can mentor their peers. This peer-to-peer learning approach can behighly effective in building teachers' confidence and skills in using ICT tools. It also promotes collaboration and knowledge sharing among teachers, creating a supportive and conducive learning environment.

Additionally, the Department of Basic Education and schools should provide access to resources and infrastructure necessary for effective ICT integration. This includes ensuring thatschools have adequate ICT infrastructure, such as computers, internet connectivity, andeducational software. Teachers should also be provided with technical support to troubleshootany ICT-related issues they may encounter. By investing in professional development for teachers in the use of ICT, the Department of Education and schools can enhance the quality of education and prepare learners for success in a technology-driven world. Teachers who areconfident and proficient in using ICT tools can create dynamic and engaging learning experiences that motivate learners and improve learning outcomes.

6.5.2 Resource Allocation

Addressing resource constraints in schools is crucial for effective implementation of ICT in teaching and learning. The Department of Education plays a pivotal role in ensuring that schools have sufficient resources, such as computers and technical support, to facilitate the integration of ICT in education. One of the key strategies is to allocate adequate funding for the procurement of ICT tools and infrastructure. This includes providing schools with computers, tablets, interactive whiteboards, and another essential ICT equipment. By ensuringthat schools have access to these tools, the Department of Education can create a more conducive learning environment that promotes digital literacy and prepares learners for the future workforce.

In addition to providing ICT tools, the Department of Education should also invest in technical support for schools. This includes training technical staff to maintain and troubleshoot ICT equipment, as well as providing schools with access to helpdesk support for ICT-related issues. By ensuring that schools have the necessary technical support, the Department of Education can minimize downtime and ensure that ICT tools are used effectively in teaching and learning.

Furthermore, the Department of Education should prioritize schools with large class sizes or in disadvantaged areas when allocating ICT resources. Schools with large class sizes often face greater challenges in implementing ICT due to limited resources and infrastructure. By prioritizing these schools, the Department of Education can help bridge the digital divide and ensure that all learners have access to quality education.

Moreover, the Department of Education should collaborate with private sector partners and non-profit organizations to supplement resources for schools. This can include donations of ICT equipment, funding for infrastructure upgrades, and support for teacher training programs.By leveraging external partnerships, the Department of Education can maximize its impact and ensure that schools have access to the resources they need to integrate ICT effectively.

Addressing resource constraints is essential for the successful implementation of ICT in education. By allocating sufficient resources, such as computers and technical support, to schools and teachers, the Department of Education can mitigate challenges related to large class sizes and promote a more equitable learning environment. By prioritizing resource allocation and leveraging external partnerships, the Department of Education can ensure that all schools have access to the resources they need to prepare learners for success in the digitalage.

6.5.3 Learner Discipline Programs

Ensuring learner discipline in the use of ICT is essential for maintaining a conducive learning environment and maximizing the benefits of technology in education. Teachers play a crucial role in implementing programs that promote responsible use of ICT among learners. One approach is to conduct educational campaigns that raise awareness about the importance of responsible ICT use. These campaigns can highlight the potential risks associated with inappropriate ICT use, such as cyberbullying, plagiarism, and distraction. By educatinglearners about these issues, teachers can help them make informed decisions about their digital behavior.

Workshops and training sessions can also be effective in promoting responsible ICT use. These sessions can provide practical tips and guidelines for using ICT devices and platforms responsibly. For example, learners can be taught about the importance of maintaining privacy settings on social media platforms and avoiding the use of unauthorized software or websites.

In addition to educational campaigns and workshops, initiatives can be implemented toreinforce responsible ICT use. For example, schools can establish clear policies and guidelinesregarding ICT use, with consequences for inappropriate behaviour. Teachers can also incorporate digital citizenship lessons into their curriculum, teaching learners about ethical and responsible behaviour online. Furthermore, teachers can lead by example by demonstrating responsible ICT use themselves. By modelling appropriate behaviour, teachers can set a positive example for learners to follow. Implementing programs focused on learner disciplineis crucial for promoting responsible ICT use in education. Through educational campaigns, workshops, and initiatives, teachers can instill a sense of responsibility among learners and create a safe and productive learning environment. By promoting responsible ICT use, teachers can maximize the benefits of technology in education and prepare learners for success in the digital age.

6.5.4 Collaborative Learning Platforms

Encouraging the use of collaborative learning platforms among teachers is crucial forenhancing the integration of ICT in teaching and learning. These platforms offer a valuable space for teachers to share best practices, exchange ideas, and collaborate on innovative teaching strategies. One key benefit of collaborative learning platforms is the opportunity for teachers to learn from each other's experiences. By sharing their successes and challenges, teachers can gain valuable insights into effective ICT implementation strategies. This collaborative approach can help teachers overcome obstacles and find creative solutions to common problems. Furthermore, collaborative learning platforms facilitate the sharing of resources and materials. Teachers can access a wealth of teaching materials, lesson plans, andeducational tools shared by their peers. This not only saves time and effort but also ensures thatteachers have access to high-quality resources that can enhance their teaching practices.

In addition to sharing resources, collaborative learning platforms can also foster a sense of community among teachers. By engaging in discussions, sharing ideas, and collaborating on projects, teachers can build relationships and form a supportive network. This sense of community can be invaluable, especially for teachers who may feel isolated or overwhelmedin their teaching roles. To facilitate the sharing of best practices among teachers, schools cancreate opportunities for collaboration and professional development. This could include hosting workshops, seminars, and conferences where teachers can come together to discuss ICT implementation strategies and share their experiences. Schools can also establish online forums or communities where teachers can continue to collaborate and share resources outside of formal

events. Encouraging the use of collaborative learning platforms among teachers is essential for promoting effective ICT integration in teaching and learning. By facilitating the sharing of best practices and fostering a sense of community, schools can support teachers in their efforts to enhance their teaching practices and improve student outcomes.

6.5.5 Technical Support Systems

Ensuring a strong technical support system within educational institutions is crucial for overcoming ICT-related challenges and maintaining the effective functioning of ICT infrastructure. The Department of Education and school leadership must prioritize the development and implementation of robust technical support systems to address these challenges effectively. One key aspect of strengthening technical support systems is to ensure that schools have access to a team of skilled professionals who can address ICT issues promptly. This team should be equipped with the necessary expertise to troubleshoot and resolve technical problems efficiently, minimizing disruptions to teaching and learning. Regular training and upskilling of technical support staff are essential to keep them abreast ofthe latest technologies and best practices in ICT support.

In addition to having a skilled technical support team, it is important to establish clear protocols for reporting and resolving ICT issues. Schools should have a designated point of contact for reporting technical problems, and a systematic process should be in place to prioritize and address these issues based on their urgency and impact on teaching and learning. Regular monitoring and evaluation of technical support systems are also crucial to ensure their effectiveness. Schools should conduct regular audits of their ICT infrastructure and technical support processes to identify areas for improvement and address any emerging issues proactively. This proactive approach can help prevent potential disruptions and ensure that ICT systems are functioning optimally to support teaching and learning activities.

Furthermore, schools should consider implementing backup power solutions, such as generators or solar power, to mitigate the impact of load-shedding on ICT infrastructure. Thesebackup power solutions can help ensure uninterrupted access to ICT tools and resources, evenduring power outages. Strengthening technical support systems within educational institutions is essential for overcoming ICT-related challenges and ensuring the effective use of ICT in teaching and learning. By prioritizing the development of skilled technical support teams, establishing clearprotocols for reporting and resolving ICT issues, and implementing backup power solutions, schools can enhance the reliability and effectiveness of their ICT infrastructure,

ultimately improving the overall quality of education. By implementing these recommendations, educational stakeholders can work collaboratively to create an environment where ICT is seamlessly integrated, addressing challenges and maximizing the potential benefits for both teachers and learners. The recommendations put forth emphasize key strategies for the successful integration of Information and Communication Technology (ICT) in education. Firstly, prioritizing Professional DevelopmentPrograms for teachers is highlighted, emphasizing the need to invest in workshops, training sessions, and continuous learning opportunities to empower teachers with the necessary ICTskills. Secondly, Resource Allocation is identified as crucial, urging the Department ofEducation to provide sufficient resources, such as computers and technical support, to mitigatechallenges related to large class sizes and promote an equitable learning environment.

The third recommendation emphasizes Learner Discipline Programs, calling for teachers to implement initiatives that foster responsible ICT use among learners. Additionally, Collaborative Learning Platforms are encouraged, promoting a community of learning where teachers share best practices for effective ICT implementation. Lastly, Technical Support Systems are underscored as vital, with a focus on strengthening these systems to ensure the seamless functioning of ICT infrastructure and minimize disruptions caused by issues like load-shedding. Collectively, these recommendations aim to enhance the quality and effectiveness of ICT integration in education.

6.6 Suggestions for future research

As the integration of ICT continues to reshape teaching and learning environments, educational stakeholders are increasingly interested in exploring strategies to maximize its benefits and mitigate challenges. This study identifies several areas that merit further research to enhance the effective implementation of ICT in educational settings. Further research may interest educational stakeholders in the following areas:

- Techniques for minimizing discipline issues during the utilization of ICT in teaching and learning.
- The utilization of grouping patterns and group work to render ICT implementation easier in the classroom.
- The exploration of other teaching methods that may function best when combined with the use of ICT as a means of teaching and learning.
- Examining the types of ICT programs teachers are receiving and how the program benefits them in their careers should be done as part of teacher education programs.

Further research in these areas has the potential to provide valuable insights and practical strategies for teachers and policymakers. By addressing these research gaps, educational stakeholders can better understand how to leverage ICT to improve teaching and learning outcomes, ultimately enhancing the overall quality of education.

6.7 The significance of the study

Effective implementation of Information and Communication Technology (ICT) in educationis crucial for enhancing teaching and learning experiences. However, despite having access to technology, teachers often lack the necessary training, skills, or resources to use it effectively.This challenge highlights the importance of addressing teachers ' needs to ensure successful ICT integration in the classroom.

The findings of this study can offer valuable insights into specific issues faced by teachers when implementing ICT in teaching and learning. By identifying these challenges, the study can help develop targeted solutions to improve teachers ' ICT skills and enhance their ability to use technology in the classroom. For example, teachers may need training on how to use specific ICT tools or how to integrate them into their lesson plans effectively. By addressing these needs, teachers can become more confident and proficient in using ICT, ultimately benefiting their learners' learning experiences.

Furthermore, this study can contribute to the professional growth of teachers by enhancing their knowledge, skills, and understanding of how to use ICT in education. Professional development programs can be tailored based on the study's findings to provide teachers withrelevant training and support. This, in turn, can lead to improved teaching practices and betterstudent outcomes.

For policymakers, the study's findings can provide valuable information for creating and improving education systems and modernizing learning environments in schools. By understanding teachers ' needs and challenges regarding ICT implementation, policymakers can develop policies and initiatives that support effective ICT integration in education. This can lead to more innovative and engaging learning experiences for learners. Additionally, thestudy can help schools develop ICT policies that guide the use of technology in teaching and learning. These policies can outline best practices for integrating ICT into the curriculum, as well as guidelines for teachers on how to use technology effectively. By establishing clear policies, schools can ensure that ICT is used in a way that enhances learning outcomes and benefits learners.

The findings of this study can significantly impact the implementation of ICT in education by addressing key areas such as teachers ' needs, professional growth, and policy development. Firstly, by understanding the challenges teachers face in integrating ICT into their teaching practices, educational institutions and policymakers can develop targeted strategies to support teachers. This could include providing professional development opportunities focused on enhancing digital literacy skills and effective use of ICT tools.

Secondly, supporting teachers ' professional growth in ICT can lead to more innovative and engaging teaching practices. Teachers who are equipped with the necessary skills andknowledge to effectively use ICT can create dynamic learning environments that cater to diverse learning styles and promote active student engagement. Finally, the findings of this study can inform policy development related to ICT integration in education. By highlighting the importance of addressing teachers ' needs and providing adequate support, policymakers can develop policies that promote the effective use of ICT in schools. This can lead to the creation of more inclusive and accessible learning environments that benefit all learners.

6.8 Reflections on my research journey

In this study, primary data collection was employed to gather information from teachers in real-life classroom settings, specifically focusing on the practices of pedagogical ICT in promoting teaching and learning in schools within the Tshwane West district. This approach allowed for a deeper understanding of how ICT contributes to effective teaching and learning practices. Through primary data, insights were gained into teachers ' perspectives on the implementation of ICT and how they incorporate it into their teaching methodologies.

Additionally, the study highlighted the challenges teachers face when integrating ICT into their classrooms.

One of the key findings of this research is the presence of barriers that teachers encounter when using ICT in their lessons. Despite the availability of some resources in the schools studied, there was a notable lack of sufficient resources and support from IT technical teams. This highlights the need for bridging the gap between education and technology through ongoing research and strategic planning. Furthermore, the study revealed that effective implementation of ICT in the classroom goes beyond simply having the necessary tools available. It also requires having specific tools and enough resources for every learner to utilize.This ensures that ICT can be effectively integrated into the teaching and learning process, enhancing educational outcomes.

However, it is important to note that while ICT has the potential to positively impact teaching and learning, its implementation is not without challenges. One of the limitations of this study was the reluctance of some participants to participate, possibly due to fear of the unknown or other reasons. This underscores the need for careful consideration and planning when implementing changes in the education environment.

This study highlights the complexities and challenges associated with integrating ICT into teaching and learning practices. While ICT offers significant benefits, such as enhancing teaching methodologies and improving student engagement, its effective implementation requires adequate resources, support, and training for teachers. By addressing these challenges and barriers, teachers can harness the full potential of ICT to promote more effective teaching and learning practices in classrooms.

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APPENDICES

Appendix A: Letter to the Gauteng Department of Education

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Enquiries: MS Mafampe
Cell phone: 072 0483475
Email: smafampe@gmail.com

5761 Ext 5
Soshanguve East
Pretoria
0152

20.06.2022

Request to conduct research in the Tshwane West District

Dear Sir/Madam

My name is Ms. M.S Mafampe, a Masters student at the University of Pretoria. The main requirement of my dissertation is to conduct research. The title of my study is "**The use of Information Communication for teaching and learning in the Tshwane West District**".

The aim of the study is to understand how teachers apply ICT for teaching and learning in the Tshwane West district. I therefore, request your permission to conduct research in the selected schools within the above-mentioned district. My study will involve collecting data from the participants through semi-structured interviews. The participants in the study will be teachers from the selected schools. The interviews will not disturb the participants' contact time, and will take place at a place convenient to the participants.

The participants will be informed about the aims and objectives of the study, and be requested to sign a consent form as an agreement to participate in the study. The researcher will also

request permission to conduct research in their schools from principals of the selected schools. The identity of the sites and participants will not be revealed. The data provided by the participants will be treated with confidentiality. Pseudonyms will be used to conceal the identity of the participants and sites. Covid-19 protocols will be adhered to during the interviews.

This study is under the supervision of Dr. E.M Kgwete, who can be contacted at ephraim.kgwete@nwu.ac.za for any clarity.

I trust this request will receive your favourable consideration.

Yours faithfully

Mafampe M.S (Researcher UP)

Appendix B: Approval from Gauteng Department of Education

GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

8/4/4/1/2

GDE RESEARCH APPROVAL LETTER

Date:	**15 August 2022**
Validity of Research Approval:	**08 February 2022– 30 September 2022** **2022/364**
Name of Researcher:	**Mafampe S**
Address of Researcher:	**5761 Ext 6**
	Soshanguve East
Telephone Number:	**072 048 3475**
Email address:	**smafampe@gmail.com**
Research Topic:	**The use of Information Communication Technology to promote teaching and learning in Tshwane West District**
Type of qualification	**Masters**
Number and type of schools:	**2 Secondary Schools**
District/s/HO	**Tshwane West**

Re: Approval in Respect of Request to Conduct Research

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

16/08/2022

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

Office of the Director: Education Research and Knowledge Management
7th Floor, 17 Simmonds Street, Johannesburg, 2001
Tel: (011) 355 0488
Email: Faith.Tshabalala@gauteng.gov.za
Website: www.education.gpg.gov.za

1. *The letter would indicate that the said researcher/s has/have been granted permission from the Gauteng Department of Education to conduct the research study.*
2. *The District/Head Office Senior Manager/s must be approached separately, and in writing, for permission to involve District/Head Office Officials in the project.*
3. ***Because of the relaxation of COVID 19 regulations researchers can collect data online, telephonically, physically access schools, or may make arrangements for Zoom with the school Principal. Requests for such arrangements should be submitted to the GDE Education Research and Knowledge Management directorate.***
4. ***The Researchers are advised to wear a mask at all times, Social distance at all times, Provide a vaccination certificate or negative COVID-19 test, not older than 72 hours, and Sanitise frequently.***
5. *A copy of this letter must be forwarded to the school principal and the chairperson of the School Governing Body (SGB) that would indicate that the researcher/s has been granted permission from the Gauteng Department of Education to conduct the research study.*
6. *A letter/document that outlines the purpose of the research and the anticipated outcomes of such research must be made available to the principals, SGBs, and District/Head Office Senior Managers of the schools and districts/offices concerned, respectively.*
7. *The Researcher will make every effort to obtain the goodwill and cooperation of all the GDE officials, principals, and chairpersons of the SGBs, teachers, and learners involved. Persons who offer their cooperation will not receive additional remuneration from the Department while those that opt not to participate will not be penalised in any way.*
8. *Research may only be conducted after school hours so that the normal school program is not interrupted. The Principal (if at a school) and/or Director (if at a district/head office) must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.*
9. *Research may only commence from the second week of February and must be concluded before the beginning of the last quarter of the academic year. If incomplete, an amended Research Approval letter may be requested to conduct research in the following year.*
10. *Items 6 and 7 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and be paid for by the Gauteng Department of Education.*
11. *It is the researcher's responsibility to obtain written parental consent of all learners that are expected to participate in the study.*
12. *The researcher is responsible for supplying and utilising his/her research resources, such as stationery, photocopies, transport, faxes, and telephones, and should not depend on the goodwill of the institutions and/or the offices visited for supplying such resources.*
13. *The names of the GDE officials, schools, principals, parents, teachers, and learners that participate in the study may not appear in the research report without the written consent of each of these individuals and/or organisations.*
14. *On completion of the study, the researcher/s must supply the Director: Knowledge Management & Research with one Hard Cover bound and an electronic copy of the research.*
15. *The researcher may be expected to provide short presentations on the purpose, findings, and recommendations of his/her research to both GDE officials and the schools concerned.*
16. *Should the researcher have been involved with research at a school and/or a district/head office level, the Director concerned must also be supplied with a summary of the purpose, findings, and recommendations of the research study.*

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

Kind regards

.....

Mr. Gumani Mukatuni
Acting CES: Education Research and Knowledge Management

DATE: 16/08/2022

Office of the Director: Education Research and Knowledge Management
7th Floor, 17 Simmonds Street, Johannesburg, 2001
Tel: (011) 355 0488
Email: Faith.Tshabalala@gauteng.gov.za
Website: www.education.gpg.gov.za

Appendix C: Letter of consent for Educators

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Enquiries: MS Mafampe
Cell phone: 0720483475
Email: smafampe@gmail.com

5761 Ext 6
Soshanguve East
Pretoria
0152
28-06-2022

Educators:

LETTERS OF CONSENT TO PARTICIAPTE IN A RESEARCH

Dear Teacher

My name is **Ms M.S Mafampe** a Master's student at the University of Pretoria. I am conducting a study titled **"The use of Information Communication Technology to promote teaching and learning in Tshwane West District."** You have been purposively selected as a possible participant. My supervisor for this project is **Dr. E.M Kgwete**, you are welcome to contact him on 0721905886 should the need arise.

This study seeks to understand the perceptions of teachers on the use of Information Communication Technology for teaching and learning within the Tshwane West District. Semi-structured interviews will be used to collect data from the selected teachers within the Tshwane West District. You have been selected as one of the potential participants in the study.

You will be asked to give your written or verbal consent before the research begins. Your responses will be treated with confidentiality in which the principles of privacy and anonymity will be strictly adhered to. Your identity will be anonymous. Pseudonyms or codes will be used to conceal your true identity. Further research may include secondary data analysis using the data for future purposes. Your anonymity will be maintained in all published and written data resulting from the study. The interview will be 45 minutes long. The interview will take place at a venue convenient to you as a participant out of the school's contact time. The interviews will be audio recorded.

Participation in the study is voluntary and participants are at liberty to withdraw their participation without facing any consequences. You will not be disadvantaged in any way as a participant. An informed consent form will be given to you as a potential participant to complete before the commencement of the study. As a participant, you will be informed about the aims of the study without deceiving yourself. There are no foreseeable risks in participating in this study. The findings of

this study will emanate into a Master's dissertation and an article for publications in an academic journal. The findings will also be shared at conferences.

I would like to request your permission to become a participant in the study.

Your participation in the study is voluntary. Find below the clauses that will guide this research:

ETHICS CLAUSES

SECONDARY DATA CLAUSE

We would also like to request your permission to conduct the above-mentioned research at your department and use the data. Confidentially and anonymously, for further research purposes, as the data sets are the intellectual property of the University of Pretoria. Further research may include secondary data analysis using the data for teaching purposes. The confidentiality and privacy applicable to this will be binding on the future research studies.

COVID CLAUSE

Due to COVID-19 and to minimise the spread of infection, the researcher will ensure that Covid-19 protocols are observed.

NO AWARD CLAUSE

Since your participation in the study is voluntary, please note that no participants will receive any monetary awards or awards in kind.

Any questions or concerns pertaining to the study, should be directed to smafampe@gmail.com.

Yours Faithfully

Researcher's Name & Surname (please print): Mokware Sarah Mafampe

Researcher's signature: ..... Date: 19/07/2022

Full names of supervisor: Ephraim Kgwete

Signature: ..... Date 19/07/2022

Thank you

Mafampe M.S (UP Student Researcher)

Principal Investigator: Mokware Sarah Mafampe

Student number: 18311262

Post Graduate Student

Appendix D: Letter of consent for the principal of the school

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Enquiries: Ms Mafampe
Cell phone: 072 048 3475
Email: smafampe@gmail.com

5761 Ext 6
Soshanguve East
Pretoria
0152
28-06-2022

The principal

REQUEST OF PERMISSION TO CONDUCT RESEARCH

Dear Principal

My name is Ms M.S Mafampe a Master's student at the University of Pretoria. I am conducting a study titled **The use of Information Communication Technology to promote teaching and learning in Tshwane West District**.

This study aims to understand the perceptions of teachers on the use of Information Communication Technology in the Tshwane West District. The study will use semi-structured interviews as a data collection tool. Teachers will be purposively selected from schools within the Tshwane West District. Your school forms part of the selected schools within the district.

I humbly request your permission to collect data through semi-structured interviews with the selected participants at your school. The interviews will be 45 minutes long for each participant. The interviews will take place at a convenient location out of school contact time. This study will be conducted under the supervision of Dr E.M Kgwete. You are welcome to contact him should a need arise on 0721905886.

Participants will be requested to sign the consent form as permission to take part in the study. Informed consent will be made in which the researcher fully explains to the participant the objectives of the study without deceiving them. The principles of privacy, anonymity and confidentiality will be strictly adhered to. The participants' identities (their names and the name of the school) will be concealed by using pseudonyms or codes. Their responses will be treated confidentially and anonymously.

The collected data will remain the intellectual property of the University of Pretoria. The study will be guided by the following clauses:

ETHICS CLAUSES

SECONDARY DATA CLAUSE

We would also like to request your permission to conduct the above-mentioned research at your department and use the data. Confidentially and anonymously, for further research purposes, as the data sets are the intellectual property of the University of Pretoria. Further research may include secondary data analysis using the data for teaching purposes. The confidentiality and privacy applicable to this will be binding on the future research studies.

COVID CLAUSE

Due to COVID-19 and to minimise the spread of infection, the researcher will ensure that Covid-19 protocols are observed.

NO AWARD CLAUSE

Since your participation in the study is voluntary, please note that no participants will receive any monetary awards or awards in kind.

A consent form is attached, may you please sign the attached form should you decide to grant me permission to commence with the study. If you require any further clarity or concerns pertaining to the study, you are welcome to contact me on 0720483475 or smafampe@gmail.com.

I trust this request will receive your favourable consideration.

Thanking you in advance.

Yours faithfully

Mafampe M.S (Researcher UP)

Full names of supervisor: **Dr Ephraim Matala Kgwete**

Signature: _____ Date 19/07/2022

Thank you

Mafampe M.S (UP Student Researcher)

Principal Investigator: Mokware Sarah Mafampe

Student number: 18311262

Post Graduate Student

University of Pretoria

Cell phone number: **0720483475**

E-mail address: smafampe@gmail.com

Supervisor: **Dr E.M Kgwete**

E-mail: ephraim.kgwete@up.ac.za

2

Telephone number: 0721905886

PERMISSION TO CONDUCT RESEARCH

I, _____, (Principal) in Tshwane West District hereby grant/refuse **Mafampe Mokware Sarah** permission to conduct a study on **The use of information communication technology to promote teaching and learning in Tshwane West District**

Signature: _____ Date: _____

Stamp

Appendix E: Consent Form for Educators

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Enquiries: MS Mafampe

Cell phone: 0720483475

Email: smafampe@gmail.com

5761 Ext 6

Soshanguve East

Pretoria

0152

20-03-2022

CONSENT TO PARTICIAPTE IN A RESEARCH

I _____ (Participants Name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and prepared to participate in the study. I understand that my participation is voluntary and that I am free to withdraw at any time without penalty.

I am aware that the findings of this study will be processed into a research report, journal publication and or conference proceedings, and that my participation will be kept confidential unless otherwise specified. I agree to the recordings of the audio tapes.

Participant's Name & Surname (please print): .....

Participant's signature: ..... Date: .....

Researcher's Name & Surname (please print): .....

Researcher's signature: ..... Date: .....

1

University of Pretoria

Cell phone number: **0720483475**

E-mail address: smafampe@gmail.com

Supervisor: **Dr E.M Kgwete**

E-mail: ephraim.kgwete@up.ac.za

Telephone number: 0721905886

PERMISSION TO CONDUCT RESEARCH

I, _____, (name of teacher r) hereby agree/disagree to participate in the study being conducted by Mafampe Mokware Sarah on **The use of information communication technology to promote teaching and learning in Tshwane West District"**

Signature: _____ Date: _____

Stamp

Appendix F: Interview schedule

INTERVIEW TRANSCRIPT (ONE SAMPLE)

Interview conducted verbally. Duration of interview: Interviewed started at 14:00 and ended at 14:30 (30 min). Semi-structured interview recorded; transcripts are typed verbatim.

Table 1 below captures the demographic information of the participants

Participant number	PP1
Current Post level {PL 4 (Principal); PL 3 (Deputy Principal, PL 2 HOD, PL 1 teacher	PL1
District	TW
Type of school	Township
Medium of instruction	English
Gender {Male (M); Female (F)}	Male
Teaching Experience	9

Researcher: Good afternoon, Sir,

E1: Good afternoon, Mam

Researcher: Before we start with the interview, I wanted to confirm with you if you have read the terms and condition about this research interview and you have signed the concern form voluntarily.

E1: Yes, Mam I read the consent form and I signed to give concern.

Researcher: I also want to remind you that this interview is done voluntarily and you are free not to answer questions that makes you feel uncomfortable. Lastly remember that you are not obliged to mention your name or your school's name for the sake of confidentiality. And I will also not mention your name nor your school's name in my research.

Please feel comfortable and indicate to me when you are ready to start.

E1: I'm ready to start.

Researcher: What are the advantages of using technology for teaching and learning?

E1: I would say teachers are also learning a lot from the transformation from old to new way of doing things, but some teachers still believe in the old way of teaching. Since the introduction of this Information and Communication Technology comes a lot of disturbances in the process of teaching and learning.

Researcher: Which Operating Systems are you using at school?

E1: I'm not so familiar with the operation systems that the school uses. I'm only happy with I see the system up and running. Those are only for the specialists.

Researcher: Are there ICT resources at your school?

E1: In my school they make use of smartboards, cell phones as well as computers to enhance teaching and learning. Smartboards comes with a lot of helpful demonstrations, instructions and new styles of teaching different from textbooks. We also refer to computers and cell phones for videos based on the topic we are teaching.

Researcher: Do teachers get adequate ICT support from the Department of Education?

E1: The support we get as teachers we get to be taught how to operates the smartboard and more knowledge on how to access the important elements per subject. The district is trying its best to offer workshops on ICT related matters.

Researcher: Does the school have proper ICT infrastructure?

E1: The infrastructure is good and conducive and in the position that is perfect for learners to observe and listen to the whole lesson, but other smartboards at our school are not functional. The school have ensured that the smartboards are protected therefore they are well protected with buglers.

Researcher: Does the school support the implementation of the use of ICT at school?

E1: The support we normally get as teachers we get to be taught how to operates the smartboards and more knowledge on how to access the important elements per subject.

Appendix G: Title approval

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Student no: 18311262
Our ref: University of Pretoria Student Service Centre
Tel: (012) 420 3111
Email: ssc@up.ac.za

2023-05-05

Ms MS Mafampe
5761 Ext 6
Soshanguve East Ext 6
0152
South Africa

Dear Ms Mafampe

TITLE AND SUPERVISOR APPROVAL

I have pleasure in informing you that your approved title and supervisor for **MEd General** are as follows:

Title: The implementation of Information and Communication Technology for teaching and learning in Tshwane West District

SUPERVISOR: Dr EM Kgwete.

You are advised to acquaint yourself with Regulations in the publication 'General Regulations and information'.

Your registration as a student must be renewed annually before 28 February until you have complied with all the requirements for the degree. You will only be entitled to the guidance of your supervisor if annual proof of registration is submitted.

You are welcome to contact us at the abovementioned telephone number or email address if you have any enquiries.

Yours sincerely

for DEAN:
Faculty of Education
P06

University of Pretoria
Private Bag X20
Hatfield
0028

Tel: +27 (0)12 420 3111
Email: ssc@up.ac.za

www.up.ac.za