



THE DEVELOPMENT OF A FRAMEWORK FOR THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGY IN THE CLASSROOM

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DECLARATION

I, Jerome Louw, declare that this dissertation titled: “The development of a framework for the use of information and Communication Technology in the Classroom.” hereby submitted for the degree Master of Education in the Faculty of Humanities at the Central University of Technology, is my own original work and that it has not been submitted by me for a degree at this or any other tertiary institution. I also declare that all references used in this dissertation have been cited and acknowledged.



Louw Jerome

12 September 2016



DEDICATION

This work is dedicated to my late mother, Hendrina Springbok, who instilled in me the love for education; as well as my wife, Petrovine; my children and my family for their love and support while I conducted my research.

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Firstly, I wish to thank God for the blessings that He has bestowed upon my life and for giving me the opportunity and strength to complete my studies.

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ABSTRACT

The aim of this study was to explore the development of a framework for the use of Information and Communication Technology in the classroom. It was clear from the study that teachers lack Information and Communication Technology (ICT) capability, and should therefore be trained and retrained. While they are expected to produce quality education, they are also expected to receive training which is a time-consuming exercise and often makes teachers want to give up on the implementation of ICT in the classroom.

If teachers were to use ICT in the classroom, it would change the passive role of the learners in which they merely receive knowledge to a more active role where they construct their own knowledge. In addition, teachers would have the opportunity to connect with experts, and have access to global resources. Teachers should be motivated to use ICT to improve the quality of their teaching. This, together with proper ICT skills, would ensure the effective use of ICT.

To ascertain the effective use of ICT by teachers, research was conducted in ten secondary schools in Bloemfontein. A random sample of 30 secondary school teachers was drawn from ten schools. A mixed methods approach was used to collect data, i.e. qualitative (questionnaires) and qualitative (interviews). Questionnaires were administered to the participants and were then followed by unstructured interviews. The research participants were selected randomly from the study population in an unbiased manner to produce quantifiable, reliable data. Mix methods designs provide advantages when a researcher is exploring complex research questions. The findings of this study revealed that teachers have a positive attitude towards the use of ICT, and that it enables better teaching standards and educational outcomes. Teachers also have barriers that hinder them from using ICT in the classroom.

Keywords: Information Communication Technology, barriers, constructivist framework, attitudes, teaching standards.

LIST OF ACRONYMS

BECTA:	British Educational Communications and Technology Agency
DEEP:	Digital Education Enhancement Programme
DoE:	Department of Education
ICT:	Information and Communication Technology
PanAf:	Pan African Research Agenda
SITE:	Society for Information Technology and Teacher Education
UNESCO:	United Nations Educational, Scientific and Cultural Organisation

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CHAPTER 1

1 INTRODUCTION

1.1 INTRODUCTION AND BACKGROUND TO THIS STUDY

Over the past decade, there has been a tremendous demand for the use of Information and Communication Technology (ICT) in classrooms in South Africa (UNESCO, 2008). The rapid growth in information and communication technologies has brought remarkable changes in the 21st century (Nyambane & Mziki, 2014). According to Tiba, Condy and Tunjera (2016), the widespread use of technology has led to teachers being pressured into adopting and using ICT in their teaching. In South Africa, teachers have been encouraged to use ICT for curriculum delivery. The aforementioned authors state that, despite the South African government expenditure on ICT equipment, there seems to be a slow rate of adoption and use of ICT in the classroom.

Michael, Leigh and Peter (2011) note that an important measure of the success of any educational reform is the extent to which it is adopted by teachers. Johnson (2010) states that ICT has been changing the way in which people learned and interact for thousands of years he further argued that teachers must prepare for an ICT-rich future and keep up with change by adopting effective strategies that infuse lessons with appropriate technologies. This emphasises the need for teachers to actively pursue professional development that enables a lifelong exploration of ways in which to enhance teaching and learning. If there is resistance to the adoption of ICT, then the potential of ICT as a teaching tool will not be realised. According to Yusuf (2011), having ICTs in schools will not guarantee their effective use. Yusuf (2011) notes that teachers must be competent and have the right attitude towards ICT in order for its gains to be realised in the teaching and learning context.

The South African government suggested that the use of ICT should be a priority for teaching and learning in the future of education (DOE, 2003; Jaffer, Ngami &

Czerniewicz, 2011). In the foreword of the South African Department of Education (DoE) through its ICT in Education policy, the White Paper on e-education (DoE, 2003), the Minister of Education proclaimed that:

The introduction of ICT to our schools will create new possibilities for learners and teachers to engage in new ways of information selection, gathering, sorting and analysis.

In addition, ICT has the potential to enhance the management and administrative capacity of schools. The enhancement of teaching and learning, especially for different subjects, depends on the capability of both teacher and learner to use and apply the ICTs effectively.

The ability to use ICTs is described as having the necessary technical and cognitive skills to access, use and develop ICT tools appropriately for subject learning improvement. Teachers should be able to motivate and encourage learners to apply technology, or to engage them in creative ways (ICT) to solve problems, analyse and exchange information, as well as to develop their own ideas. ICT capability also involves the proper selection, use and evaluation of these technological tools. Therefore, subject teachers will be able to decide when to use ICT in their lessons. Teachers would have the knowledge and skills to help the learners in deciding which aspects of the technology available to them would be appropriate for to a certain task (DoE, 2003).

The application of ICTs has made several contributions towards education, which includes providing a catalyst for rethinking teaching practice (Flecknoe, 2002), improving educational outcomes, increasing pass rates, and enhancing and improving the quality of teaching and learning (Garrison & Anderson, 2003).

According to Hennessy, Harrison and Wamakote (2010), governments in Sub-Saharan Africa (SSA), emphasised teacher development as the key to the effective implementation of policy and curricula, in using ICT to enhance teaching and learning and to raise educational standards. In many African countries, however, a major impediment is the lack of qualified teachers. Nevertheless,

access to and usage of ICT, such as the electricity supply, remains rather sporadic (Hennessy et al., 2010).

According to Light (2009) when ICT is effectively integrated into a high-quality learning environment, it can help to deepen students' content knowledge, engage them in constructing their own knowledge and support the development of complex thinking skills. However, ICT alone cannot create this kind of teaching and learning environment; teachers should know how to structure lessons, select resources, guide activities, and support this learning process – tasks which many traditionally-trained teachers are not prepared to take on. To use technology effectively, the pedagogical paradigm needs to shift towards more student-centred learning. This shift is neither trivial nor easily accomplished, particularly in countries with teacher-centred educational traditions.

The Pan African Research Agenda (PanAf, 2008-2011) on the Pedagogical Integration of Information and Communications Technologies, South Africa, shows that ICT capabilities as well as the integration of technology in classrooms play a significant major role in the training of teachers in the use of ICT. Due to the lack of ICT capability, it is clear that teachers will have to be trained in this area (PanAf, 2008-2011). While receiving training, teachers still have to produce quality educational outcomes to enhance subject knowledge (PanAf, 2008-2011). Teachers experience burn-out as a result of all the hours they have to invest in learning how and when to apply technology in their lessons, while simultaneously preparing to present effective lessons to the learners. This time-consuming business leads to teachers giving up on the implementation of ICT in the teaching of their subjects, and therefore chooses to remain with conventional teaching methods. Even with ICT-capable teachers, further limitations include the shortage of effective equipment (PanAf, 2008-2019).

The United Nations Educational, Scientific and Cultural Organization UNESCO (2008) suggest that ICTs:

...contribute to universal access to education, equity in education, the delivery of quality learning and teaching, teachers' professional development and more efficient education management, governance and administration.

In developing countries, ICTs could improve the quality of and access to education by providing equal opportunities for urban, peri-urban and rural learners.

Recent studies in South African schools that have attempted to investigate the utilisation of ICTs in the classroom present evidence of the limited use of quality ICT, and insignificant patches, which should be a cause for concern in a country that values quality and equity (Wilson-Strydom & Thomson, 2005). Wario (2014) argued that there is a significant investment in ICT in South African Schools, but that it is still not being integrated effectively into classroom practice and he further points out that schools in South Africa have ICT but that not all teachers are using it.

1.2 BACKGROUND TO THE STUDY

According to Wilson-Strydom and Thomson (2005) supported by Jantjies and Joy (2016), most teachers in South African schools are not on a level where they can confidently use ICT to enhance teaching and learning. Hennessy et al. (2010) found that teachers' attitudes and expertise, as well as their lack of autonomy and knowledge in terms of evaluating the use and role of ICT in teaching are hindering their readiness and confidence when it comes to using ICTs in teaching and learning.

The use of ICT will change the passive role of learners in which they simply receive knowledge to a more active role which requires them to construct knowledge. The use of ICT will enable teachers to collaborate as well as engage with experts, and have access to global resources. In addition, learners will have access to quality learning materials, and learning will become fun. Learners who use ICT will show a better understanding of the topics they are studying.

Yusuf (2005) suggests that ICT helps learners to develop multiple intelligences, critical thinking, creative skills, and also allows for inter-school collaborations. According to Fu (2013), ICT offers more opportunities to develop critical (higher-order) thinking skills based on a constructive learning approach. A study conducted by Fu (2013) confirms that ICT develops learners' understanding of their learning areas and provides more creative solutions to different types of learning inquiries.

The adoption and use of ICT have a positive impact on the improvement of subject knowledge. The use of ICT tools would assist both learners and teachers in creating a better learning environment as it would be easier to work in and manage classrooms. Fu (2013) claims that ICT fosters autonomy by allowing teachers to create their own material thus provide more control over course content than is possible in a traditional classroom setting. Fu (2013) further states that the ability to apply and transfer knowledge while using ICT efficiently and effectively, and therefore the whole learning process, enriches learners' learning skills and broadens their knowledge beyond what they already know.

According to Wario (2014), the challenges faced with regard to the integration of ICT in South African classrooms include different factors such as teachers' attitudes which are viewed as a priority at this stage. The successful integration and implementation of ICT largely depend on the attitudes of teachers, who eventually determine how it is used in the classroom. There is a need for teachers to recognise ICT as an educational tool as it develops into a new educational era, and to accept it as part of their natural teaching and learning experience.

An early study by Passey (1998) suggests that this will support and enrich the development of teachers' pedagogic competencies. Teachers should be further motivated to integrate ICT into their lessons to improve the quality of their teaching, and to give their learners the opportunity to learn faster, learn more, learn differently, learn on their own, learn together, learn inside and outside the classroom, learn in a variety of ways and to be creative. However, most teachers still rely on conventional teaching tools due to their lack of skills or confidence (Passey, 1998).

1.3 PROBLEM STATEMENT

Despite the increasing demand for the integration of ICT into classroom practice activities to enhance teaching and learning, teachers are still not incorporating 21st century ICT technologies due to the required lack of skills and pedagogic knowledge.

Ramorola (2014) states that in its e-Education Policy, the South African Government set a goal that every school-going learner be ICT-savvy by 2013. The South African government policy does not, however, present implementation strategies. Hence, most of the schools still lack ICT equipment for teaching and learning (Ramorola, 2014), and teachers are not equipped with the necessary knowledge and skills to integrate ICT in the classroom.

According to Mooketsi and Chigona (2016), despite the noble intentions and efforts driving the implementation of Information and Communication Technology (ICT) in education, the integration of ICTs into teaching and learning has been fraught with challenges (Mooketsi & Chigona, 2016). They further claim that studies that have examined the implementation process of ICT in schools are besieged with dispersed and uncoordinated implementation programmes and projects. Predominantly, existing studies have not focused on how the implementation process and context could have affected the implementation outcomes (Mooketsi & Chigona, 2016).

Some studies have examined the adoption and usage of ICT in African countries. In most countries, high prices, lack of ICT, lack of relevant e-service with the systems of trust, privacy, and security are identified as the main barriers facing those who do have access to the Internet (Stork, Calandro & Gillwald, 2013).

1.4 RATIONALE OF THE STUDY

ICT has become an important aspect of the teaching and learning process across the world. In South Africa, teaching and learning through ICT has to consider the existing challenges of the South African classroom context (Jantjies & Joy, 2015).

A study conducted by Jantjies and Joy (2016) found that teachers were generally enthusiastic about the potential of ICT. However, they have been unable to integrate ICT to support the teaching and learning process. According to these researchers, these problems can be attributed to a number of factors, which include teachers' attitude and the lack of appropriate technology and infrastructure.

According to Kriek and Stols (2010), the South African Government drafted the White Paper on e-Education in 2003 to incorporate ICT into teaching and learning, and an administrative illustration of all schools in South Africa. With the implementation of the National Curriculum Statement, teachers' beliefs can make or break the implementation of an innovation and must be aligned to the spirit of the innovation. We need a better understanding of the beliefs that influence teachers in deciding whether or not to use technology in teaching and learning. Teachers' attitudes and beliefs as barriers to using technology for instruction are identified. Problems could emerge when teachers' beliefs are ignored as these are the driving force behind their use of ICT in their classrooms. Teachers' beliefs are contextually significant in terms of the implementation of innovations. Therefore, a deeper understanding of the nature of the beliefs that influence teachers' behaviour and how these beliefs and attitudes are manifested is needed (Kriel&Stols,2010).

According to Oladosu (2012), ICT is important in shaping the global economy and producing rapid change in society. ICT has fundamentally changed the way in which people communicate and do business, and has thus given rise to new educational needs, teaching methods and strategies which teachers must not refuse to be a part of. Teachers must have the right attitude and accept the integration of modern technologies into the teaching process. Oladosu (2012) states that traditional teachers tend to be pessimistic in their perceptions of and attitude towards change. This type of pessimism could contribute to a lack of awareness about ICT as a tool for teaching and learning. Teachers should have the right attitude to cope with the use of ICT as a tool for teaching and learning. Oladosu (2012) describes attitude as a "general feeling or opinion of an individual about something". It is the controller of the actual behaviour of an individual,

whether consciously or unconsciously. Teachers' attitudes towards ICT reflect their acceptance or rejection of ICT as a tool for teaching and learning, and the right attitude is needed to develop their ICT skills.

According to Pelgrum (2001), the current belief is that ICT is the backbone of an information society and it is an important catalyst and tool for inducing educational reforms that transform learners into productive knowledge workers. Educational innovations usually do not succeed if teachers are not provided with the skills and knowledge needed to carry them out. Training teachers is a very expensive activity. Consequently, teachers have been neglected when it comes to large-scale innovations. According to Ramorola (2014), teachers not only lack skills and expertise in the use of ICT, but also lack the pedagogical knowledge needed to use it appropriately. Based on the above, it is evident that the introduction of ICT in teaching and learning has not brought any changes in the delivery of education in schools. Teachers have not shifted from teacher-centred teaching to student-centred learning (Ramorola, 2014).

Pelgrum (2001) is of the opinion that a frequent problem is that teachers do not have sufficient knowledge and skills regarding ICT, and that most countries have not been successful in terms of providing sufficient facilities to keep teachers up-to-date with the latest technologies. According to Hennessy et al. (2010), there are generally a number of challenges in terms of bringing ICT into the education process across Africa and most of the developing countries because of teachers' own education and literacy rates. In addition, access to professional development is also found to play an important role.

George and Ogunniyi (2016) mention that a lack of teaching experience with ICT, as well as that of on-site support for teachers using ICT, time required to successfully integrate technology into the curriculum, and financial support might have contributed to the low usage of ICT resources in schools.

1.5 AIM OF THE STUDY

The aim of the study was to explore the constructivist framework for the use of Information and Communication Technology that seeks to assist teachers to integrate it effectively in secondary classroom practices in Motheo district schools.

1.6 OBJECTIVES OF THE STUDY

The objectives of the research were to:

- Determine teachers' attitudes towards the use of ICT in the classroom;
- Identify teachers' use of ICT in the classroom for the advancement of learning;
- Identify barriers that prevent teachers from using ICT in the classroom; and
- Establish the role of the Department of Basic Education in developing the ICT skills needed by teachers.

1.7 RESEARCH QUESTIONS

- What are the attitudes of teachers' towards the use of ICT in the classroom?
- How do teachers use ICTs for the advancement of teaching and learning?
- What are the barriers that prevent teachers from using ICT in the classroom?
- What role does the Department of Basic Education play in the development of ICT skills needed by teachers?

1.8 HYPOTHESES

- Teachers seem to have negative attitudes towards the use of ICT in the classroom.
- Teachers do not use ICTs in the advancement of teaching and learning.
- There are no barriers that hindered teachers to use ICT in the classroom.
- There is no role played by the Department of Basic Education in the development of ICT Skills needed by teachers.

1.9 RESEARCH DESIGN AND METHODOLOGY

A mixed-methods approach was used to realise the purpose of this study. This section explains the research design and instrumentation, as well as the research sampling techniques that were used in this study.

According to Babbie and Mouton (2008), a research design is a plan or blueprint for conducting the research. The research design is a detailed plan according to which research is undertaken. This study was conducted by implementing a mixed-methods approach, and made use of a quantitative design in the form of questionnaires, and a qualitative design based on the use of semi-structured interviews.

According to Leedy and Omrod (2010), research methodology refers to the researcher's general approach in carrying out the research project. This study followed a mixed-methods approach by implementing both qualitative and quantitative research methods to explore the development of a framework for the use of Information and Communication Technology in the classroom.

According to Creswell (2003:22), "A mixed method design is useful to capture the best of both quantitative and qualitative approaches". Creswell and Plano-Clark (2011:5) observe that a definition for mixed methods should incorporate many diverse viewpoints; it combines methods, a philosophy, and a research design orientation, which ultimately seems to highlight the key components involved in designing and conducting a mixed-methods study.

Questionnaires and semi-structured interviews were the main devices used to gather empirical data regarding the use of ICT in the classroom. The data collection tools used in this study were both quantitative and qualitative in nature. Tuchman (1994:366) points out that quantitative research mirrors variables as objectively as possible by representing them as numbers or quantities. Qualitative research, on the other hand, is based on the fundamental beliefs that events must be studied in their natural settings, and that they cannot be understood unless one understands how they are perceived and interpreted by the people who participated in them (Tuckman, 1994:366).

In order to realise the purpose of the study, the research was conducted in the pragmatic paradigm. According to Cohen, Lawrence and Morrison (2011:19), the pragmatic paradigm is a one in which the “social world can only be understood from the standpoint of individuals who are part of the on-going action being investigated”. The research aimed to gain insight into teachers’ perceptions of ICT usage and how they affect their teaching. Within this paradigm, the researcher examined the integration of ICT through the eyes of the participants.

1.10 POPULATION

“The population is the entire set of objects or people which are the focus of the research and about which the researcher wants to determine some characteristics” (Bless & Higson-Smith, 2004:84). This study focused on secondary school teachers in Motheo District who are teaching ICT. A total of 30 questionnaires were distributed to 10 randomly selected schools in Bloemfontein, Motheo district.

1.11 SAMPLING PROCEDURE

In research, sampling is the process of selecting a group of subjects for a study in such a way that the individuals represent the larger group from which they were selected (Gray, 2009:101). Random sampling was used to select the participants. Cooper and Schindler (2003:179) state that “The basic idea of sampling is that by

selecting some of the elements in a population conclusions could be drawn about the entire population”.

According to Creswell (2003), quantitative data often involves random sampling so that each individual has an equal probability of being selected, and so that the sample can be generalised to the larger population.

Patten (2004) states that obtaining an unbiased sample is the main criterion when evaluating the adequacy of a sample. The researcher applied random sampling so that every member of the population stood an equal chance of becoming involved in the study. According to Cohen et al.(2007), in random sampling, each member of the population under investigation has an equal chance of being selected, and the probability of a member of the population being selected is unaffected by the selection of other members of the population. The method involves selecting at random from a list of the population the required number of subjects for the sample. In this study, schools were randomly selected from a list of schools in the Motheo District.

Purposive sampling was used to enable the researcher to select participants according to specific criteria, for example those with ICT training and those without. Neuman (2000:517) refers to purposive sampling as “a type of non-random sampling in which the researcher uses a wide range of methods to locate all possible cases of a highly specific and difficult-to-reach population”. Purposive sampling is a procedure that involves the selection of persons who represent the desired population. This is a non-probability sampling method which involves the conscious selection of certain subjects to be included in the study (Burns & Grove, 1999:238).The researcher used purposive sampling to select the teachers because they had experienced the central phenomenon. The rationale for choosing this approach was that the researcher was seeking knowledge about teachers who were either using or not using ICT in their classrooms. Thus, the participants provided the relevant information by virtue of their experience. The sampling process will be discusses in full in chapter 3.

1.12 SAMPLE SIZE

According to Kothari (2006), an optimum sample is one which fulfils the requirements of efficiency, representativeness, reliability and flexibility. The target population for this study was ten secondary schools that have ICT tools. The participants were comprised of eighteen females and twelve males who teach Grades 8 to 12 learners.

Lacobucci and Churchill (2005) assert that sample size can either be fixed or sequential. In this study, the total number of participants was 30 teachers from ten secondary schools in Bloemfontein, i.e. three teachers were chosen from each school.

1.13 DATA COLLECTION

According to Struwig and Stead (2001), data collection refers to the procedures used to generate data, as well as the techniques to process and analyse it. Qualitative data was collected using interviews and semi-structured interviews, while quantitative data was collected using questionnaires. Obtaining data from the participants who had different experiences prevented information bias, and thus increased the credibility of the information.

1.13.1 Quantitative Data Collection Techniques

Quantitative data was collected, using a questionnaire. The questionnaire is a well-established tool within social science research for acquiring information on participants' social behaviour or attitudes, as well as their beliefs and reasons for action with respect to the topic under investigation (Bulmer, 2004). Appendix 2 is the teacher questionnaire which includes questions about the biographical data of the participants. The questionnaires were delivered in person to each selected teacher. A total of 30 questionnaires were distributed and collected in person, and the response rate was 100%.

1.13.2 Qualitative Data Collection Techniques

Semi-structured interviews were conducted in order to examine the views and opinions of teachers with regard to the integration of ICT in teaching and learning in schools. Appendix 3 is the interview questions. A set of predetermined, open-ended questions was developed to guide the researcher during the interviews. The participants were guided and encouraged to share their experiences and views on the use of ICT in the classroom. However, the questioning and responses from the participants maintained flexibility and consistency. The semi-structured interview technique of probing questions was used. The researcher used phrases such as “Could you elaborate more on that point?”

1.14 DATA ANALYSIS

Data analysis means to organise, provide structure and elicit meaning from the data. The analysis of qualitative data is an active and interpretative process (Polit et al. 2001). The researcher used Microsoft Excel in designing the questionnaire and analysing the data.

Data analysis in mixed-methods research occurs within both the quantitative and qualitative approaches (Creswell 2003). Quantitative data was collected by means of a questionnaire. The data was then coded and divided into different categories in order to assist with the final processing of both quantitative and qualitative data. The researcher analysed the qualitative data in order to become familiar with the information. Appendix 5 presents the coding of the interviews. The researcher analysed all the data that had been collected as well as the interview transcripts to form a clearer understanding of the information. The researcher coded the data, and conducted a content analysis by looking for specific words according to which themes could be identified (Terre Blanche & Kelly, 2002).

Data was coded with the assistance of an external coder. The researcher qualified the quantitative data by generating themes within the data and comparing them with those found in the qualitative data. The next step in the process involved interpreting the themes (Creswell, 2003)

1.15 LIMITATIONS OF THE STUDY

Due to the small sample of the study, the results may not be generalised beyond the specific population from which the sample was drawn. Due to the large number of potential participants in the study population, the sample that was selected to participate in this study was limited to ten secondary school teachers from Bloemfontein in the Motheo District.

A further limitation is the fact that several problems are inherent in the use of interviews and questionnaires. For instance, open-ended questions may prompt participants to provide vague answers. Furthermore, participants may not understand the questions in the same way.

1.16 ETHICAL CONSIDERATIONS

All the information provided was considered to be completely confidential in that the names of the participants were not included or associated in any way with the data collected in the study. The interest of this study was in the average responses of the entire group of participants. Therefore, individual participants were not identified (nor were they identifiable) in any way, in any written reports pertaining to this research. The interviewees were presented with a consent form at the beginning of the interview session, and were invited to ask any questions. Once all of the questions had been answered, they were invited to sign the consent form.

The researcher focused on teachers. In order to deal with the issue of consent, the researcher applied for permission from the Free State Department of Education to interview three teachers from ten schools in the Motheo District. The interview took place during normal school hours, thus providing a safe environment for the interviewer and interviewees. Consent forms and covering letters were provided. Appendix 1 includes the letter to the school principals to conduct the research.

1.17 CLARIFICATION OF CONCEPTS

According to a number of researchers, ICT can be defined as “any technology used to support information gathering, processing, distribution, and use” (Beckinsale & Ram, 2006).

1.17.1 Information and Communication Technology (ICT)

Siraj-Blatchford and Siraj-Blatchford (2003:4) state that:

Information and Communication Technology (ICT) refers to anything that permits access to information, and anything that permits communication with each other or anything that has an effect on the environment by the use of electronic or digital equipment.

1.17.2 The Internet

This refers to the world-wide system of networked computers comprising of millions of smaller domestic, academic, business and government networks, which are interconnected to each other to allow for transmission of various information and services, such as e-mail, online chat, online social networking, online data storage, file transfer, search for information, e-commerce, online banking and many other digital services ([www.businessdictionary.com](http://www.businessdictionary.com/definition)>definition).

1.17.3 Professional Development

In a broad sense, professional development may include *formal* types of vocational education, typically post-secondary or poly-technical training leading to qualification or credential required to obtain or retain employment. Professional development may also come in the form of pre-service or in-service professional development programs. These programs may be formal, or informal, group or individualized. Individuals may pursue professional development independently, or programs may be offered by human resource departments. Professional development on the job may develop or enhance process skills, sometimes referred to as leadership skills, as well as task skills. Some examples for process skills are 'effectiveness skills', 'team functioning skills', and 'systems thinking skill' (Garet, Porter, Desimone, Birman & Yoon, 1 January 2001).

1.18 OUTLINE OF THE STUDY

Chapter 1 provides the introduction and background of the study. This was followed by the problem statement and rationale for the study. The purpose, objectives, research questions, hypotheses, research methodology and research design were briefly explained. Finally the limitations, clarification of concepts and outline of the study were provided.

Chapter 2 presents a literature review to construct a conceptual framework for ICT usage.

Chapter 3 deals with the research methodology that was used to investigate the use of ICT by teachers.

Chapter 4 deals with data analysis and interpretation, as well as the findings of the study.

Chapter 5 offers suggestions and recommendations based on the findings of the study.

1.19 CONCLUSION

This chapter provided an introduction to this study in terms of its content, aims, research questions, and research problem. The research design and methodology were briefly explained, and an outline of the study was given. The next chapter will focus on the literature review to provide insight into the context and theoretical framework of this study.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

A literature review for exploring the Constructivist Framework for the use of ICT in Secondary Schools in the Motheo was conducted. A number of studies have been done across the world on the use of ICT as an educational tool. The studies reported on the impact of ICT usage in teaching and learning (Mooketsi & Chigona, 2016). This study draws on previous national and international studies on the use of ICT in the classroom. This chapter will begin with a discussion about teachers' attitudes towards the use of ICT. This will be followed by a description of the use of ICT to advance teaching and learning, as well as an explanation of the barriers to the use of ICT, and the role of the Department of Education with regard to ICT.

2.2 TEACHERS' ATTITUDES TOWARDS THE USE OF ICT

Govender and Maharaj (2005) reveal that the successful implementation of educational technologies depends largely on the attitudes of teachers and how they use ICT in the classroom. Bullock (2004) found that teachers' attitudes are a major factor in the adoption of technology. Educators who have a positive attitude towards technology feel more comfortable using it, and usually incorporate it into their teaching. A positive attitude is the key factor, not only for enhancing ICT integration, but also for avoiding teachers' resistance to the use of computers (Govender & Maharaj, 2005).

According to BECTA (2003), teachers' attitudes towards ICT can influence their use of thereof, or ICT could be influenced by other barriers. Research on ICT divided attitudes into three groups: self-confidence in terms of the use of ICT, perceived relevance of ICT, and innovativeness. Negative experiences affect perceptions related to the ease of use and relevance of ICT, and reduce

confidence and increase anxiety. Computer anxiety and anxiety about change are key factors limiting teachers' use of ICT (Larner & Timberlake, 1995).

Lawal (2006) argues that awareness of policies forms the backbone of the utilisation and productivity of a programme. When an individual is aware of the guiding principles, he/ she then cultivates the right attitude which will result in improved productivity. This will urge the individual to yearn for skills to improve his/her ICT competency. Teachers demand special attention because they have special needs and interests that should be addressed with respect and ingenuity in order to encourage them to embrace the new technologies in the classrooms.

Osei (2007) points out that in the past there was the laptop initiative in South Africa to ensure that every teacher in the country owns and uses a laptop. Yusaf (2005) mentions that ICT has been infused into schools without fundamentally changing the way in which students learn and teachers teach. In most cases, it was adapted to traditional school structures and existing practices, and failed to address comprehensive educational reform. Ofsted (1995) claims that it should be acknowledged that the lack of meaningful integration may be the result of a lack of awareness or confidence on the part of the teachers.

According to Yasmin (2008), teachers who have traditional beliefs need gradual re-orientation, as well as one-on-one practical interaction with the ICTs in order to develop a concrete understanding of the potential of ICTs. Teachers' attitudes towards using knowledge outside their talent and desire tend to be a factor impeding the integration of ICT. The successful integration of ICT requires competencies and skills that are essential to teaching (Yasmin, 2008).

A study by Ang'ondi (2013) in Kenya shows that several factors have been identified in the literature as barriers to the integration of ICT in teaching and learning. Research has found that teachers are burdened people and, when they are confronted with the integration of ICT, they tend to avoid integration altogether. The successful implementation of ICT depends on staff competence and attitude. Some teachers believe that ICTs have the ability to improve classroom learning. On the other hand, most teachers find it difficult to understand the benefits of ICT

or how it could be used to achieve maximum results (Ang'ondi, 2013). Some teachers are reluctant to abandon their existing pedagogy. Ang'ondi (2013) reports that the ICT resources were inadequate which resulted in the teachers' decision not to change to use ICT in the classroom. According to the data presented by Ang'ondi (2013), many teachers kept thinking that they were not knowledgeable enough to use ICTs competently and that they lacked the skills to sufficiently manage an ICT-integrated classroom. ICT champions were motivated to use ICTs, but they felt that it was an additional burden. Teachers who were willing to integrate ICTs would be discouraged because of the lack of commitment from the administration. Most of the teachers did not want to interfere with the status quo, and therefore continued to do things as they had been done.

A study conducted by Awan (2011) in Dubai found that the attitudes of teachers presented barriers to the use of ICT in schools. The same author reports that the teachers neither had access to the equipment nor experience with regard to working with technology in their classrooms. Four teachers reported that they did not have experience in working with technology in their classrooms. Despite their negativity, however, they did display the desire to use technology more in their teaching. These teachers also felt apprehensive and ill-equipped to introduce and incorporate ICT into their teaching. A skills audit questionnaire was administered to the teachers to identify their ICT skills and to help design a proper training programme. The questionnaire sought to investigate teachers' experiences with regard to technology in general as well as their confidence in their knowledge of and ability to use technology effectively in the classroom. All four teachers reported that they had little to no knowledge or experience in terms of using ICT in the classroom. All teachers were enrolled in an International Computer Driver Licence course in order to improve their ICT skills. Awan (2011) reports that the participants' attitudes changed from negative to positive after they had attended the professional development programme.

Albirini (2004) refers to one's positive or negative judgement of a concrete subject. People's attitudes are determined by the analysis of the information regarding the result of an action, as well as the positive or negative evaluation of these results.

This means that there is always a positive relationship between teachers' attitudes and their use of ICT. A more positive attitude towards the computer was associated with a higher level of computer experience (Albirini, 2004).

A study done by Chigona and Davids (2014) in South Africa found that teachers should have a sense of achievement as a motivation. Teachers who are enthusiastic about learning how to use and incorporate ICT into their classrooms have a sense of achievement. They see the use of ICT as a wonderful way of teaching because learners learn more than when they use traditional ways of teaching. This sense of achievement when using ICT in their teaching provides the motivation to change their attitudes to a more positive one (Chigona & Davids, 2014). The study by Bingimlas (2009) shows that negative attitudes are due to a lack of confidence in the use of ICT in the classroom.

Hennessy et al. (2010) assert that in the study on the Digital Education Enhancement Programme (DEEP), the majority of the teachers were highly motivated to succeed at using ICT for their own development as well as for their students' learning. The confidence of teachers has been boosted in programmes such as DEEP which featured the use of personal computers, a project partner, joint evaluative activities and strong initial technological and pedagogic training (Hennessy et al., 2010).

In Dzidonu's (2010) opinion, there is apathy, resistance to change, as well as lack of motivation to change in relation to the introduction of ICT to facilitate education in most educational institutions. Despite the increasing popularity of ICT, some of the African educational institutions are still battling with resistance to change by the teachers, staff and students. In particular, teachers and lecturers in educational and training institutions reported various reasons for such resistance, including lack of incentives, motivation, etc. Teachers and lecturers still deliver their courses by means of the traditional chalk and talk method, with few venturing into the use of PowerPoint or other presentation tools to deliver their courses (Dzidonu, 2010).

According to Yusuf (2011), having ICTs in schools is no guarantee that they will be used effectively if the teachers are negative. He further states that teachers

must have the competence and the right attitude towards ICT in order for it to work. Yusuf (2011) adds that male and female teachers have the same attitude.

2.3 THE USE OF ICT TO ADVANCE TEACHING AND LEARNING

Education has been positively affected by ICTs due to the tremendous effect they have on teaching and learning. Moreover, ICT has the potential to innovate, accelerate, enrich and deepen skills to motivate and engage students to help relate the school experience to work practices (Yusuf, 2005).

George and Oguniyi (2016) note that if ICT is used competently, it can enhance learners' higher-order thinking skills, life-long learning habits and communication skills.

The use of technology in education is becoming an increasingly important part of higher and professional education (Wernet, Olliges & Delicath, 2000). Technology not only gives learners the opportunity to control their own learning process, but it also provides them with ready access to a vast amount of information over which the teacher has no control (Lam & Lawrence, 2002).

Learning approaches using ICT provide a number of opportunities to engage in constructivist learning through the provision of and support for a resource-based student-centred setting by enabling learning to be related to context and practice (Berge, 1998). As far as the learning process is concerned, ICT can support various aspects of knowledge construction. The more students employ ICTs in their learning process, the more pronounced its impact will become. Students enjoy learning through independent enquiry which is innovative, and the appropriate use of ICT can help to foster this. ICTs not only have the ability to enhance the quality of education by increasing learner motivation and engagement, but also to enhance teacher training. ICT could also be used to make the transition to more learner-centred environment. The integration of ICT in the curriculum delivery encourages constructive learning such that learners' thinking could be developed in a more efficient manner than traditional teaching practices (Syed Noor UI Amin, 2013).

Bester and Brand (2013) argue that comprehension and problem-solving skills are best learned through interactive media. Therefore, it is necessary to integrate ICT into teaching and learning processes.

Mikre (2011) observes that the use of ICT in schools makes a huge difference to the learners who use ICT tutorials in subjects such as Mathematics, and Natural- and Social Sciences as they score higher in their tests. ICT enhances learning; it makes learning less abstract and more relevant to learners. It supports collaborative learning because it encourages interaction and co-operation between learners and teachers regardless of where they are. ICT leads to more creative learning that promotes the manipulation of existing information and the creation of real-world products rather than the duplication of received information (Mikre, 2011).

Bonnet, Mcfarlane and Williams (1999) conducted research into the use of multimedia software to produce a learning resource about drugs. Learners were allowed to choose their own content and presentation styles, from which two main benefits were accrued. In this study, the authors believed that providing learners with choices would motivate them to think about the options available to them as well as select the most appropriate media for their audience and purpose (Bonnet, Mcfarlane & Williams, 1999).

According to Chigona and Davids (2014), ICT gives students a sense of achievement as an individual with a tendency to strive for success is motivated to choose goal-oriented success or failure activities. This sense of achievement serves as encouragement for individuals when using ICTs in the classroom. Teachers who are enthusiastic about learning how to incorporate ICTs into their teaching have the same sense of achievement. They see the use of ICTs within teaching as a wonderful approach because their learners learn more than when they use traditional methods of teaching. The teachers and learners are able to experience the different ways in which technology can be used in a classroom setting while some teachers are motivated to master the use of ICTs for teaching in their schools. Some teachers are motivated to learn more about technologies

and view ICT it as a ticket out of the disadvantaged schools to the more affluent ones. This is evident in Cape Town where many teachers would find it interesting to teach in affluent areas because the schools have good resources (Chigona & Davids, 2014).

Bottino (2003) states that the use of ICT could improve performance, teaching and administration, and develop relevant skills in the disadvantaged communities. He further indicates that ICT can also improve the quality of education by facilitating learning.

Ramorola (2014) notes that research findings over the past years provide some evidence as to the positive effects of the use of ICT on pupils' learning. There is great potential for ICT in terms of knowledge dissemination, effective learning and the development of more efficient educational services. In a survey by EU Schoolnet in 2010, teachers who used ACER Netbooks believed that the use of Netbooks had a positive impact on their learning in that it promoted individualised learning and helped to extend studying beyond the school day. ICT has not only changed the role of teachers in the classroom but has also provided them with a large number of software packages and websites that can be utilised for educational purposes (Ramorola, 2014).

The flexibility of time and space accounted for by the integration of ICT into teaching and learning processes contributes to increasing the interaction as well as reception of informatics. Such possibilities suggest changes in the communication models, as well as the teaching and learning methods, used by teachers, giving way to new scenarios which favour both individual and collaborative learning (Cabero, 2001).

According to Plomp, Pelgrum and Law (2007), people have access to knowledge via ICT which helps to keep them abreast of the latest developments. ICT can be used to remove communication barriers such as space and time. Lim and Chai (2014) state that ICT provides opportunities to access an abundance of information, using multiple information resources, viewing information from multiple perspectives, and thus fostering the authenticity of learning environments.

ICT may also make complex processes easier to understand through simulations that contribute to authentic learning environments. Thus, ICT may function as a facilitator of active learning and higher-order thinking (Alexander, 1996).

According to Hennesy et al. (2010), studies such as the Digital Education Enhancement Programme (DEEP) carried out in South Africa report that the use of ICT enhances teachers' professional knowledge and capabilities in very specific ways. ICT enables planning and preparation for teaching to be more efficient, and increases the range of teachers' existing pedagogical practices. Despite certain challenges, the majority of teachers were highly motivated to succeed in the use of ICT because there was wide-ranging evidence of positive outcomes in terms of improved literacy, numeracy and science learning by students (Hennesy et al., 2010).

Ohakwe and Okwuanaso (2006) note that knowledge of software such as Spread sheet, Excel, computer-aided design, and Database is important in teaching and that such knowledge should be impacted. Nworgu (2008) contends that computer-aided instruction is a program or package presented in the form of software for instructional purposes. Nworgu further states that ICT makes the teaching and learning processes more efficient, effective, easier and less cumbersome as the use of computer-aided instruction provides learners with different backgrounds and characteristics. Such backgrounds may be in the form of tutorials, drills and practices, as well as simulations (Nworgu, 2008).

According to Syed Noor-UI-Amin (2013), conventional teaching has emphasised content for years and that such content has been written around textbooks. The integration of ICT could help to revitalise teachers as well as students. It could also help to improve and develop the quality of education by providing curricular support in difficult subjects (Syed Noor-UI-Amin, 2013). To achieve teaching and learning objectives, teachers need to be involved in collaborative projects and the development of intervention strategies, which would include teaching partnerships with ICT as a tool.

ICT increases the flexibility of delivery of education so that learners can access knowledge anywhere, anytime. It can influence the way in which students are taught and the way in which they learn, as the processes are learner- rather than teacher driven (Moore & Kearsley, 1996). This, in turn, would not only better prepare the learners for lifelong learning, but it would also improve the quality of learning. Technology-facilitated educational programmes also remove many of the temporal constraints faced by learners with special needs (Moore & Kearsley, 1996).

One of the most vital contributions of ICT in the field of education is easy access to learning. With the help of ICT, students can now browse through eBooks, sample examination papers from previous years, etc. Students could also have easy access to resources, mentors, expert researchers, professionals and peers all over the world (Young, 2002). This flexibility has heightened the availability of just-in-time learning and provided learning opportunities for many more learners who were previously constrained by other commitments (Young, 2002).

According to Yusuf (2005a), based on the extensive use of ICTs in education, the need appeared to unravel the myth that surrounds the use of ICT as an aid to teaching and learning and the impact it has on students' academic performance. ICTs are said to help expand access to education, strengthen the relevance of education to the increasing digital workplace and raise educational quality (Yusuf 2005a). Over the past decades the experience of introducing different ICTs in the classroom in educational settings all over the world suggested the full realisation of the potential educational benefits of ICT. This has not yet been realised as there is a direct link between the use of ICT and students' academic performance. This has been the focus of extensive literature during the last two decades. ICT helps students to learn by improving the communication between them and their instructors (Valasidou & Bousiou, 2005).

According to Mwalongo (2011), the most common use of ICT for teaching included the preparation of notes, teaching-learning resources and examinations. Teachers used ICT to solve immediate problems related to teaching and learning that they

had encountered during the course of their teaching. This kind of approach of looking for further information seems to be desirable.

Aduwa-Ogiegbaen (2005) claims that the use of ICT has many prospects. Secondary school teachers have to teach large classes of students, and students no longer receive much-desired individual assistance. ICT could be used to enhance the problem-solving skills of learners, especially in English and Mathematics. ICT can serve as an administrative tool and can replace the laborious exercise of filing papers in filing cabinets and shelves where records accumulate dust over a long period of time. ICT, especially computers, could be used for individual learning in secondary schools, and because of the large classes, the individual learning style and pace could be adapted (Aduwa-Ogiegbaen, 2005). Furthermore, ICT will enable the students to progress at their own pace and receive continual evaluation, feedback and corrections for errors made. ICT could also allow the development of partner-like interactive and individualised relations with the user, and can play the role of tutor and present the learner with a variety of content as well as symbolic modes (Aduwa-Ogiegbaen, 2005).

Mdlongwa (2012) identifies the following benefits of the use of ICT in schools: the use of ICT allows learners to develop skills that will give them an edge in an ever-increasing technology-saturated work environment, and allows learners to become creators of knowledge in their own right. Learners who continue to use ICT when they do their assignments and projects develop a culture of personal information management, independent learning and working without supervision and communication skills. Moreover, ICT can also improve teachers' teaching instructions. According to a study conducted in South African secondary schools, ICT helped teachers to administer and manage their work faster and to communicate more efficiently with other teachers (Mdlongwa, 2012). George and Ogunniyi (2016) state that the use of ICT should be strongly advocated, and teachers should be shown how to benefit from it, making a clear and critical analysis of what it takes to make them useful tools and how ICT can best be used to enhance the educational process.

2.4 BARRIERS PREVENTING THE USE OF ICT IN THE CLASSROOM

Matthew, Joro and Manasseh (2015) state that ICT helps to advance Western and Asian countries, while African countries still experience a lag in its implementation which continues to widen the digital and knowledge divides. These authors mention the following barriers preventing teachers from using ICT: lack of qualified teachers, computers and electricity; burglary; and increased moral degradation. In order to increase and improve the use of ICT in schools, a range of obstacles preventing teachers from using ICT effectively need to be overcome (Kipsoi, Chang'ach & Sang, 2012).

Where policy makers continue to introduce strategies for ICT with the intention of increasing its use in schools, such strategies are likely to have an effect on the school level barriers. The teachers' level barriers are more difficult for policy makers to tackle as it is the teachers themselves who need to bring about the required changes in their own attitudes and approaches to ICT (Kipsoi et al., 2012).

According to Lui (2011), each teacher enters the teaching profession with his/her own personal theories about teaching and learning. Teachers may perceive teaching situations differently based on their beliefs. They make judgements and decisions on how to act, which strategies to implement, and which materials to use. The decision to use ICT in the classroom depends on the teachers' beliefs about teaching and learning, as well as the role of ICT (Nkula & Krauss, 2014).

Nkula and Krauss (2014) note that there is a lack of access to resources. According to these authors, access to ICT refers to the adequate amount and type of ICT in places where teachers and students can use them in order to ensure that ICT is effectively integrated into lessons. If there is limited hardware and software in schools, it limits the chances of integrating ICT into teaching and learning. By contrast, an increase in the availability of hardware and software in schools does not necessarily mean an increase in the integration of ICT (Nkula & Krauss, 2014).

Dzidonu (2010) states that one of the barriers preventing the use of ICT in schools is poor and limited communication infrastructure. He further mentions that ICT

plays an important role in the delivery of educational services. The poor state of ICT infrastructure in most African countries is a major barrier, preventing an increase in educational and training opportunities (Dzidonu, 2010). Most African countries have undergone a major transformation but the telecommunications and communications infrastructures of some of these countries are still far from being developed, especially in rural area (Dzidonu, 2010).

As pointed out by Nkula and Krauss (2014) in the Society for Information Technology and Teacher Education (SITES) 2006 study in South Africa, a high percentage of schools do not have access to computers, while some schools have no Internet access, and only very few South African teachers have access to technical support.

Chigona and Chigona (2010) observe that during the Khanya Schools Project in the Western Cape, teachers who used the laboratories in the Khanya schools did not have sufficient technical support regarding the use of ICT for teaching. The teachers complained that the technical support was not readily available, which negatively affected their use of technology for teaching. The lack of technical support discourages teachers from the effective use of ICT in their teaching. The Khanya Project only provided ICT facilitation for certain subjects, while other teachers were excluded and did not take advantage of the availability of ICT (Chigona & Chigona, 2010).

According to Chigona and Davids (2014), the learners' readiness to learn by means of ICT is a challenge. Learners with challenging academic problems negatively impact the teaching environment. As reported by teachers, learners with few or no computer skills in a computer laboratory have a negative impact on the teaching and learning process. Consequently, a significant investment is needed by teachers to improve the computer skills of such learners. This means that teachers cannot focus on the content they have prepared to teach the class, and avoid teaching by means of technology (Chigona & Davids 2014).

Sherman and Howard (2012) identified the following barriers at Klipspringer and Sibiyahigh Schools: computer viruses and insufficient time to develop

technological skills and knowledge. Teachers at these schools mentioned that computer viruses were the most common barrier preventing the use of ICT in these schools.

According to Kipsoi et al. (2012), one of the barriers that prevent teachers from using ICT effectively is the lack of time for training. Bingimlas (2009) notes that several studies indicate that teachers neither have the competence nor the confidence to use ICT in their classrooms because they do not have enough time. Teachers do not have the time to plan technology-based lessons, explore the different Internet sites or look at various aspects of educational software. This affects teachers in many aspects of their work as it affects their ability to complete tasks.

According to Aduwa-Ogiegbaen and Lyamu (2005), in Nigeria, there were a few Internet providers that provided Internet gateway services to Nigerians. These Internet providers provided poor services to customers to defraud and exploit them. Secondary schools in Nigeria do not receive adequate funds for high-tech equipment, and schools in rural areas do not have access to the Internet.(Aduwa-Ogiegbaen & Lyamu, 2005).

Cassim and Obono (2011) identified the lack of training and skills as one of the barriers that prevent the use of ICT in the classroom. They further indicate that in Cambodia, most teachers make use of their acquired skills in some way after training, while some re-invent ways in which to use their acquired skills. According to this study, the integration of ICT into teaching is still difficult for some teachers as they require more training and practice (Cassim & Obono, 2011).

Du Plessis and Webb (2012) emphasise that teachers need multiple types of training in which technology and pedagogical needs are addressed because teachers' ability to use ICT affects their willingness to integrate it into the classroom. Nkula and Krauss (2014) note that teachers received training on ICT knowledge on integration but that it was found that these teachers did not integrate ICT into their teaching (Nkula& Krauss, 2014). The training of teachers in the use

of ICT should be conducted in the same manner in which the teachers are expected to integrate it, and support must be provided for teachers to prepare them to use it in their classrooms. According to Ndawi, Thomas and Nyaruwata (2013), teachers who used ICT extensively in their classrooms indicated that they had received proper training and that support is not enough.

Aduwa-Ogiegbaen and Lyamu (2005) argue that it is not just that there is a lack of information infrastructure, but also a lack of human skills and knowledge to fully integrate ICT into secondary schools. There is a shortage of trained personnel in application software, operating systems, network administration and local technicians to service and repair computer facilities (Aduwa-Ogiegbaen & Lyamu, 2005). Those who are designated to use computers either do not receive adequate training or do not receive any training at all. In most of the secondary schools, teachers were found to lack the necessary skills to fully utilise ICT for curriculum delivery. These teachers need to be trained with regard to educational technologies and the integration of ICT into the classroom (Aduwa-Ogiegbaen & Lyamu, 2005).

According to Ramorola (2014), there is a remarkable improvement in access to ICT tools in schools, but there is a decline in the use and integration of ICT to enhance learning. Many teachers face several challenges when trying to integrate ICT into teaching and learning.

2.5 THE ROLE OF THE DEPARTMENT OF EDUCATION IN THE IMPLEMENTATION OF ICT IN SCHOOLS

Based on this fact, the government initiated programmes for the integration of ICT into schools to address the challenge of producing computer-literate teachers in various ways and at different rates across the country. The South African government formed partnerships with other role players such as Schoolnet South Africa and the South African Institute for Distance Education to develop teachers in terms of introducing ICT into curriculum and management (Ramorola, 2014).

According to Isaacs (2005), the current ICT in education policy framework has been evolving since 1996 and is embedded within a broader national government economic, social and development strategy. The role of ICT in the South African government strategy for national economic growth, social development, and job creation received increasing prominence over time. In 1996, Mr Thabo Mbeki played a prominent role in the historic information society and development conference which gave rise to the African Information Initiative, spearheaded later by the United Nations Economic Commission for Africa. Since then, a host of programmes and strategies have been introduced that demonstrate central government commitment to the promotion of South Africa as an “information society” (Isaacs, 2005).

The South African government has established broad policies and strategies at national and provincial level in the use of ICT in education. A number of ICT frameworks for policies in South Africa and the use of ICT in education have been on the policy agenda since 1995, and the possibility of using a range of ICT to find solutions received greater attention (James, 2001). According to Matthew, Joro and Manasseh (2015), in order to ensure that ICTs are widely adopted and used in the school system, the following efforts should be made. The DoE should ensure that ICT policy statements are translated into reality.

2.6 THEORETICAL FRAMEWORK

Verma and Mallick (1999:6), as well as Blumberg, Cooper and Schindler (2011:36), are of the opinion that the main role of theory is to help guide the researcher. In the social sciences, it usually implies a set of statements describing and explaining the relationship between human behaviour and the factors that affect or explain it. Paraphrasing Best and Khan (2006:10), a theory could best be described as an attempt to develop a general explanation for some phenomenon. More specifically, a theory, according to these authors, defines non-observable constructs that are inferred from observable facts and events, and are thought to have an effect on the phenomenon under study. It further implies that a theory

describes the relationship between key variables for explaining a current state or predicting future concurrences.

A theory is thus an essential research tool for stimulating the advancement of knowledge (Inglis & Maclean, 2005:17). Consequently, theory should drive the research process and provide a framework for action and understanding. In this study, the theoretical framework that will be used is constructivism. The research philosophy that underpins this study is reflected in different principles as outlined by different research paradigms.

2.6.1 Constructivism

According to Oliver (2002), ICT plays an increasingly pivotal role in teaching and learning, and in the way in which we teach and receive information. Teachers and learners have to change from passive, teacher-centred instruction to a more socially-constructed teaching method. Through the constructivist approach, ICT can contribute more to teaching and learning by means of an active construction of knowledge supported by various perspectives within meaningful contexts and social interactions (Oliver, 2002). The researcher wishes to shed light on the development of a framework for the use of ICT in the classroom through the use of constructivism. Constructivism is one of the frameworks that is commonly used to answer questions about the impact of ICT in teaching and learning (Oliver, 2002).

Technology has significantly impacted the pedagogies of social constructivism. The theoretical framework chosen for this research is that of constructivism. This learning theory provides a theoretical framework for practical problems that may arise. It also gives direction to this study and facilitates implementation (Oliver, 2002).

Constructivism, according to Brooks and Brooks (1999), is a philosophy of learning that is founded on the premise that by reflecting on our experiences, we construct our own understanding of the world in which we live.

According to Gredler (2000) the influence of the constructivist learning movement, as well as the theory of constructive learning, emphasises the teacher-centred role in academic curricula and suggest improvement according to the teachers' needs and interests.

Constructivism argues that learning is interactive and advocates the autonomy and active participation of the learner (Gredler, 2000). The learner is an information constructor and actively builds his/her own subjective representations of reality. New information is related to previous knowledge in terms of schema development (Gredler, 2000).

Constructivism was further developed in the works of Bruner (1960) and Vygotsky (1978). Vygotsky's fundamental contribution to constructivism was the formal introduction of the social aspect to learning (Vygotsky, 1978). Theorists who have contributed to the development of constructivism follow a common theme, i.e. knowledge is considered to be dynamic and constantly changing. Learning is an active process which involves the learners' personal interpretations created through experience (Neo, 2007). Vygotsky (1978) argues that social interaction plays a key role in the development of cognitive function. He further states that higher-order thinking results from relationships between individuals. Furthermore, Vygotsky (1978) emphasises the social context of learning and the notion that knowledge is mutually constructed. Vygotsky (1978) believes that this life-long process of development is dependent on social interaction and that social learning actually leads to cognitive development.

Bruner (1960) emphasises four characteristics for effective instruction which emerged from his theoretical constructs:

- Personalised: Instruction should relate to learners' predispositions, and facilitate interest towards learning;
- Content structure: Content should be structured in such a manner that it can be most easily grasped by the learner;

- Sequencing: Sequencing is an important aspect for the presentation of material; and
- Reinforcement: Rewards and punishment should be selected and paced appropriately.

According to Bruner (1960), learners engage in discovering learning as well obtaining knowledge on their own. Learners select and transform information, construct hypotheses, and make decisions, relying on a cognitive structure in order to do so. For discovery to occur, learners require background preparation in the form of a cognitive structure that provides meaning, organisation of experiences, and allows the individual to go beyond the information given (Bruner, 1960).

Bruner (1960) is considered to be one of the main theorists among the cognitive constructivists, whereas Vygotsky (1978) is the major theorist among the social constructivists.

Weiten (2000) states that learning happens when experience leads to a constant change in the individual's knowledge or manner. The strengths of constructivism lie in its emphasis on learning as a process of personal understanding as well as the development of meaning where learning is viewed as the construction of meaning rather than as the memorisation of facts (Weiten, 2000). Learning approaches, using contemporary ICT, provide many opportunities for constructivist learning as well as their learner-centred environments based on their context (Oliver, 2002).

Gray, Ryan & Coulan (2003) states that in recent years, it has been recognised that e-learning is not merely another medium for the transmission of knowledge, but that it changes the relationship between the teacher or trainer and learner. It requires new skills, competencies and attitudes amongst those planners, managers, teachers and trainers who are going to design and develop materials and support learners online. The constructivist approach focuses on the design environment, places emphasis on instructional sequence, and is often more challenging to practice in computer-based learning environments (Young, 2003).

Blazquez and Diaz (2006) are of the view that there is no doubt that ICTs are seen as central to education in the 21st century. Therefore, the design for ICT training should be based on the constructivist theory where knowledge is acquired through the active involvement of students, and where there is collaboration and negotiation of meaning (Blazquez & Diaz, 2006).

In this study, the researcher explored the constructivist framework for the use of ICT in secondary schools in the Motheo District.

2.7 CONCLUSION

This chapter attempted to answer the research questions. From this chapter, it is evident that teachers' attitudes towards the use of ICT, the use thereof to advance teaching and learning, barriers to the use of ICT in the classroom, as well as the role of the DoE in ICT implementation in schools play a major role. The successful integration of ICT into classrooms can lead to a number of benefits and can be influential in changing teaching and learning.

For teachers to integrate ICT, they not only need to have the resources but also a positive attitude towards the use thereof to advance teaching and learning. All barriers must be removed, and the DoE's role is essential to the implementation of ICT in the classroom. Chapter 3 describes the research methodology that was employed to explore the research questions.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter describes the research paradigm used in the study, and presents an in-depth discussion of the mixed-methods approach. It also presents an explanation of the research design, population, sampling, data collection and analysis, and ethical considerations employed in this study. In order to verify accuracy from a qualitative perspective, issues of trustworthiness in respect of dependability, credibility, and transferability are presented. Reliability and validity in terms of the quantitative perspective are also discussed.

3.2 RESEARCH PARADIGMS

A paradigm includes the accepted theories, traditions, approaches, models, frames of reference, and research methodologies used as a model or framework for observation and understanding (Cresswell, 2007:19; Babbie, 2010:3).

3.2.1 Pragmatism

The research philosophy that underpins this study is reflected in different principles as outlined by different research paradigms. The research paradigm selected for this study is pragmatism. To be able to realise the purpose of the study, the research was conducted according to the pragmatist paradigm. According to Cohen et al. (2011:19), the interpretive paradigm is one in which the “social world can only be understood from the standpoint of individuals who are part of the on-going action being investigated”. The aim of the research was to gain insight into teachers’ perceptions of ICT usage. Within this paradigm, the researcher examined the use of ICT through the eyes of the participants.

3.3 RESEARCH METHODOLOGY

According to Leedy and Omrod (2010:12), research methodology refers to the researcher's general approach in carrying out the research. Mouton (2001:56) views research methodology as focusing on the research process and the kind of tools and procedures to be used.

3.4 MIXED METHODOLOGY

This study makes use of a mixed-methods approach, which will be both qualitative and quantitative in nature, to explore and describe the use of ICT in the classroom. According to Plano-Clark and Ivankova (2015), mixed-methods research is a process in which researchers integrate quantitative and qualitative methods of data collection and analysis to best understand a research purpose. The way in which this process unfolds in a given study is shaped by mixed-methods research content considerations and the researcher's personal, interpersonal and social context (Plano-Clark & Ivankova, 2015). In mixed-methods research, quantitative and qualitative methods are combined in the context of one study (Cresswell, 2003).

While it is important to understand other terms used to describe the combined use of qualitative and quantitative methods, it is equally critical to determine what does not represent a mixed-methods study. Studies that simply combine multiple methods in terms of data collection or multi-informant studies need to be distinguished from mixed-methods designs. For example, the use of a questionnaire that contains rating scales, categorical answers, as well as open-ended questions, does not automatically constitute a mixed-methods study (Cresswell, 2003). Similarly, collecting information from different sources, such as a systematic literature review and key informant interviews, does not automatically indicate a mixed-methods approach. For the research to be considered as a true mixed-methods study, there must be genuine "integration of the data at one or more stages in the process of research" (Creswell et al. 2003: 212).

According to Creswell (2003:4), qualitative and quantitative approaches are often portrayed as polar opposites. Creswell (2008) states that mixed-methods research can be defined as a procedure for collecting, analysing and “mixing” both qualitative and quantitative data at some stage of the research process within a single study to understand a research problem more completely. In this approach, numeric information was used to answer the quantitative research questions.

De Vos (2002) is of the opinion that the researcher gains advantages of both methods by mixing qualitative and quantitative approaches. According to Maree (2010), a mixed-methods approach can be used to address different research problems. It can be helpful in terms of gaining an in-depth understanding of some trends and patterns, generating and testing theories, developing new measurement instruments, studying diverse perspectives or understanding the relationship between variables (De Vos, 2002). In any of these situations, collecting and analysing quantitative and qualitative data within one study will provide a more elaborate approach to the research problem and will produce a deeper understanding thereof (De Vos, 2002).

In this study, an exploratory mixed-methods approach was used in order to determine why teachers do not use ICT in their classrooms in the Motheo District. For this purpose, a semi-structured interview (qualitative method) and a questionnaire (quantitative method) were used to collect the data. The data were connected in the results. The qualitative section, in conjunction with the literature review, was used to develop a measurement instrument, namely a quantitative questionnaire. This was done in order to answer the research questions.

3.5 RESEARCH DESIGN

Bless and Higson-Smith (1995:46) define the term “research design” as “a plan of how to proceed in determining the nature of the relationship between variables”. According to Welman and Kruger (2001), the research design is the strategy or plan which is used to acquire participants or subjects, and how to collect data from them in order to arrive at a conclusion about the initial research questions

“Research design”, according to Welman, Kruger and Mitchell (2009:46), is best described as the overall plan, according to which the respondents of a proposed study are selected, as well as the means of data collection or generation, while Babbie and Mouton (2008:74) describe research design as a plan or blueprint for conducting the research. The research design also entails a detailed plan, according to which research is undertaken.

Polit and Hungler (1999:155) describe the research design as a blueprint, or outline, for conducting the study in such a way that maximum control will be exercised over factors that could interfere with the validity of the research results. The research design is the researcher’s overall plan for obtaining answers to the research questions guiding the study. Burns and Grove (2001:223) state that designing a study helps researchers to plan and implement the study in a way that will help them to obtain the intended results, thus increasing the chances of obtaining information that could be associated with the real situation.

This study followed a mixed-methods approach by employing a quantitative, descriptive survey design in the form of a questionnaire, and a qualitative design by means of structured interviews. The research design should be seen as a mixed-bag approach that implies choosing from different alternatives and options to ensure that the research purpose and perspective are clarified and achieved. The research problem will determine the methods and procedures: the types of measurement, sampling, and data collection and analysis to be employed in the proposed research (Zikmund, Rabin, Carr & Griffin, and 2010:66).

As far as the qualitative component of the study was concerned, the interview as a research instrument was selected to assist the researcher in gaining a clearer understanding and acquiring knowledge of the issues under investigation, and to provide information to clearly describe the phenomenon (Fouché, 2002).

The above-mentioned designs were selected to provide the researcher with a holistic view of real-life events experience by teachers.

3.5.1 Triangulation Design

3.5.1.1 Quantitative research method

Quantitative research has the following characteristics (Brink & Wood, 1998:305; Burns & Grove, 1997:27-30; 1999:192):

- There is a single reality that can be defined by careful measurement;
- It is usually concise;
- It describes and examines relationships, and determines causality among variables where possible;
- Statistical analysis is conducted to reduce and organise data, determine significant relationships, and identify differences and/or similarities within and between different categories of data;
- The sample should be representative of a large population;
- Reliability and validity of the instruments are crucial;
- Comprehensive data collected by employing different methods and/or instruments should result in a complete description of the variable or the population studied; and
- It provides an accurate account of characteristics of particular individuals, situations, or groups.

Monyatsi (2002:160) notes that in the quantitative approach, statistical data analysis can be used to show relationships, whereas the information-rich qualitative research approach provides explanatory data from the interview and observation schedules. McMillan and Schumacher (2001: 32) also point out that, apart from being the most commonly-used method in educational research, a descriptive survey is quantitative and is often preferred because it is objective in data collection, quantifies variables and describes phenomena using numbers to characterise them.

The quantitative approach generates numbers which are analysed statistically, making comparisons and correlations possible (Descombe, 2000:174). According

to Gay and Airasian (2000:25-26), the main aim of descriptive research in quantitative approaches is the exploration and clarification of phenomena where accurate information is lacking.

3.5.1.2 Qualitative research

People often describe qualitative research as research attempts to collect rich, descriptive data in respect of a particular phenomenon or context with the intention of developing an understanding of what is being observed or studied. It therefore focuses on how individuals and groups view and understand the world and construct meaning out of their experiences (Maree et al. 2013). The purpose of qualitative research is to shed light on a particular social phenomenon in its natural setting (Saunders et al., 2007: 109).

According to Holloway and Wheeler (1996), qualitative research studies people or systems by interacting with and observing the participants in their natural environment and focusing on their meanings and interpretations.

Tuchman (1994:366) points out that quantitative research mirrors variables as objectively as possible by representing them as numbers or quantities. He further states that qualitative research is based on the fundamental beliefs that:

- Events must be studied in their natural settings; and
- Events cannot be understood unless one understands how they are perceived and interpreted by the people participating in them.

Using only a quantitative or a qualitative approach to conduct research falls short of what is used in the social and human sciences today; hence, the need to use the mixed-mode research approach (Tashakkori & Teddlie, 2003:5).

According to Cresswell (2003:16), the concurrent strategy enables the researcher to investigate different issues at the same time. In this study, the researcher investigates why teachers do not use ICT in the classroom, and at the same time

investigates the relationship between the potential impact of ICT and how it can be used to enhance teaching and learning.

Cresswell (1994:175) states five advantages of combining research approaches in a single study, namely:

- It helps to integrate results;
- It is complimentary because overlapping and different facts of a phenomenon may emerge;
- It is developmental because the quantitative method is used sequentially to help inform the qualitative method;
- It helps contradictions and fresh perspectives to emerge; and
- Mixed methods add scope and breadth to a study.

According to Johnson and Onwuegbuzie (2004:14), the goal of mixed-methods research is not to replace either the quantitative or qualitative approaches to research, but rather to draw from the strengths of these approaches and to minimise possible weaknesses.

In this study, the research philosophy that underpins the study is reflected in different principles, as outlined by different research paradigms.

3.6 RESEARCH PARADIGMS

A paradigm includes the accepted theories, traditions, approaches, models, frames of reference, and research methodologies, and can be seen as a model or framework for observation and understanding (Creswell, 2007:19; Babbie, 2010:3).

3.7 POPULATION

A population refers to the total groups of subjects that meet a designated set of criteria (Polit & Hungler, 1999). Polit and Hungler (1999:278) distinguish between

“the target population and the accessible population”. The target population includes all cases about which the researcher wishes to make generalisations. The accessible population comprises all the cases that conform to the designated criteria and are accessible to the researcher as a pool of subjects for a study (Polit & Hungler, 1999).

The target population in this study was comprised of teachers in the Motheo District. The participants from ten high schools in Bloemfontein made up the target population. Therefore, the population for this research consisted of 30 teachers, i.e. three from each of the ten schools in Bloemfontein in the Motheo District.

3.7.1 Sampling

Polit et al. (2001) define a sample as “a proportion of a population”. Polit and Hungler (1999:43, 232) define a population as:

...the totality of all subjects that conform to a set of specifications, comprising the entire group of persons that is of interest to the researcher and to whom the research results can be generalised.

LoBiondo-Wood and Haber (1998:250) describe a sample as “a portion or a subset of the research population selected to participate in a study, representing the research population”. In this study, the sample was chosen from teachers in Bloemfontein in the Motheo District.

According to Creswell (2003c), quantitative data often involves random sampling so that each individual has an equal probability of being selected, and the sample can be generalised to the larger population. The researcher applied simple random sampling so that each member of the population stood a chance of becoming involved in the study. According to Cohen et al.(2007), in simple random sampling, each member of the population under study has an equal chance of being selected, and the probability of a member of the population being selected is unaffected by the selection of other members of the population. The method involves selecting at random from a list of the population the required number of

subjects for the sample (Cohen et al., 2007). According to Mouton (2001), if a suitable sampling design has been applied to the survey then one of the strengths should be that it will have the potential to generalise to large populations, and a high measurement of reliability and validity will be evident.

Purposive sampling was employed to enable the researcher to select a few participants according to specific criteria. Parahoo (1997:232) describes purposive sampling as “a method of sampling where the researcher deliberately chooses who to include in the study based on their ability to provide necessary data”. The rationale for choosing this approach was based on the fact that the researcher was seeking information about teachers who were either using or not using ICT in their classrooms. Thus, the participants would provide the relevant information by virtue of their experience. The researcher used purposive sampling in that individuals were selected due to their experience with regard to the central phenomenon.

3.7.1.1 Sample size

According to Lacobucci and Churchill (2005), sample size can either be fixed or sequential. In this study, the total number of participants was 30 teachers from ten secondary schools in Bloemfontein, i.e. three teachers were chosen from each school. The researcher worked in conjunction with the principals in choosing participants from each school, based on their level of experience as well as their qualifications. Monyatsi (2002:176) explains that a “population in research is a discrete group of units of analysis such as organisations or schools”. This is why ten schools as educational units were used to select the sample for the study rather than using all educational institutions. The target population for this study was ten secondary schools.

The participants used in this study included fourteen female teachers and sixteen male teachers, all of whom taught Grades 8 to 12.

Holloway and Wheeler (2002) assert that sample size does not influence the importance or quality of the study. They further note that there are no guidelines in determining sample size in qualitative research. When a researcher uses a

qualitative approach, he/she is usually unaware of the number of people who will participate in the research because the sample can change in size and type during the research. Sampling continues until saturation has been achieved (Holloway, 1997).

3.8 DATA COLLECTION STRATEGIES

According to Parahoo (1997:232), a research instrument is “a tool used to collect data”. Qualitative data was collected by means of interviews, using semi-structured questions, while quantitative data was collected by means of a questionnaire. Obtaining data from participants with different experience prevents information bias and thus increases credibility regarding the information.

3.8.1 Quantitative Data Collection Techniques

3.8.1.1 Questionnaire

The researcher collected data, using a questionnaire. The questionnaire is a well-established tool within social science research for acquiring information on participants' social behaviour or attitudes, as well as their beliefs and reasons for action with respect to the topic under investigation (Bulmer, 2004). According to Maree (2013), the advantages of a questionnaire are that:

- Respondents can complete the questionnaire at a convenient time; and
- Respondents can check personal records if necessary. There is no interviewer who may affect the respondent.

The questionnaire (see Appendix 2) was designed to be completed anonymously by the respondents. A covering letter addressed to the principals was written to accompany each questionnaire (see Appendix 4). The covering letter explained the purpose of the research, and contained important guidelines for the completion of the questionnaire. The questionnaire items were developed to elicit responses with regard to general information as well as in relation to the views and

experiences of teachers pertaining to the use of ICT in their classrooms. In this study, a five-point Likert scale was used to enable scores of either strongly agree(5); agree (4); not sure (3); disagree (2) and strongly disagree (1).A brief outline of the different sections of the questionnaire is presented below:

- Section A: (Demographic information from Questions 1-4): The questions in this section were included to obtain demographic information from the respondents in order to describe the study participants. These questions only had to be completed by the principal or his/her delegate (acting principal, deputy principal, etc.).
- Section B: The aim of the questions in this section was to collect information from respondents regarding the attitudes of teachers towards the ICT competencies required for ICT use in schools. Closed-end questions were grouped in different related categories, which correlate with the core competencies for the use of ICT.
- Section C (Barriers): Questions 1-16 focused on the barriers preventing the use of ICT. The questions in this section were included to obtain information about the barriers teachers face when using ICT in their classrooms.
- Section D: This section included questions about the use of ICTs to advance teaching and learning (1-10).
- Section E: The questions in this section focused on the role of the DoE (1-10) in connection with ICT.

The researcher used the Microsoft Excel program to design the questionnaire and analyse the data. The advantages of the questionnaire were that it allowed the researcher to explain the participants involved in this study.

Delport (2005) emphasises that one of the limitations of a questionnaire is the cost involved. The researcher had considered this and, as a result, decided to limit the study to the Bloemfontein region in the Motheo District in order to address these limitations.

3.8.2 Qualitative Data Collection Techniques

3.8.2.1 Interviews

The qualitative data was collected, using semi-structured interviews. According to Punch (2005), an interview is one of the most important ways in which to collect data. Face-to-face interviews were conducted in order to generate information on the views and opinions of teachers. A set of predetermined, open-ended questions was developed to guide the researcher during the interviews (see Appendix 3). The participants were guided and encouraged to share their experiences as well as their views on the use of ICT in the classroom. However, the questioning and responses from the participants maintained flexibility and consistency. The semi-structured interview technique of probing was used. The researcher used phrases such as “Could you elaborate more on that point?”

3.9 DATA ANALYSIS

Data analysis means to organise, provide structure and elicit meaning. The analysis of qualitative data is an active and interpretative process (Polit et al., 2001). Data analysis in mixed-methods research occurs within both quantitative and qualitative approaches (Creswell, 2003b). Quantitative data was collected by means of a questionnaire, which was coded and divided into different categories in order to assist with the final processing. The descriptive quantitative data analysis is described in depth in Chapter 4.

The researcher analysed the qualitative data (see Appendix 5) in order to become familiar with the information. The researcher analysed all the collected data and interview transcripts to form a clearer understanding of the information. The researcher coded the data, conducted a content analysis by looking for specific words for which themes were identified (Terre Blanche & Kelly, 2002). After all of the data had been coded with the assistance of an external coder, the researcher qualified the quantitative data by generating themes within it and comparing them with those of the qualitative data, and interpreting them (Creswell, 2003b).

3.9.1 Quality Criteria

In order to ensure quality, trustworthiness will address the qualitative aspect of the study. Reliability and validity will focus on the uses of reliability and validity.

3.9.1.1 Trustworthiness (reliability)

When applying mixed methods in research, the trustworthiness of the data should include the various topics discussed under qualitative approaches. The term “trustworthiness” refers to the way in which the researcher is able to persuade the audience that the findings in the study are worth paying attention to and that the research is of a high quality (Johnson & Turner, 2003). According to Holloway (1997), “trustworthiness is the truth value of a piece of research”. In this study, trustworthiness was ensured by the researcher by laying aside his preconceived ideas about the phenomenon under investigation and by returning to participants to ascertain whether the description was a true reflection of their experience.

3.9.1.2 Dependability

McCormick and James (1988) suggest that, in addressing dependability, the researcher needs to go back to the respondents to check whether the findings are dependable. According to Polit et al. (2001), this refers to the stability of data over time and under various conditions. Dependability can be linked to reliability in quantitative studies. To ensure that the study was dependable, the researcher ensured that it was logical, traceable, and clearly documented. The researcher provided a detailed account of the study process.

3.9.1.3 Credibility

Polit et al. (2001) postulate that credibility refers to the confidence of the data; it is similar to internal validity. Durrheim and Wassenaar (2002) refer to credibility as the assurance that the researcher's conclusions stem from the data. For this study to be credible, the researcher strove to produce findings that are believable and convincing. In order to ensure the credibility of the study, the researcher spent time in gathering the data as required. Field notes were kept during data collection and used for data analysis. Regular discussions were held with supervisors, and adjustments were made in accordance with their suggestions and recommendations. Holloway and Wheeler (2002) argue that researchers should reflect on their own actions, feelings and conflicts experienced while conducting the research. To achieve the credibility of the study, the researcher adopted a self-critical stance to study the participants, their roles, relationships and assumptions

3.9.1.4 Transferability

Holloway and Wheeler (2002) assert that transferability means that findings can be applicable to similar situations or participants. Transferability is similar to generalisation. Generalisability is regarded as the way in which the reader is able to take the findings and transfer them to other contexts. The researcher used descriptions of the participants and contexts by supplying a large amount of clear and detailed information about teachers not using ICT in the classroom and the setting in which they work and function, to ensure transferability (Creswell, 2003a). In this study, transferability was ensured by means of random sampling to generalise the results to the population as a whole. In this study, the teachers selected through random sampling represent all teachers in the Motheo District.

3.9.1.5 Reliability

Gay and Airasia (2000:114) note that "reliability is the degree of consistency that the instrument or procedure demonstrates". An instrument such as a questionnaire is said to be reliable to the extent that independent administrators thereof or a comparable instrument, consistently yield similar results (Saunders et al.

2007:367). The more reliable the instruments, the more consistent and dependable the results will be. While several procedures exist for establishing reliability such as test re-test and split-half methods, the split-half method is the most commonly-used one in educational research (McMillan & Schumacher, 2001: 230). The researcher had the final questionnaire assessed and analysed by his supervisors to ensure that it was adequate for measuring what it was supposed to measure and to ensure content validity.

3.9.1.6 Validity

Fraenkel and Wallen (2008:147) state that “validity refers to the appropriateness, meaningfulness, correctness and usefulness of the inferences a researcher makes”. Two types of validity exist, namely internal and external validity. Internal validity means that the results of the study are due to the effect of independent variables (McMillan & Schumacher, 2006:118). In this study, internal validity was ensured by a substantial theoretical framework, a standardised questionnaire, and the compilation of the correct statistical analysis. External validity refers to the extent to which the results of the research can confidently be generalised to the population from which the sample was selected (McMillan & Schumacher, 2006:118). External validity was optimised by the selection of schools according to the criteria that was available.

“The validity of an instrument refers to the extent to which it measures what it is supposed to measure” (Maree, 2013:216). According to this author, there are a number of different types of validity, namely:

- Face validity: This refers to the extent to which an instrument “looks valid” and whether it measures what it is supposed to measure;
- Content validity: The extent to which the instrument covers the complete content of the particular construct that it has set out to measure;
- Construct validity: This type of validity is needed for standardisation and has to do with how well the construct(s) covered by the instrument is/are measured; and

- Criterion validity: Validity is probably the ultimate test as to whether an instrument measures what it is supposed to measure. To determine the degree of criterion validity of an instrument, scores on an existing instrument which is known to measure the same construct should be available for the sample of subjects.

The researcher's supervisors scrutinised the questionnaire to ensure a high degree of face validity.

3.10 ETHICAL CONSIDERATIONS

According to the Helsinki Declaration of 1972, it is imperative to obtain clearance from an ethics committee when human subjects are involved in any kind of research.

According to Strydom (2002a), anyone involved in research needs to be aware of the general agreements about what is proper and improper in scientific research. This author states that a researcher must follow and abide by the ethical guidelines (Strydom, 2002). In order to ensure ethical conduct in this study, the researcher adhered to the following principles: informed consent and voluntary participation, protection from harm, privacy, confidentiality and anonymity.

3.10.1 Informed Consent

Teachers were approached at schools to participate in the research. The researcher briefly explained the purpose of the research to the participants. He also obtained verbal and written consent (see Appendix 6) from the participants before distributing the questionnaire and conducting the interviews. During the interview, the researcher presented the participants with a letter of consent in which the research process was described. He requested the participants to read the letter, ask questions to gain clarity, and sign the consent form to be involved in the research. The researcher reminded the participants that they could withdraw

at any time during the process if they so wished, and informed them that their participation was voluntary.

3.10.2 Protection from Harm

In this research, physical harm was not to be considered. The researcher was sensitive to the participants' emotions when asking probing questions that could cause them psychological harm. The researcher informed the participants that if they felt that some parts of the interview were too much for them, they were free to withdraw from the study or choose not to answer the questions. The researcher assured the participants that the information they provided would not be used against them. The participants had the right to full disclosure. According to Polit et al. (2001), full disclosure means that the researcher has fully explained the nature of the study, and the person's right to refuse participation.

3.10.3 Privacy, Confidentiality and Anonymity

According to Burns (2000), both the researcher and the participants must have a clear understanding regarding the confidentiality of the results and findings of the study. The research was conducted in the participants' natural settings, and there was no invasion of privacy with regard to the information provided. Anonymity was therefore upheld. The participants were assured of confidentiality verbally and in the written consent form (see Appendix 6). The list of names, transcriptions and notes were kept in a safe place, and pseudonyms were used in the transcriptions or notes.

3.11 CONCLUSION

This chapter elaborated on the research methodology and design, as well as the procedures used in this study. It also explained how the researcher addressed issues of validity, reliability and ethics. The next chapter (Chapter 4) will focus on the data analysis, and will present an in-depth discussion of the results or findings of this study.

CHAPTER 4

ANALYSIS AND FINDINGS

4.1 INTRODUCTION

This chapter describes the analysis of data and discusses the research findings. The findings relate to the research questions that guided the study. The qualitative and quantitative data were analysed to identify, describe and explore the use of ICT in school classrooms. Data was obtained by means of questionnaires and interviews completed by 30 secondary school teachers in Bloemfontein in the Motheo District. A total of 30 questionnaires were received, i.e. all of the participants completed and returned the questionnaire to the researcher, and all 30 were used in this study.

The questionnaire was comprised of five sections as follows:

- The first section was designed to elicit demographic data such as gender, age, educational level and level of ICT training;
- The second section was designed to elicit data describing the attitudes of teachers towards the use of ICT;
- The third section focused on the barriers preventing teachers from using ICT in their classrooms;
- The fourth section focused on the use of ICT in the classroom for the advancement of learning; and
- The fifth section concentrated on the role played by the Department of Education in the development of ICT skills needed by teachers.

The data obtained by means of the questionnaires was analysed by a statistician. The findings are discussed according to the various sections of the questionnaire.

4.2 PRESENTATION OF THE DATA OBTAINED BY MEANS OF THE QUESTIONNAIRES

4.2.1 Demographic Data

The demographic data described the demographics of the participants. Most of the respondents omitted the open-ended question in this section of the questionnaire. Table 4.1 shows the demographic data of the participants according to gender, age, educational qualification and ICT training.

Table 4.1: Demographic data of the participants

Item		Frequency	Percentage
Gender	Male	16	53%
	Female	14	47%
Age	Below 30	6	20%
	31-40	6	20%
	41-50	12	40%
	51-60	6	20%
Educational level: Qualification	Diploma	3	10%
	Bachelor's degree	26	86.7%
	Master's degree	1	3.3%
ICT training	No training	2	6.7%
	Informal training	20	66.7%
	Formal training with certificate	8	26.6%

Participants were asked to indicate their gender, i.e. male or female. All 30 participants (100%) responded to this question. Sixteen of the participants (53.3%) were male, and fourteen (46.7%) were female. In terms of age, the results show that more (40%) were between the ages of 41 and 50. The rest of the teachers (20%) happened to be either below the age of 30, or between the ages of 31 and 40, and 51 and 60. As far as their level of education was concerned, the results revealed that most of the participants had a bachelor's degree, followed by those who had a diploma (10%) and one (3.3%) who had a master's degree. With regard to ICT training, twenty of the participants (66.7%) revealed that they had received

informal training, while eight (26.6%) had obtained formal training with a certificate, and two (6.7%) indicated that they had not attended ICT training.

4.2.1.1 Findings from the demographic data

From the data, it emerged that 40% of the respondents were between the ages of 41 and 50, and that 87.7% of the respondents had a bachelor's degree and only 3.3% had a master's degree. It was concluded that most of the respondents were university graduates who could appreciate the use of ICT in the classroom because of their high level of education. However, the data also indicated that high levels of the respondents (66.7%) had received formal training in ICT, which could have an impact on the use of ICT in the classroom.

4.2.2 Teachers' Attitudes towards the Use of ICT in the Classroom

The participants were asked to respond to the questions pertaining to teachers' attitudes towards the use of ICT in the classroom, the results of which (in percentages) appear in Table 4.2.

Table 4.2: Teachers' attitudes towards the use of ICT in the classroom

	ITEM	Strongly Agree	Agree	Not sure	Dis-agree	Strongly Disagree
1	It is very important for me to work with a computer.	60%	33.3%	0%	6.6%	0%
2	I use a computer because I am very interested.	36.6%	60%	0%	3.3%	0%
3	I feel comfortable using ICT as a teaching tool.	46.6%	43.3%	3.3%	6.6%	53.3%
4	The use of computers stresses me out.	3.3%	0%	0%	46.6%	13%
5	If something goes wrong, I will not know how to fix it.	3.3%	33.3%	16.6%	33.3%	0%
6	The use of ICT in teaching and learning excites me.	43.3%	46.6%	6.6%	3.3%	0%
7	The use of ICT in teaching and learning impacts positively on learners' motivation and achievement.	43.3%	46.6%	10%	0%	0%
8	The computer is a valuable tool for teachers.	56.6%	40%	3.3%	0%	0%
9	The computer will change the way in which students learn in my classes.	46.6%	30%	23.3%	0%	3.3
10	The use of ICT is not conducive to student learning because it is not easy to use.	6.6%	0%	10%	73.3%	20%
11	For ICT to be fully exploited for teaching and learning, radical changes in schools are needed.	33.3%	40%	6.6%	20%	3.3%
12	I believe that the use of computers and other electronic devices will take over my profession.	10%	3.3%	6.6%	60%	0%
13	For ICT to be fully exploited for teaching and learning, teachers must change their attitudes.	43.3%	30%	6.6%	16.6%	3.3%
14	Teachers should receive extensive training on the use of ICT.	40%	50%	6.6%	6.6%	3.3%
15	The abusive use of computers and ICT tools has negatively affected my attitude towards ICT as tools for teaching and learning.	13%	10%	20%	43.3%	13.3%

. 5= Strongly Agree, 4=Agree, 3= Not Sure, 2= Disagree, 1= Strongly Disagree

The results in Table 4.2 indicate that the teachers had positive attitudes towards the use of ICT in the classroom. This confirms that teachers are ready to use ICT in their teaching practice. The results revealed that the participants had more positive attitudes towards ICT.

The results show that 60% of the participants strongly agreed while 33.3% agreed that it was important to work with a computer. 56.6% of the participants believed that computers were a valuable tool for teachers. Approximately 43.3% of the respondents strongly agreed and 46.6% agreed that the use of ICT in teaching and learning excited them. The results revealed that 43.3% of the participants strongly agreed and 46.6% agreed that ICT was an effective educational tool and could impact positively on learners' motivation and achievement.

About 46.6% of the respondents believed that computers would change the way in which students learned in their classes. The results indicated that 73.3% of the respondents disagreed that the use of ICT was not conducive to student learning because it was not easy to use, whereas 33.3% strongly agreed and 40% agreed that for ICT to be fully exploited for teaching and learning, radical changes in schools were needed. 60% of the participants disagreed with the perception that computers and other devices would take over the teaching profession. Most of the participants (88.9%) strongly agreed that the use of ICT in teaching and learning excited them. Slightly less than three out of four (73.3) indicated that they either strongly agreed or agreed that for ICT to be fully exploited for teaching and learning, teachers needed to change their attitudes. The teachers demonstrated that they agreed that they should receive extensive training on the use of ICT. In this regard, Table 4.2 shows that 90% more than half (56.6%) disagreed and strongly disagreed that the abusive use of computers and ICT tools had negatively affected their attitudes towards ICT as tools for teaching and learning. In the study conducted by Yusuf, Ajidagba, Yusuf, Amali, Bello & Oniye (2015), the analysis of the results revealed that basic school teachers seem to have a positive attitude. This study is in line with that of Yusuf (2011) who noted a generally positive attitude by respondents. This positive attitude indicated their willingness for the integration of ICT in the curriculum.

4.2.3 Barriers Preventing Teachers from Using ICT in the Classroom

Table 4.3: Barriers preventing teachers from using ICT in the classroom

	ITEM	Strongly Agree	Agree	Not sure	Dis-agree	Strongly Disagree
1	ICT tools are changing too fast.	13.3%	33.3%	16.6%	36.6%	0
2	I spend too much time integrating ICT into my lessons.	0	3.3%	13.3%	80%	3.3%
3	I had no time to attend quality training programmes.	0	10%	26.6%	63.3%	0
4	There are no long-term staff development programmes to support the integration of technology into instruction.	16.6%	50%	13.3%	20%	0
5	Some of my peers have failed to integrate ICT tools into their teaching.	10%	56.6%	13.3%	13.3%	6.6%
6	There is no technical support available at my school.	16.6%	26.6%	0	53.3%	3.3%
7	The software available at my school is difficult to learn and use.	3.3%	16.6%	10%	63.3%	6.6%
8	There are no training programmes (seminars and workshops) available to encourage ICT supported teaching.	10%	26.6%	10%	50%	3.3%
9	It is difficult to change from my current teaching practice to integrate ICT into my teaching.	0	16.6%	10%	60%	10%
10	There is a lack of pedagogical models on how to use ICT for learning.	3.3%	46.6%	23.3%	26.6%	0
11	Pressure to prepare learners for tests and exams influences the use of ICT.	10%	30%	30%	30%	0
12	Most teachers are not in favour of the use of ICT in their classrooms.	3.3%	53.3%	33.3%	10%	0
13	Using ICT in teaching and learning is not a goal of our school.	6.6%	43.3%	13.3%	30%	6.6%
14	The cost of ICT tools is too high.	30%	43.3%	6.6%	20%	0

5= Strongly Agree, 4=Agree, 3= Not Sure, 2= Disagree, 1= Strongly Disagree

Table 4.3 shows the results of the barriers that prevent teachers from using ICT in the classroom. The findings revealed that 36.6% of the teachers disagreed that ICT tools are changing too fast, while 13.3% strongly agreed and 33.3% agreed. As shown in Table 4.3, fifty (50%) of the participants felt that there was no staff development to integrate technology into instruction in the classroom. The results showed that 66.6% agreed or strongly disagreed that their peers integrated ICT into their teaching. From the results, it appears that there is a relationship between some of the barriers such as lack of pedagogical models (49.9% agreed or disagreed) and the fact that 56.6% of the participants felt that teachers were not in favour of the use of ICT because the cost thereof was too high (73.3%), while 49.9% agreed or strongly agreed that ICT was not a goal of their schools.

4.2.4 ICT in the Classroom

To answer the question on how ICT can be used for the advancement of learning, the results in Table 4.4 indicated that the use of ICT was very high.

Table 4.4: The use of ICT in the classroom for the advancement of learning

	ITEM	Strongly Agree	Agree	Not sure	Dis-agree	Strongly Disagree
1	ICT encourages pupils to work collaboratively.	6.6%	70%	13.3%	10%	0
2	ICT helps learners to acquire new knowledge effectively.	23.3%	66.6%	10%	0	0
3	ICT cuts down on preparation time and teachers' administration burden.	13.3%	43.3%	13.3%	23.3%	6.6%
4	ICT helps me to communicate with my learners and colleagues.	10%	66.6%	3.3%	16.6%	0
5	ICT helps me to organise my work.	23.3%	63.3%	6.6%	6.6%	0
6	ICT is a fast means of acquiring information.	23.3%	73.3%	3.3%	0	0
7	ICT engages learners' attention and can motivate them to explore new knowledge.	30%	66.6%	3.3%	0	0
8	ICT improves the class climate.	26.6%	63.3%	10%	0	0
9	Learners try harder in what they are learning.	10%	43.3%	40%	6.6%	0
10	Learners understand more easily what they have learnt.	13.3%	66.6%	20%	0	0

5= Strongly Agree, 4=Agree, 3= Not Sure, 2= Disagree, 1= Strongly Disagree

The results for all questions ranged from 56.6% to 96.6% (agree or strongly agree). The results are presented in ascending order, and show that agree and strongly agree constitute the highest percentage (96.6%) for the items "ICT is a fast means of acquiring information and engaging learners' attention, and can motivate learners to explore". The results show that 76.6% of the participants were of the

opinion that ICT encourages pupils to work collaboratively. About 89.9% of the participants indicated that ICT helped learners to acquire new knowledge effectively, and that ICT improved the class climate. The results revealed that 86.6% of the teachers felt that ICT helped to recognise work. More than three quarters (79.9%) felt that learners understood more easily what they had learnt. More than three quarters (76.6%) of the participants indicated that ICT encouraged learners to work collaboratively, and that it helped the teachers to communicate with their learners and colleagues. 56.6% of the participants indicated that ICT cut down on preparation time and teachers' administrative burden. Finally, the results showed that 53.3% revealed that learners understood more easily what they had learnt.

4.2.5 The Role of the Department of Education in the Development of Teachers' ICT Skills

Table 4.5: The role of the DoE in the development of teachers' ICT skills

	ITEM	Strongly Agree	Agree	Not sure	Dis-agree	Strongly Disagree
1	The DoE must provide the infrastructure to enhance ICT use in schools.	46.6%	43.3%	3.3%	6.6%	0
2	The DoE should engage police in the security of schools with ICT tools.	33.3%	43.3%	16.6%	6.6%	0
3	The DoE should develop ICT software in various subject areas for use in schools.	43.3%	43.3%	6.6%	3.3%	3.3%
4	The DoE should sponsor and provide free compulsory training on ICT-assisted instruction for teachers.	46.6%	46.6%	0	6.6%	0
5	ICT-literate teachers should be instructed to collaborate and mentor non-ICT-literate teachers.	30%	60%	3.3%	6.6%	0
6	The DoE should design and introduce free ICT training kits for teachers.	33.3%	60%	0	6.6%	0
7	The DoE must review plans and policies on ICT in schools.	36.6%	63.3%	0	0	0
8	The DoE should generate funds to buy ICT tools for teachers to use.	40%	56.6%	3.3%	0	0
9	The DoE should partner with private companies to help teachers to develop their ICT skills.	43.3%	50%	6.6%	0	0
10	Teacher educational institutions should design and offer courses for all teachers on ICT-assisted instruction.	43.3%	56.6%	0	0	0

5= Strongly Agree, 4=Agree, 3= Not Sure, 2= Disagree, 1= Strongly Disagree.

The results in Table 4.5 show that the DoE plays a pivotal role with regard to ICT in schools. 85.9% of the participants agreed or strongly agreed that the DoE should provide the necessary infrastructure to enhance the use of ICT in schools. About 79.9% strongly agreed or agreed that the DoE should engage police in the security of schools with ICT. The results showed that 86.6% of the participants agreed or strongly agreed that the DoE should develop ICT software in various subject areas for use in schools. Approximately 93.2% of the participants felt that the DoE should sponsor and provide free compulsory training on ICT-assisted instruction for teachers. 90% of the participants agreed or strongly agreed that ICT-literate teachers should be instructed to collaborate and mentor non-ICT-literate teachers. 100% of the participants agreed or strongly agreed that the DoE should review plans and policies on ICT in schools. The results revealed that 96.6% felt that the DoE should generate funds and buy ICT tools for teachers to use. The results showed that 93.3% of the participants felt that the DoE should partner with private companies to help teachers to develop their ICT skills. Table 4.5 also shows that 100% of the participants felt that teacher education institutions should design and offer courses for all teachers on ICT-assisted instruction.

4.3 QUALITATIVE FINDINGS

Participants

In this study, 25 teachers from ten schools were interviewed. All of the participants were teaching at secondary schools in Bloemfontein in the Motheo District. Eight of the 25 participants who were interviewed revealed that they had received formal training on ICT, and offered Communication and Information Technology as a subject at their respective schools.

The semi-structured interviews consisted of eight questions. The findings of this study are presented according to the eight questions.

4.3.1 Necessity for Teachers to be ICT Literate

In Question 1, participants were requested to provide information about their need to be ICT literate. Table 4.6 shows the code, descriptions and frequencies regarding this question. The findings revealed that a large number of participants felt that teachers should use ICT to teach, and that ICT is an important tool for the administrative duties of teachers.

It is evident from the findings that participants believed that it was necessary for teachers to be ICT literate despite most of them lacking the basic ICT skills. They could perform basic operations on a computer but could not integrate ICT into their lessons. Participant T.2 attested to this in the interviews:

Yes in today's modern society, learners know a lot about knowledge and communication. Learners in the school where I teach are very active on social media; if learners would be more interested in the lessons, learners will become active participants in the predictions of knowledge rather than passive listener's in the classroom. Teachers will have to have the necessary skills and knowledge to have an active classroom. I therefore think that it is a must for teachers to be ICT literate.

T.2 also indicated that:

The resources are kept away from teachers; I think management purposefully kept away from ICT teacher. Some teachers have access to these resources, whilst other teachers are excluded. Teachers have to get hold of resources at an expense. This creates a negative culture and de-motivates teachers who are ICT literate to try and develop new skills.

Participant T.3 revealed that:

There are no funds to promote ICT effectively by training teachers. Participant T.18 said that: The Internet itself is technically an ocean of knowledge. Teachers should have the skill to understand how it works to help find useful information for the learners. How to work with computers, etc. How to use or integrate mobile devices in your lessons.

According to the findings, teachers could use ICT to enhance teaching and learning, enabling planning and preparation for teaching to be more efficient. In some of the schools, ICT was available in the form of computers but it was not connected to the Internet. As a result, the teachers were unable to access the computers which made it difficult for them to keep up with new knowledge via the Internet.

Table 4.6: Codes, descriptions and frequencies regarding teachers' need to be ICT literate

QUESTION 1	Code	Description of code	Frequency
	NET	Internet as teaching tool	4
	PART	Participating in learning	2
	RES	Research	3
	MOT	Capturing attention by means of a visual or motivational aid	1
	ADMIN	Administrative activities	6
	TEACH	ICT use to teach	10
	POS	ICT use has a positive impact on grasping capacity	1
	QUIK	Quickness or efficiency	1
	FAC	Facilities or technology associated with ICT	1

4.3.2 ICT Requirements for Secondary School Teachers

In Question 2, participants were asked to respond to the question “What do you think are the most important ICT skills for secondary school teachers?” Table 4.7 shows the ICT skills for secondary school teachers. The findings for this question are very closely linked to Question 1 which focused on the necessity of ICT, whereas Question 2 focused on the skills needed to be able to use ICT in the classroom. It is evident that a significant focus has been placed on the variety of approaches that can be used in teaching and learning through the use of ICT. The findings show that teachers use a significant variety of ICT tools as methods for teaching, including the use of facilities or technology and presentation software such as Excel.

The findings show from (4-3) is moderate. These referred to the Internet as a teaching and research tool. The participants felt that requirements such as participation in learning, projector technology, capturing attention by means of a visual or motivational aid, and raising standards or educational outcomes were regarded as less important.

T25 indicated that:

Yes, learners are more motivated in computers and Internet is being used in the classroom ICT tools are very helpful, it helps them to do assignments, ICT also enable students with special needs or difficulties to also assume responsibilities when they use ICT to organise their work through digital portfolios or projects.

T18 mentioned that:

The Internet is technically an ocean of knowledge. Teachers should have the skill to understand how it works so that they could help learners find useful information. How to work with computers, etc. How to use or integrate mobile devices in your lessons.

Table 4.7: Codes, descriptions and frequencies of ICT skills for secondary school teachers

QUESTION 2	Code	Description of code	Frequency
	NET	Internet as teaching tool	4
	PART	Participating in learning	1
	RES	Research	3
	POS	ICT use has a positive impact on grasping capacity	2
	TEACH	ICT use to teach	5
	ADMIN	Administrative activities	2
	VAR	Variety of approaches in teaching and learning	7
	PROJ	Projector technology	1
	FAC	Facilities or technology associated with ICT	6
	XLS	Spreadsheet software	5
	MOT	Capturing attention by means of a visual or motivational aid	1
	STAND	Raising standards or educational outcomes	1

4.3.3 Relationship between ICT and Learner Performance

Table 4.8: Codes, descriptions and frequencies of the relationship between ICT and learner performance

Code	Description of code	Frequency
NET	Internet as teaching tool	0
RES	Research	2
ADM	Administrative activities	0
TEACH	ICT use to teach	3
STAND	Raising standards or educational outcomes	10
POS	ICT use has a positive impact on grasping capacity	7
SUBS	ICT is not acting as a substitute for good quality education	1
VAR	Variety approaches in teaching and learning	3
MOT	Capturing attention by means of a visual or motivational aid	2

In Question 9, to which participants were asked to respond (see Table 4.8), categories emerged. The categories included the Internet as a teaching tool, research, administrative activities, the use of ICT to teach, raising the standards or educational outcomes, the positive impact of the use of ICT on grasping capacity, ICT not acting as a substitute for good quality education, a variety of approaches in teaching and learning, and the capturing of attention by means of a visual or motivational aid.

From the above data, it emerged that ICT can raise the standards of education with a frequency of ten. Secondly, it was found that the use of ICT has a positive impact on grasping capacity. The results of the interviews show that teachers can find more opportunities to use ICT in such a manner that it has a positive impact on grasping capacity. It is evident from the interviews that teachers can use ICT in a variety of ways, and that it can be used as an effective teaching tool.

Participant T25 mentioned that:

Learners are more motivated when computers and Internet are being used in the classroom and ICT tools are very helpful, they help them to do assignment. ICT also enables students with special needs or difficulties to assume responsibilities when they use ICT to organise their work through digital portfolios or projects.

Participant T.16 observed that:

Yes, they will have the opportunity to interact with other learners. They can get a broader perspective of content done. Learners will be exposed to other ways of doing things. ICT has an inclusive approach for learners that need more than one stimulation.

Participant T.15 commented that:

If ICT tools are being used correctly, meaning they don't replace the teacher but enhance the lessons that help learners with a better understanding of the content, learner performance might improve.

4.3.4 ICT Development among Teachers

Table 4.9: Codes, descriptions and frequencies regarding DoE ICT literacy development among secondary school teachers

QUESTION	Code	Description of code	Frequency
	TRAIN	Providing of training and development	12
	PART	Participating in learning	2
	EQUIP	Lack of equipment and resources	8
	TEACH	ICT use to teach	1

The findings in Table 4.9 reveal that the perception of teachers is that the DoE must play a major role in the development and training of teachers in order to become ICT literate. Four categories emerged from the data, including the provision of training, participation in learning, a lack of equipment and resources, and the use of ICT to teach. These are critical factors and it is clear that there needs to be an intervention by the DoE to equip secondary school teachers with

the necessary ICT tools for effective use in the classroom. For example, Participant T2 mentioned that:

In my opinion, short courses are a must. The department only has one-day seminars for specific subjects. The department should give bursaries to enrol teachers who are not ICT literate to develop these skills at computer colleges. The department donates laptops and tablets and other sources to schools. However, they do not check if these resources are used by teachers. There should be people to check if teachers have access to the resources. I think the Department of Education does attempt to encourage ICT literacy as implemented by legislation and they lack proper execution in this process.

Similarly, Participant T17 indicated that:

Yes, I think training and development occur frequently but if teachers do not have the resources to use it every day, they will not use their knowledge and they want to feel confident in using ICT.

Participant T18 commented:

There are still a lot of schools that are not using technology and most of the teachers don't even know how to use a computer. They should offer more ICT literacy courses to enhance teachers' ICT skills.

4.3.5 The Challenges Faced by Teachers Regarding the Use of ICT in the Classroom

Table 4.10: Codes, descriptions and frequencies of the challenges faced by teachers with regard to the use of ICT in the classroom

QUESTION 6	Code	Description of code	Frequency
	NET	Internet as teaching tool	1
	PART	Participating in learning	1
	APP	Application or real life situation	1
	ADM	Administrative activities	1
	TEACH	ICT use to teach	3
	SEC	Security measures	1
	EQUIP	Lack of equipment and resources	10
QUESTION 6	Code	Description of code	Frequency
	ATT	Attitude of role-players towards ICT	10
	TRAIN	Provision of training and development	6

Question 5 asked the participants about the challenges faced by teachers in their schools who did not use ICT in their classrooms. Nine categories emerged from the responses to this question (see Table 4.10), including the Internet as a teaching tool, participating in learning, application or real-life situation, administrative activities, the use of ICT to teach, security measures, a lack of equipment and resources, and the attitudes of role players towards ICT and the provision of training and development. The findings identified a lack of equipment, and the attitudes of role players towards ICT as being the most-rated categories. These were followed by the provision of training and development. The administrative activities were rated third. The remaining categories had one frequency. Regarding the lack of equipment, Participant T3 mentioned that there had been no funds available to effectively promote ICT training. Participant T2 also indicated that teachers had to obtain access to ICT at their own expense. With regard to the attitudes of role players, Participant T18 revealed that some teachers had been resistant to innovation. Regarding the training and development of teachers, Participant T1 claimed that technology was taking over and that if they did not stay up to date, they would lose out.

4.3.6 Other Challenges Hindering the Integration of ICT

Table 4.11: Codes, descriptions and frequencies of other ICT-related challenges

Code	Description of code	
NET	Internet as teaching tool	1
PART	Participating in learning	0
ATT	Attitudes of role-players towards ICT	2
SEC	Security measures	3
COST	The cost and maintenance of ICT are too high	5
EQUIP	Lack of equipment and resources	6
TRAIN	Provision of training and development	5

In Question 6, the participants were asked about other challenges that hindered the integration of ICT. Table 4.11 shows the codes, descriptions and frequencies related to this question. Seven categories emerged, including the Internet as a teaching tool, participating in learning, attitudes of role-players towards ICT,

security measures, the cost and maintenance of ICT, a lack of equipment and resources, and the provision of training and development. The response pertaining to the lack of equipment and resources had a frequency of six. Participant T11 indicated that there had been no support from the school and that the DoE and teachers should buy their own programmes and software. Participant T9 mentioned that all classes should be equipped with ICT tools. Concerning the cost, Participant T2 indicated that teachers should obtain access to ICT at their own expense. Regarding training and development, Participant T3 felt that ICT was not available everywhere. In terms of the security measures, Participant T4 indicated that there was a need for security to prevent theft from taking place. With regard to the attitudes of role players, Participant T14 mentioned that the mind-set of the DoE regarding ICT skills and management needed to change. The remaining categories had no frequencies.

4.3.7 ICT Development Strategies

Table 4.12: Codes, descriptions and frequencies pertaining to the opinions of secondary school teachers regarding an ICT literacy strategy

Code	Description of code	Frequency
TRAIN	Provision of training and development	16
TEAM	Team- or group work	1
EQUIP	Lack of equipment and resources	7

In Question 7, the participants were asked about an ICT literacy strategy for secondary school teachers. Three categories emerged, including the provision of training and development, team- or group work, and a lack of equipment. The first category had a frequency of sixteen. Participant T20 identified the need for a boot camp for teachers, i.e. training sessions for teachers away from the school. Participant T15 said, “Make it compulsory for teachers to participate in ICT training, not just computer literacy”. Participant T12 mentioned that they could work with the CUT and the UFS to provide training on a monthly basis over a period of one year.

Regarding the category on lack of equipment and resources, which had a frequency of seven, Participant T23 indicated that they had already offered CAT as a subject and that perhaps they should start there? In terms of team- or group work, Participant T8 said that networking had made their lives much easier.

4.3.8 Teachers' Perceptions Regarding the Use of ICT in the Classroom

Table 4.13: Codes, descriptions and frequencies regarding teachers' perceptions pertaining to the use of ICT in the classroom

Code	Description of code	Frequency
NET	Internet as teaching tool	0
PART	Participating in learning	1
RES	Research	1
MOT	Capturing attention by means of visual or motivational aid	6
ADM	Administrative activities	5
TEACH	ICT use to teach	7
APP	Application or real-life examples	2
STAND	Raising standards or educational outcomes	12

The responses to Question 8 are shown in Table 4.13. Eight categories emerged from this question, including the Internet as a teaching tool, participating in learning, research, capturing attention by means of a visual or motivational aid, administrative activities, the use of ICT to teach, application or real-life examples, and raising standards or educational outcomes. The first category had a frequency of twelve. Standards and educational outcomes was a common response because some of the respondents viewed ICT as a valid method for improving standards and outcomes for teaching and learning. ICT can be used as an educational tool to enhance teaching opportunities so that learners can see visual examples of the work being covered and, in doing so, enhance learning.

The findings indicate that most teachers were of the opinion that the development of ICT literacy can be enhanced through regular, compulsory short courses. Teachers also indicated that the DoE should sponsor teachers to go on training courses, and that teachers should make use of peer coaching within schools.

Most of the teachers who had been interviewed believed that using ICT was important, while others indicated that it had many advantages such as helping to facilitate teaching and learning, and increasing the learners' participation.

Participant T14 said:

We are living in the 20th century and ICT is here to stay; we need to up skill all teachers and introduce ICT at all schools. The sooner we start the better for all. ICT will enhance teaching and learning at school. All role players need to become involved: Education Department, government, teachers, schools, parents and businesses.

Participant T16 mentioned:

The use of ICT enhances teaching in different ways.

- Learners can be approached by using different kinds of stimulation: visual, auditory, etc. learners' ability is tested and broadened.
- All using ICT correctly. I am able to assist learners more individually.

Participant T7 also commented that they were:

Positive and motivated; we just lack the time to convert text syllabus into multimedia instruction.

4.4 CONCLUSION

In this chapter, the qualitative and quantitative data was analysed and interpreted, and a conclusion was drawn. A statistical analysis was conducted in accordance with the sequence of questions in the questionnaire and those in the interviews.

The next chapter provides the conclusion and makes recommendations based on the research findings that were discussed, and addresses the limitations of the study.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 INTRODUCTION

In this chapter, the researcher discusses the significance, recommendations, and limitations of the study.

The availability of ICT in schools does not necessarily mean that teachers make use of or implement ICT technology in the classroom (Ntemana & Olatokun, 2012:182).

To explore the integration of ICT in the classroom, the researcher examined various research questions:

- What are teachers' attitudes towards the use of ICT in the classroom?
- How do teachers use ICTs for the advancement of teaching and learning?
- What are the barriers that prevent teachers from using ICT in the classroom?
- What role does the DoE play in the development of ICT skills needed by teachers?

To answer these questions, a comprehensive literature review was conducted in Chapter 2, which focused on the use of ICT in the classroom.

Chapter 3 focused on the research methodology. Data were collected from 30 teachers in Bloemfontein in the Motheo District. Data were gathered by means of questionnaires and interviews with participants.

Chapter 4 focused on the results of the study by discussing and interpreting the findings pertaining to the data.

5.2 DISCUSSION

5.2.1 What are the Attitudes of Teachers towards the Use of ICT in the Classroom?

It may be argued that the teachers who participated in this study reflected a generally positive attitude towards the use of ICT in the classroom. In spite of the teachers' lack of training (40%) on the use of ICT, they were positive about the potential impact of its use (40%) as well as its advantages. This indicates that the use of ICT in the classroom could change the way in which teachers teach, as well as the impact thereof on learning. This is evident in the study by Govender et al. (2005) in the KwaZulu-Natal Province whose teachers have positive attitudes towards ICT. According to these authors, participants seem to have totally accepted the rationale for introducing ICT into schools, and are able to base their judgements on understandable reasons. The majority (90%) of the participants considered computers to be a viable tool that has the potential to bring about different improvements with regard to their schools and classrooms.

It is evident from this study that teachers believe that ICT is conducive to student learning. The data indicates that the abusive use of computers as well as that of ICT tools, do not affect teachers' attitudes towards the use thereof. Teachers must change their attitudes to fully exploit ICT for teaching and learning. The participants believed that integrating ICT tools into teaching and learning has the potential to impact positively on learners and motivate them to achieve.

It was found that participants identified challenges with regard to the integration of ICT. They felt comfortable using ICT, but were of the opinion that if something were to go wrong, they would not know how to fix it.

As far as the interviews were concerned, the following questions were grouped together to examine the attitudes of teachers with regard to the use of ICT in the classroom:

- Do you feel that it is necessary for teachers to be ICT literate?
- What are the personal views of teachers regarding the use of ICT in the classroom?

The interviews yielded some interesting facts. In this case, it may be argued that the teachers were very positive about the use of ICT and the Internet in the classroom. It may be observed from the findings that teachers recognised and appreciated the usefulness of ICT in teaching and learning. The data showed that teachers revealed other benefits of ICT such as using it to ease their administrative burden.

It may be argued that the teachers were also positive about the fact that ICT could be used to raise the standard of education. ICT could also be used in teaching to increase the level of the learners' attention. The findings concur with those of Teo (2008) who argues that teachers showed a more positive attitude towards computers and intention to use computer than their perceptions of the usefulness of the computer and their control of the computer. A study done by Hart and Laher (2015) confirms that teachers had a positive attitude towards the use of ICT. According to these authors, the strongest predictors of teachers' attitudes were their perceptions of usefulness. It is evident that when integrating ICT into the classroom, attention must be paid to the extent to which teachers perceived it as fitting into their cultural frame of reference (Hart & Laher, 2015).

5.2.2 How Do Teachers Use ICTs for the Advancement of Teaching and Learning?

The study investigated, more specifically, teachers' use of ICTs for the advancement of teaching and learning. It was found that teachers were in favour of the potential impact of ICT on teaching and learning. In this regard, 80% of the teachers indicated that ICT could play a vital role in the advancement of teaching and learning. Furthermore, 70% indicated that ICT encourages learners to work collaboratively, are a fast means of acquiring information, helps learners to acquire new knowledge effectively, engages learners' attention, and can motivate learners

to explore. These results are supported by Chigona and Chigona (2010) who posit that ICT has the means to aid in the preparation of learners by developing their cognitive and critical thinking skills, their ability to access information, as well as their evaluation and synthesising skills.

With regard to its impact on teaching and learning, the findings revealed that ICT has a positive impact on raising the standards or educational outcomes. It was observed from the findings that the use of ICT gave rise to higher standards of education. It must, however, be recognised that these findings are based on a small sample of teachers (25) who participated in this study. South African schools that have attempted to investigate the utilisation of ICTs in the classroom (Ndlovu & Lawrence, 2012). This should be a cause for concern in a country that values quality and equity. In this case, it may be argued that more research is needed to investigate the quality of ICT usage in the classroom, and whether ICT enhances learning, particularly in previously-disadvantaged schools where access to quality education is lacking due to insufficient human and physical resources (Ndlovu & Lawrence, 2012).

There appeared to be some contradiction from a number of teachers with regard to the impact of ICT on standards or educational outcomes. Even though the findings revealed a generally positive response in that teachers wanted to use ICT in a variety of ways in their teaching, it seemed as though there was a lack of use of ICT. In this regard, Bester and Brand (2013) argue that the use of technology has the potential to improve achievement, and that it will most probably improve attention and, if sustained over time, develop into better concentration. According to these authors, one can assume that an optimal learning situation is created when the teacher succeeds in capturing the attention of the learners. In this regard, ICTs encourage as well as motivate learners to concentrate on the learning task at hand.

5.2.3 What Are the Barriers that Prevent Teachers from Using ICT in the Classroom?

50% of the participants identified lack of long-term staff development programmes, as well as a lack of pedagogical models on how to use ICT for teaching, as barriers preventing them from using ICT in the classroom. An important issue is to provide teachers with pedagogical training rather than simply training them to use ICT tools (Becta, 2004). In this study, it was found that there was pressure to prepare learners for tests and exams, which negatively influenced participants with regard to the use of ICT. Furthermore, the participants noted that using ICT for teaching and learning had not been a goal of their schools. Another barrier was the cost of ICT, which was revealed by participants as being too high (43%). From the interviews, it is evident that the teachers were interested in using ICT, but that they lacked the resources to do so which resulted in difficulties in the successful use thereof in the classroom. The interviews also showed that teachers faced barriers when integrating ICT into the classroom.

It is evident from the findings that 60% of the teachers felt that it would not be difficult for them to change from their current teaching practice to integrate ICT into their teaching but that it had not been a goal of their schools. In this regard, Balanskat, Blamire and Kefala (2006) argue that many teachers in Denmark still choose not to use ICT in teaching situations because of their lack of ICT skills rather than for pedagogical reasons. It is evident from this study that there seems to be a relation between the barriers, and that teachers cannot use ICT tools appropriately in the classroom. It was also found that there are barriers preventing teachers from using ICT such as a lack of training, as well as a lack of ICT equipment and resources. A study done by Mooketsi and Chigona (2016) on the Khanya Project confirms that trained teachers were not given time to master the skills between training and implementation. The teachers in the Khanya Project did not feel that they had the requisite ICT skills (Mooketsi and Chigona, 2016). Another hindering factor is the attitude of role-players towards the use of ICT in the classroom. It can be observed from the findings that teachers had received insufficient training and that the focus was mainly on basic ICT skills rather than on how to integrate ICT into teaching and learning. Cubukcuoglu (2013)

emphasises the fact that the training of teachers should not only include basic technological skills but also provide training on improving the pedagogical use of technology. A study by Kipso, Chang'ach and Sang (2012) in Kenya found that teachers were not adequately trained on ICT integration in teaching and learning. This study concludes that teachers need to be trained on how to use ICT infrastructure on a regular basis and that training to be done at school level.

One can argue that teachers do not use ICT in the classroom because they are poorly trained and lack ICT resources in schools. The demographic data is proof that out of the 30 participants, only eight had received formal training and had obtained a certificate (27%).

5.2.4 What Role Does the Department of Basic Education Play in the Development of ICT Skills Needed by Teachers?

Findings show that teachers would like the DoE to play a bigger role in the development of teachers' ICT skills. Teachers' perceptions were that the DoE could contribute more towards enhancing the use of ICT in schools by providing ICT training and other ICT infrastructure. The findings revealed that training would undoubtedly provide teachers with the necessary knowledge and skills to use ICT. Some teachers made recommendations on how the government can contribute in this regard. In this case, Lundall and Howell (2008) argue that ICT presents many exciting opportunities for teachers. These authors opine that there is no doubt that the current pace of change causes great pressure. Furthermore, it is important that policy makers take into account that key resources are put in place in schools (Lundall et al., 2008). The DoE should provide schools with technical support, constant maintenance and frequent upgrading of resources to ensure optimal use of ICT. Teacher training must address both pre-service as well as in-service training. It seems that many teachers are still teaching according to their formal training, and have little confidence in their ability to use ICT effectively, despite the aim of the policies to address not the in-service training of teachers, but also preparatory training (Lundall et al., 2008).

5.3 CONCLUSION

The use of ICT in schools presents teachers and the DoE with challenges regarding the successful integration of ICT into teaching and learning. It is important that teachers' insights into training and development with regard to ICT are noted in order to integrate ICT successfully into schools. This study indicated that the participants were positive about the integration of ICT into their teaching. The participants in this study have significantly positive attitudes towards the use of ICT, and one can only assume that once they are provided with the necessary training and infrastructure, they will benefit from ICT applications in their classrooms. It can be concluded that the teachers in this study will have a strong motivation to adopt ICT in their classrooms once they have been given the opportunity to do so and have been formally trained. There is a strong agreement between the items pertaining to the notion that the DoE needs to play a greater role in ICT in schools. The majority of the participants agreed on the items in the questionnaire. It is important for the DoE to serve as a catalyst in ICT- assisted instruction and review its plans and policies with regard to ICT.

To conclude, it can be reported that:

- There are still barriers preventing teachers from using ICT in their classrooms;
- There are no long-term staff development programmes to support the integration of technology into instruction;
- There is a lack of pedagogical models on how to use ICT for learning;
- Most teachers are not in favour of the use of ICT in their classrooms; and
- The cost of ICT tools is too high.

5.4 RECOMMENDATIONS

The use of ICT as an educational tool seems to be critical to teachers in the Motheo District, despite their failure to utilise it in the classroom. In fact, there is little evidence of its use in the classroom. Teachers need to be given training on how to use ICT in the classroom for the advancement of teaching and learning, particularly in the new technological era. It is recommended that in order for teachers to enhance teaching and learning through ICT, training strategies need to be in place to equip teachers for the task.

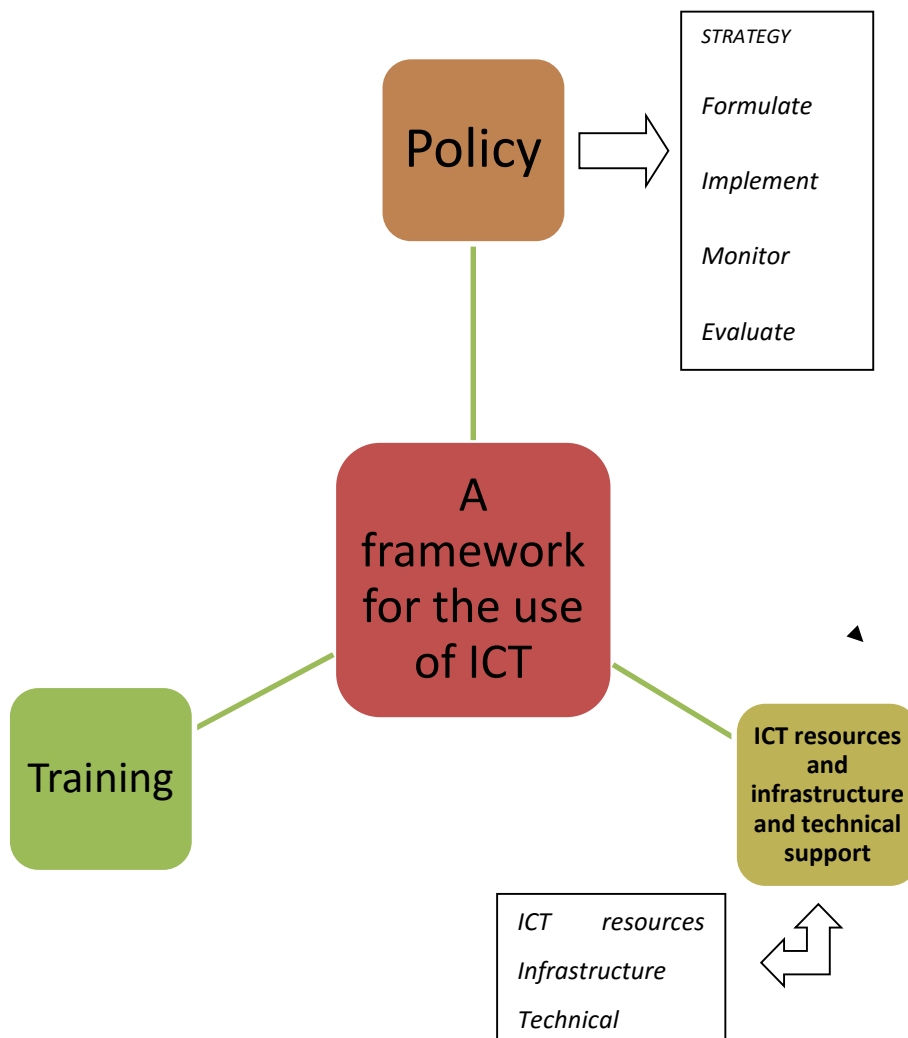
The DoE should provide frequent training on the use of ICT in the classroom for educational purposes, rather than simply for the administrative duties of teachers. It is important for the training to be well structured and based on the subject content to be covered by teachers in class. This can be achieved by means of compulsory, in-service training of teachers at schools, and by adjusting the workload of teachers in order for them to attend training sessions. It is crucial that the DoE use a direct approach by giving guidance to schools and providing training courses through private companies. It is recommended that every school have its own ICT policy. In order for the DoE to achieve the objective of the ICT policy, clear targets in terms of implementation should be in place and the performance of schools using ICT measured.

One of the most effective ways of embedding ICT in schools is to offer educational training at entry level to the teaching profession. This should be a stand-alone subject that is compulsory for all teacher training institutions to form part of their subject didactics.

It is crucial for all role-players to be informed about the ICT equipment available across subjects and to all teachers, rather than just certain teachers. In order to use ICT in schools, it is important that teachers receive full-time technical support. In this regard, it would be better for schools to train some teachers on technical support in order to help their peers.

It is important that schools form partnerships with private companies to obtain the necessary support. These companies should provide ICT tools to ensure access to all. It is crucial that schools are equipped with new and up-to-date technologies to keep track of learners and to be able to cope with the rapid evolution of technology.

Framework for the use of ICT in the classroom



POLICY:

Schools must implement their own ICT policies in line with the framework of the Department of Education to implement ICT use in the classroom. In this ICT policy document must be clear goals what schools want to achieve.

Schools must formulate a strategy.

To implement an action plan to reach their goals. An action plan can be formulate through teamwork by teachers in relation with their needs for ICT implementation and they feel part of the process and the development of a policy will give teachers the opportunity to reflect on their particular educational use of ICT and they will be more positive to implement ICT in their classrooms.

Schools must implement the strategy.

Ensures that the necessary resources, financial, people, time and equipment are available to implement the strategy.

Schools must monitor the strategy.

- Monitor the progress of the implementation plan.
- Check whether the implementation strategy solve the problem of teachers not using ICTs
- If not, or whether the implemented strategy had an impact on teaching and learning.

Schools must evaluate the strategy

- Whether the plan strategy was successful or not.
- Through the evaluation it can be determined whether the procedure was effective or perhaps it can be make more effectively.
- The following can be determined during the evaluation.
 - Lessons to be learned from problems that arise during ICT usage.
 - Can these lessons be used in all subject areas of the school?
 - Was there perhaps a better or cheaper solution?
 - During the evaluation the input from every teacher involved in the process must be obtained.

The SMT (School Management Team) must effectively direct the process of ICT integration in the school.

The policy must include support and training to ensure ICT integration and must encourage cooperation between teachers for dissemination of ICT related-knowledge and ICT must be compulsory for all teachers.

Teachers must know the content of an ICT policy and share the values expressed within the school ICT policy and understand their implications.

TRAINING:

For ICT training to be effective schools must make an assessment of teachers ICT skills. Training must be based on teachers' level of ICT training. Before teachers can use ICT basic computer training must be done with teachers with no ICT skills. This basic computer training can take place at school and can be done through peer education. This training can include face to face training based on teacher's needs. Schools must base this training on the needs of teachers according to the needs analysis done by schools and can be short courses, workshops and self-study courses. The training programme must be designed in a manner that teachers get the skills that allow them to integrate ICT in the classroom.

Teachers training needs must not stop at basic computer skills but should prepare teachers and provide support to use ICT to teach and integrate ICT in their lessons. Intermediate and advance training can be done through lead-teachers who attended ICT training sessions. These lead-teachers can be trained by the DoE or other private companies offering these training. This training session must be frequent and based on ICT that can be used in teaching and learning. Training must be conducted in a constructivist environment where teachers can interact with each other during training. When training is conducted it must be interactive to show teachers how to integrate ICTs. Trainers must work alongside teachers to observe, support, and evaluate ICT integration. For raining to be effective and appropriate it must give rise to sound pedagogy based on different types of learning. The DoE and schools must offered off-side programs which focused on collaboration, personal reflection, sharing problems for learning With ICTs and financial assistance to help teachers to purchase ICT tools.

ICT RESOURCES AND INFRASTRUCTURE AND TECHNICAL SUPPORT

- ICT resources
- In order for schools to meet their ICT targets the SMT must make sure what ICT resources are readily available at school and what is needed to train the teachers to use ICT. Teachers must have access to resources to integrate ICT in their lessons. Teachers must be provided with up-to-date technology and supportive networks to use ICT in the classroom. There must be a range of software available to subject teachers to teach and use the appropriate forms of software supporting different skills and ways of teaching.
- Infrastructure

Schools must have proper infrastructure like internet connection and sufficient computer labs. School ICT laboratories should be located in places as would allow teachers to access the facility without being a security risk. Hardware that is going to be used must be up-to-date

- Technical support

Technical support by means of a technician must be available to teachers so that they can focus on teaching and not worry about technical issues. ICT support or maintenance contracts in schools can help teachers to use ICT without losing time through having to fix hardware and software problems. If schools cannot afford a technician guidance must be provided to teachers on technical support, operation and troubleshooting of hardware, software and network resources.

5.5 LIMITATIONS OF THE STUDY

The limitations of this study brought were about by the fact that the study only focused on ten secondary schools in Bloemfontein in the Motheo District. Not all of the schools that use ICT in education were involved in this study. Furthermore, the number of participants was limited. For example, the data and findings obtained by means of the interviews were limited to 30 secondary school teachers. It is possible that future research may wish to include more participants.

The data and findings drawn from the interviews are limited to 25 teachers. It is possible that future research may wish to interview more respondents.

The study did not investigate the availability of ICT resources and tools in the schools. As the researcher was aware of the limitations, he prevented these challenges from affecting the quality of the study by eliminating biased views and by continuously monitoring all interpretations in order to ensure a rigorous study.

5.6 STUDY SUMMARY

The research questions that were presented in Chapter 1 are as follows:

- What are teachers' attitudes towards the use of ICT in the classroom?
- How do teachers use ICTs for the advancement of teaching and learning?
- What are the barriers that prevent teachers from using ICT in the classroom?
- What role does the Department of Basic Education play in the development of ICT skills needed by teachers?

This study found that teachers have positive attitudes towards the use of ICT in the classroom. In this study, teachers were of the opinion that ICT can be used for the advancement of teaching and learning, but that there are still barriers that prevent them from using ICT. In this study, teachers indicated that the DoE can play a pivotal role in the use of ICT in schools. It is hoped that this study has highlighted the need for ICT training and development in secondary schools. The integration of ICT into schools is not on the desired level of the DoE as outlined in the 2003 White Paper on e-Education. A great deal needs to be done to improve the use of ICT in classrooms, and teacher development and training is one aspect that needs improvement.

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APPENDIX 1

Enquiries: BM Kitching
Ref: Notification of research: JS Louw
Tel. 051 404 9221 / 082 252 1519
Email: berthakitching@gmail.com and B.Kitching@fseducation.gov.za



The Acting District Director
Motheo District

Dear Mr Moloï

NOTIFICATION OF A RESEARCH PROJECT IN YOUR DISTRICT BY JS LOUW

1. The abovementioned candidate was granted permission to conduct research in your district as follows:

Topic: The Development of a framework for the use of ICT in the classroom.

Schools involved: Petunia, Dr Viljoen, HTS Louis Botha, Lereko, Heatherdale, Sand Du Plessis, Brebner, Dr Blok, Kagisho and Bloemfontein Secondary School in Motheo District.

Target Population: 3 teachers from each school.

Period: From April to September 2016. Please note the department does not allow any research to be conducted during the fourth term / academic quarter of the year.

2. **Research benefits:** The research will determine how to change teachers' attitude towards the use of ICT in the classroom, how to use ICT in the classroom to advance learning, what are the barriers preventing teachers from using ICT in the classroom and strategies for the development of ICT skills needed by teachers. The research findings can be used by the Department of Education.
3. Logistical procedures were met, in particular ethical considerations for conducting research in the Free State Department of Education.
4. The Strategic Planning, Policy and Research Directorate will make the necessary arrangements for the researcher to present the findings and recommendations to the relevant officials in your district.

Yours sincerely


DR JEM SEKOLANYANE
CFO

DATE: 30/03/2016

RESEARCH APPLICATION NOTIFICATION LOUW SJ 23 MARCH 2016
Strategic Planning, Research & Policy Directorate
Private Bag X20565, Bloemfontein, 9300 - Old CNA Building, Room 318, 3rd Floor, Charlotte Mexeke Street, Bloemfontein
Tel: (051) 404 9283 / 9221 Fax: (086) 6678 678

APPENDIX 2

QUESTIONNAIRE (TEACHERS)

Questionnaire

Name of school: _____

School address: _____

Thank you for participating in this study on the use of ICT in schools. The survey focuses on the use of ICT in teaching and learning, as well as the attitudes of teachers towards the use of ICT in their classrooms.

This questionnaire is addressed to teachers, and seeks information with regard to ICT infrastructural support for teachers, as well as background information on teachers.

It should not take you more than 15minutes to complete the questionnaire.

All responses will remain anonymous, and will be treated in the strictest confidence. No individual or school will be identifiable in the published reports, and will be used for the purposes of this study only.

Thank you very much for your time and effort in responding to this questionnaire.

APPENDIX 3

Answer each question by circling the appropriate number in the shaded column.

SECTION A

ITEM		
Gender	Male	1
	Female	2
Age	Below 30	1
	31-40	2
	41-49	3
	50-59	4
	Other	5
Educational qualification	Diploma	1
	Bachelor's degree	2
	Master's degree	3
ICT Training	No training at all	1
	Informal training	2
	Formal training with certificate	3

SECTION B

Answer the following questions by indicating STRONGLY AGREE; AGREE; DISAGREE; or STRONGLY DISAGREE.

	ITEM	STRONGLY AGREE	AGREE	NOT SURE	DISAGREE	STRONGLY DISAGREE
1	It is very important to me to work with a computer.	5	4	3	2	1
2	I use a computer because I am very interested in doing so.	5	4	3	2	1
3	I feel comfortable using ICT as a teaching tool.	5	4	3	2	1
4	The use of computers stresses me out.	5	4	3	2	1
5	If something goes wrong, I will not know how to fix it.	5	4	3	2	1

6	The use of ICT in teaching and learning excites me.	5	4	3	2	1
7	The use of ICT in teaching and learning impacts positively on learners' motivation and achievement.	5	4	3	2	1
8	The computer is a valuable tool for teachers.	5	4	3	2	1
9	Computers will change the way students learn in my classes.	5	4	3	2	1
10	The use of ICT is not conducive to student learning because it is not easy to use.	5	4	3	2	1
11	For ICT to be fully exploited for teaching and learning, radical changes in schools are needed.	5	4	3	2	1
12	I believe that the use of computers and other electronic devices will take over my profession.	5	4	3	2	1
13	For ICT to be fully exploited for teaching and learning, teachers must change their attitudes.	5	4	3	2	1
14	Teachers should receive extensive training in the use of ICT.	5	4	3	2	1
15	The abusive use of computers and ICT tools has negatively affected my attitude towards ICT as tools for teaching and learning.	5	4	3	2	1

SECTION C

Answer the following questions by indicating STRONGLY AGREE; AGREE; DISAGREE; or STRONGLY DISAGREE.

	ITEM	STRONGLY AGREE	AGREE	NOT SURE	DISAGREE	STRONGLY DISAGREE
1	ICT tools are changing too fast.	5	4	3	2	1
2	I spend too much time integrating ICT into my lessons.	5	4	3	2	1
3	I have no time to participate in quality training programmes.	5	4	3	2	1
4	There are no long- term staff development programmes to support the integration of technology into instruction.	5	4	3	2	1
5	Some of my peers have failed to integrate ICT tools in their teaching.	5	4	3	2	1
6	There is no technical support available at my school.	5	4	3	2	1
7	The software available at my school is difficult to learn and use.	5	4	3	2	1
8	There are no training programmes (seminars and workshops) available to encourage ICT-supported teaching.	5	4	3	2	1
9	It is difficult to change from my current teaching practice to integrate ICT into my teaching.	5	4	3	2	1
10	There is a lack of pedagogical models on how to use ICT for learning.	5	4	3	2	1

11	Pressure to prepare learners for tests and exams influences the use of ICT.	5	4	3	2	1
12	Most teachers are not in favour of the use of ICT in their classrooms.	5	4	3	2	1
13	Using ICT in teaching and learning is not a goal of our school.	5	4	3	2	1
14	The cost of ICT tools is too high.	5	4	3	2	1

SECTION D

	ITEM	STRONGLY AGREE	AGREE	NOT SURE	DISAGREE	STRONGLY DISAGREE
1	ICT encourages pupils to work collaboratively.	5	4	3	2	1
2	ICT helps learners to acquire new knowledge effectively.	5	4	3	2	1
3	ICT minimises preparation time and teachers' administrative burden.	5	4	3	2	1
4	ICT helps me to communicate with my learners and colleagues.	5	4	3	2	1
5	ICT helps me to organise my work.	5	4	3	2	1
6	ICT is a fast means of acquiring information.	5	4	3	2	1
7	ICT captures learners' attention and motivates them to explore.	5	4	3	2	1
8	ICT improves the class climate.	5	4	3	2	1
9	Learners try harder in terms of what they are learning.	5	4	3	2	1
10	Learners understand more easily what they have learnt.	5	4	3	2	1

SECTION E

	ITEM	STRONGLY AGREE	AGREE	NOT SURE	DISAGREE	STRONGLY DISAGREE
1	The DoE must provide infrastructure to enhance the use of ICT in schools.	5	4	3	2	1
2	The DoE should engage police in the security of schools with ICT tools.	5	4	3	2	1
3	The DoE should develop ICT software in various subject areas for use in schools.	5	4	3	2	1
4	The DoE should sponsor and provide free compulsory training on ICT-assisted instruction for teachers.	5	4	3	2	1
5	ICT-literate teachers should be instructed to collaborate and mentor non-ICT-literate teachers.	5	4	3	2	1
6	The DoE should design and introduce free ICT training kits for teachers.	5	4	3	2	1
7	The DoE must review plans and policies on ICT in schools.	5	4	3	2	1
8	The DoE should generate funds and buy ICT tools for teachers to use.	5	4	3	2	1
9	The DoE should partner with private companies to help teachers develop their ICT skills.	5	4	3	2	1
10.	Teacher education institutions should design and offer courses for all teachers on ICT-assisted instruction.	5	4	3	2	1

APPENDIX 4

INTERVIEW SCHEDULE FOR TEACHERS

Category of school:

(a) High-achieving school (according to the mean score).....

(b) Low achieving school (according to the mean score).....

1. Do you feel it is necessary for teachers to be ICT literate?

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.....

2. What do you think are the most important ICT skills for secondary school teachers?

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3. Do you think there is a relationship between ICT and learners' performance?

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4. In your opinion, has the Department of Education done enough to encourage the development of ICT literacy among secondary school teachers?

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5. What do you think are the challenges faced by teachers in your school who don't use ICT in their classrooms?

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6. Apart from the above-mentioned challenges, what other challenges do you face in your attempt to be ICT literate?

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7. Can you suggest any strategies for the development and enhancement of ICT literacy among secondary school teachers?

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8. What is your personal view on the use of ICT in the classroom?

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.....

APPENDIX 5

LETTER OF PERMISSION TO CONDUCT RESEARCH IN SECONDARY SCHOOLS

153 Geelvis Street
Bloemside
Bloemfontein
9306

The principal

Dear Sir/Madam

RE: Permission to conduct research

I, J. S. Louw, have registered with the Central University of Technology (CUT) in the Free State for the degree, Master in Education. I am currently completing the empirical part of my study entitled “The development of a model/framework for the use of ICT in the classroom”. The aim of the study is to establish a framework for the use of ICT in the classroom.

Your school has been purposively selected to participate in the study. I hereby request your permission for three teachers to fill out the questionnaires, and to allow me to conduct interviews with the selected teachers. Your assistance in granting me an interview and allowing me to make observations in relation to the study will be highly appreciated. All principles of confidentiality will be adhered to.

Thanking you in advance for your kind assistance

Warm regards

Jerome S. Louw

Mobile: 0789811962

E-mail: louwjerome@yahoo.com

APPENDIX 6

Interview coding

Question 1: Do you feel it is necessary for teachers to be ICT literate?

Question Number	Interview respondent	Response	Code
1	T1	Yes	
	T2	Yes, in today's modern society, learners know a lot about knowledge and communication. Learners in the school where I teach are very active on social media. If learners would be more interested in the lessons, learners will become active participants in the predictions of knowledge rather than passive listeners in the classroom. Teachers will have to have the necessary skills and knowledge to have an active classroom. I therefore think that it is a must for teachers to be ICT literate.	PART, NET
	T3	Yes, teachers should be ICT literate; it develops and improves education.	TEACH
	T4	Yes, technology is the future and the learners of today are all involved with some type of technological device.	TECH
	T5	Yes, it helps you in presenting topics in different ways to learners.	TEACH
	T6	Yes, for recording purposes and for setting up tests and exams and certain subjects can be effective in lesson planning as well.	ADMIN
	T7	Yes, even if it's only to perform basic tasks on a computer. The ability to use email and drop box could be a great tool if all colleagues can utilise it.	ADMIN
	T8	Yes, it helps so much to make the lessons more interesting and learners can actively participate in class. Sometimes they even jump up to assist when the educator struggles with something.	TEACH,POS

	T9	Yes, definitely! ICT undoubtedly facilitates the consolidation of fundamental notions across all subjects. It is a rapidly-growing element in teaching methods, organisation and resource collection.	TEACH,NET,VAR
	T10	Yes, to be able to do exam papers on computers or to teach learners about computers.	ADMIN
	T11	To help promote an effective learning environment. ICT helps teachers to do proper lesson planning and effective teaching.	TEACH
	T12	Yes, we need to move on and most of our learners spend most of their time on their phones and also make use of the Internet to get information.	TECH.NET, RES
	T13	No comment (did not participate in interview).	
	T14	It is necessary for teachers to be ICT literate as this will enhance teaching and learning in schools. ICT will improve class climate. Discipline problems would be eliminated. It will encourage faster ways of gaining and getting information.	TEACH,QUIK,MOT
	T15	Yes, ICT lessens the teachers' administrative burden, helps to be creative and innovative.	ADMIN,TEACH
	T16	Yes, the demands on teachers have become more, and for the teachers to be able to meet the demands, they need to embrace ICT. This will make their workload easier.	ADMIN
	T17	Yes, but it does not help if they are literate but each and every classroom is not equipped with Wi-Fi and ICT tools.	FAC
	T18	Yes, ICT is becoming a need in societies around the world and are also reaching schools with all the advancements in ICT .It is essential that teachers have a thorough working knowledge of these technologies. Everyone is communicating through technology, so teachers should not fall behind.	TECH,
	T19	No comment (did not take part in interview).	

	T20	Yes, children and society have evolved since we were children. They have evolved into information-seekers. Teachers should manage a classroom around ICT. Thus we, as teachers, should be educated with regard to information communication to be effective facilitators in the classroom.	NET,RES,PART
	T21	Yes, most definitely! How would you empower yourself if you are not near a computer? Yes, especially for your daily activities in your class to explore and use new resources in the classroom.	ADMIN, RES
	T22	Yes, teachers do not know the value until they start to use it.	TEACH
	T23	All teachers have their way of teaching and some can be effective without ICT as well.	TEACH
	T24	No comment.	
	T25	Yes, everybody needs a basic understanding of ICT and how to make productive use of it. It is also important to think critically and creatively.	TEACH,POS

Codes

Table 4.6: Code, descriptions and frequencies about necessity to be ICT literate

Code	Description of code	Frequency
NET	Internet as teaching tool	4
PART	Participating in learning	2
TEAM	Team- or group work	0
RES	Research	3
MOT	Capturing attention as a visual or motivational aid	1
ADMIN	Administrative activities	6
TEACH	ICT use to teach	10
POS	ICT use has a positive impact on grasping capacity	1
QUIK	Quickness or efficiency	1
FAC	Facilities or technology associated with ICT	1

Question 2: What do you think are the most important requirements for secondary school teachers?

Question Number	Interview respondent		Code
1	T1	All basic skills from working on an interactive whiteboard to using the Internet; interchanging without struggling	FAC
	T2	Teachers must be able to use a computer. They must be able to use programs like Microsoft Word, Microsoft Excel and PowerPoint. Teachers must be able use these programs to set exams and create PowerPoint slides to spark interest in learners. Teachers have to be able to use the Internet; they will be able extract information from the Internet to make their subject interesting. Teachers must be able to give exciting tasks to learners, using Internet resources.	TEACH, EDU,XLS,NET
	T3	To know how to work with MS Office programs to promote the use in lessons.	EDU
	T4	Basic MS Office skills (Word, Excel, and PowerPoint), as well as integrating lessons with multi-media.	EDU,XLS
	T5	Microsoft Excel and Word and PowerPoint	EDU,XLS
	T6	The use of multimedia in teaching is becoming increasingly important. Learners are also requiring more learner support material. Thus drop box B cloud software can become essential to teaching.	VAR,FAC
	T7	Yes, it helps so much to make the lessons more interesting and learners can actively participate in class. Sometimes they even jump up to assist when the educator struggles with something.	TEACH,PART
	T8	Most definitely! ICT undoubtedly facilitates the consolidation of fundamental notions across all subjects. It's a rapidly-growing	FAC,VAR

		element in teaching methods, organisation and resource collection.	
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	T9	Basic operation of devices, e.g. laptops, tablets, data projectors, interactive whiteboards. Methods to get subject content onto digital format, using Scanner Internet subject relevant programs and assessment banks. New creative ways to keep classes interactive and refrain from presenting dull, lifeless and one-dimensional classes.	PROJ,TEACH,MOT
	T10	Excel to mark or convert marks	XLS
	T11	Compiling and setting of PowerPoint slides;doing research in the necessary subjects; setting of assessment tasks and assignments; presenting relevant information to learners with use of ICT.	VAR,FAC
	T12	To prepare their own presentation and to get information on the Internet.	FAC,VAR,NET
	T13	No comment.	
	T14	The Internet itself is technically an ocean of knowledge. Teachers should have the skills to understand how it works to help find learners useful information; how to work with computers etc.; how to use or integrate mobile devices in your lessons	POS,STAND
	T15	Teachers must be able to use technology as a tool to research, organise and communicate information.	RES.ADMIN
	T16	How to incorporate ICT in the classroom; understanding the use of ICT in the classroom; the relevance of ICT	TEACH
	T17	The basic development of interactive presentations where the learners can take part and feel part of the positive classroom environment	VAR,FAC

	T18	The Internet itself is technically an ocean of knowledge. Teachers should have the skills to understand how it works to help find learners useful information; how to work with computers etc.; how to use or integrate mobile devices in your lessons	RES,NET,VAR
	T19	No comment.	
	T20	Internet – how to find credible information online	RES,NET
	T21	All administrative duties (to capture marks) Windows, Excel, PowerPoint (To explore and to make an effort to professionalise your work ethic	ADMIN,XLS
	T22	To use interactive boards, data projectors and cameras	VAR
	T23	No comment.	
	T24	No comment.	
	T25	Yes, learner being used in the classroom; ICT tools are very helpful; it helps them to do assignments. ICT also enables students with special needs or difficulties; students also assume responsibilities when they use ICT to organise their work through digital portfolios or projects.	POS.TEACH

Codes

Table 4.7: Codes, descriptions and frequencies of the ICT requirements for secondary school teachers

Code	Description of code	Frequency
NET	Internet as teaching tool	4
PART	Participating in learning	1
RES	Research	3
POS	ICT use has a positive impact on grasping capacity	2
TEACH	ICT use to teach	5
ADMIN	Administrative activities	2
VAR	Variety of approaches in teaching and learning	7
PROJ	Projector technology	1
FAC	Facilities or technology associated with ICT	6

XLS	Spreadsheet software	5
MOT	Capturing attention as a visual or motivational aid	1
STAND	Raising standards or educational outcomes	1

Question 3: Do you think there is a relationship between ICT and learners' performance?

Question Number	Interview respondent		Code
1	T1	Yes, what learners see, they tend to remember.	MOT
	T2	There has to be a relationship between ICT and learners' performance. If the teachers are not able to make lessons interesting, learners will not do well. If teachers do not have access to these tools, they will not be able to supply learners with more information to understand the content.	TEACH,RES
	T3	No, but if used the correct way, it can improve education performance from the learners.	STAND
	T4		
	T5	In some cases, yes. A video or illustration might help them to remember something better.	MOT
	T6	Not that I can see. Our learners have problems studying and understanding whether lessons are performed using ICT or the old method of chalk and talk. As far as I am concerned, results remain the same.	STAND.SUBS
	T7	There could be but it depends on the learners' personal engagement that is dependent on various internal and external factors.	TEACH
	T8		
	T9	Yes, the use IT is growing instantly in every new generation. Sometimes getting the same information in a slightly different setting and format makes all the puzzle pieces fall into place.	TECH
	T10	No.	
	T11	There is definitely a correlation between ICT and learner performance. By presenting a lesson through the use of ICT, the teacher is able to attract the learners' attention and thus promote the	STAND

		effectiveness of learning. Lessons can thus be presented in a more interesting fashion.	
	T12	Yes, because children with access to computers and tablets, etc. are the ones who normally perform better because their parents download educational programmes and they learn while playing. So the more we can play at school, the more we can learn.	TECH,VAR
	T13	No comment.	
	T14	There is a definite relationship between ICT and learners' performance. We are moving into a computer age. Learners' performance will be enhanced with the introduction of ICT in schools.	STAND
	T15	If ICT tools are being used correctly, meaning it doesn't replace the teacher, it enhances the lessons. That helps learners to a better understanding of the content. Learner performance might improve	STAND,VAR
	T16	Yes, they will have the opportunity to interact with other learners. They can get a broader perspective of content done. Learners will be exposed to other ways of doing things. ICT has an inclusive approach for learners that need more than one stimulation.	VAR,POS
	T17	Yes, learners are more positive towards an electronic and interactive approach and therefore perform better.	POS.STAND
	T18	Yes, learners are more desperate to learn when working with technology. They enjoy lessons more where teachers integrate ICT. There is also more participation in the class.	POS , TEACH
	T19	Yes, learners are more motivated when it comes to using ICT in class. IT empowers learners in a classroom set-up instead of being recipients of information they can obtain it on their own.	POS,RES
	T20	Yes, what they hear and what they see can enhance effective learning. Definite improvement in results.	POS, STAND
	T21	Yes, it increases active learning in the classroom.	POS

	T22	It is possible for learners to pay more attention to be more captivated than if they have to follow in a textbook. But it is not clear if they will perform better.	STAND
	T23	It is possible for learners to pay more attention to be more captivated than if they have to follow in a textbook. But it is not clear if they will perform better.	STAND
	T24	No comment.	
	T25	Yes, learners are more motivated in computers, and Internet is being used in the classroom. ICT tools are very helpful. It helps them to do assignments. ICT also enables students with special needs or difficulties. Students also assume responsibilities when they use ICT to organise their work through digital portfolios or projects.	POS,STAND

Codes

Table 4.8: Codes, descriptions and frequencies of the relationship between ICT and learner performance

Code	Description of code	Frequency
NET	Internet as teaching tool	0
RES	Research	2
ADM	Administrative activities	0
TEACH	ICT use to teach	3
STAND	Raising standards or educational outcomes	10
POS	ICT use has a positive impact on grasping capacity.	7
SUBS	ICT is not acting as a substitute for good quality education.	1
VAR	Variety approaches in teaching and learning	3
MOT	Capturing attention as visual or motivational aid	2

Question 4: In your opinion, has the DoE done enough to encourage ICT literacy development among secondary school teachers?

Question Number	Interview respondent	Code
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1	T1	No, not all teachers have been given the opportunity to go for training. They send a notice out for one to two educators and that is not fair.	TRAIN
	T2	Short courses are a must. This is my opinion. The Department only has one-day seminars for specific subjects. The Department should give bursaries to enrol teachers who are not ICT literate to develop these skills at a computer college. The Department donates laptops and tablets and other resources to schools .However, they do not check if these resources are used by teachers. There has to be people to check if teachers have access to the resources. In my opinion, I think the Department of Education does attempt to encourage ICT literacy as implemented by legislation, but they lack proper execution in this process.	TRAIN,EQUIP,
	T3	No, not that I am aware of For all subjects, the DoE helped to develop ICT through CAT.	TRAIN
	T4		
	T5	No, not really. Many schools still don't have the necessary equipment and not all teachers are trained and equipped to integrate ITC.	EQUIP
	T6	Very, very little. The only support we get is for recording purposes (SAMS) school management system.	TRAIN
	T7	No.	
	T8	No, they must provide more free training and get more funding to incorporate it in class.	TRAIN
	T9	Yes, enough training and development are available. Classrooms with updated ICT are scarce, though.	TRAIN,EQUIP
	T10	No. Can give more training	TRAIN
	T11	No.	

	T12	In my personal experience, I have never been approached by the DOE with regard to ICT or ICT training. The DoE definitely does not do enough to encourage ICT in schools.	TRAIN
	T13	No comment.	
	T14	No, the DOE is currently focusing on Grade 12, not on ICT literacy development. As far as I know, ICT training and development has not yet been done at school.	TRAIN
	T15	No, for the Department of Education must frequently organise ICT literacy workshops for teachers.	TRAIN,PART
	T16	No, schools are left on their own to equip themselves for the eternal demands. The Department should invest more into schools to make ICT use a reality.	EQUIP
	T17	Yes, I think training and development occur frequently but if teachers do not have the resources to use it every day, they will not use their knowledge and won't be able to feel confident in using ICT.	TRAIN.EQUIP
	T18	No, there are still a lot of schools that are not using technology. Most of the teachers don't even know how to use a computer. They should offer more ICT literacy courses to enhance teachers' ICT skills.	TRAIN,PART,TEACH
	T19		
	T20	No.	
	T21	No, only give computers to some schools and they must see to infrastructure which many schools could not maintain.	EQUIP
	T22	No. In my subject, they only sponsor technical schools.	EQUIP
	T23	No, it's expensive, especially for teachers.	
	T24	No comment.	
	T25	No, not all the schools are equipped with technology.	EQUIP

Codes

Table 4.9: Code, description and frequency about DoE ICT development among secondary school teachers

Code	Description of code	Frequency
TRAIN	Providing of training and development	12
PART	Participating in learning	2
EQUIP	Lack of equipment and resources	8
TEACH	ICT use to teach	1

Question 5: What do you think are the challenges teachers face in your school that they do not use ICT in their classrooms?

Question Number	Interview respondent		Code
1	T1	Not staying up to date with the latest technology. Technology is taking over and if we don't stay up to date, we lose out and get frustrated; we rob the children of an even better education. We also miss out on a chance to have fun in the class whilst learning; meaning teaching is taking place.	TRAIN,ATT
	T2	The resources are kept away from teachers. I think management purposely kept teachers away. Some teachers have access to these resources. However, some teachers are excluded. Teachers have to get hold of resources at an expense. This creates and negative culture and de-	EQUIP,ATT

		motivates teachers who are ICT literate to try and develop new skills.	
	T3	There are no funds to promote ICT effectively with training teachers.	EQUIP
	T4	There is no training available for teachers, and schools lack financial support or funds to equip the classrooms with the needed technological products.	TRAIN,EQUIP
	T5	Difficulty to understand all the methods and equipment.	TRAIN,EQUIP
	T6	The point with our learners is there is very little disruption as teachers don't have to turn their back on learners to write on the board. But very detrimental in terms of teacher administration.	ATT.ADMIN
	T7	More time-consuming practises that rely on hard copies of learning support material. Learners possibly feeling disconnected and disinterested with their work because they are unable to relate to it.	EQUIP,ATT,APP
	T8	Fear to use computers, vandalism and the expensive equipment.	EQUIP
	T9	The direct method is not an appropriate teaching style anymore.	ATT
	T10	Uneasy to set tests and exam papers	TRAIN
	T11	The biggest challenge at our school regarding to the use of ICT is the school's poor financial situation. The second issue is poor security at the school. Theft in the classrooms makes it difficult as well. A lack of ICT training also presents a challenge. Baring classes; lack of resources; difficulty conveying subject materials; presenting low-standard lessons	EQUIP,TRAIN,ATT,TEACH

		compared to the rest of the world. Getting lower results for your efforts.	
	T12	Learners get bored because they don't find it interesting in those classes. Then get bad to lower marks in their subjects. Learners prefer to take subjects where teachers make more use of ICT.	ATT,TEACH
	T13		
	T14	Capacity-building development of all education. Technical support to be embedded in ICT roll-out at schools.	EQUIP
	T15	Access to ICT tools. Availability of these tools or resources – lack of ICT literacy – some don't understand the need for change from the old ways of teaching to teaching in the 21 st century – lack of technical support.	ATT,TEACH
	T16	Ignorance, illiteracy, fear of using ICT	ATT
	T17	There are no ICTs available in all classes so classes have to move which takes a lot of time. Classes are also too big so some children have to share which causes disciplinary problems.	EQUIP
	T18	Yes, teachers don't know how to use the technology and claim that they don't have time for workshops after school. <ul style="list-style-type: none"> - Teachers need to be specifically trained in order to integrate ICT into their teaching; schools don't have money to do that. - Some teachers are resistant to innovation and change. - Teachers don't know how to integrate it into the curriculum. 	TRAIN,ATT
	T19		
	T20	Mind set of decision makers at school are not progressive; they are not in	ATT,EQUIP

		touch with the youth of today. They might be afraid of change. This can affect decision making when it comes to implementation of or policy making with regard to ICT. Availability of ICT – not regularly available.	
	T21	The provision of Internet use. Schools do not supply or make Wi-Fi available.	NET
	T22	They will have to change the way they teach. I think some might be afraid of technology.	ATT
	T23	Kids might not be on focused on them as they could be.	PART
	T24		
	T25	Most teachers are not in favour of the use of ICT in their classrooms. Most of the teachers are not ICT literate. Broken down computers. Lack of computers.	SEC

Codes

Table 4.10: Codes, description and frequency of challenges teachers faced with the use of ICT in the classroom

Code	Description of code	Frequency
NET	Internet as teaching tool	1
PART	Participating in learning	1
APP	Application or real-life situation	1
ADM	Administrative activities	1
TEACH	ICT use to teach	3
SEC	Security measures	1
EQUIP	Lack of equipment and resources	10
ATT	Attitude of role-players towards ICT	10
TRAIN	Providing of training and development	6

Question 6: Apart from the above-mentioned challenges, what other challenges do you think you face in an attempt to be ICT literate?

Question	Interview	Code
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Number	respondent		
1	T1	Equipment and security at school	EQUIP
	T2	The fact that teachers have to get access to ICT at their own expense. As mentioned above, these de-motivate a literate teacher to try and develop necessary ITC skills.	COST
	T3	ICT is not available everywhere, only for some courses at university.	TRAIN
	T4	Load shedding, needed security for theft not to take place	SEC
	T5	Lack of proper training and latest equipment	TRAIN
	T6	Teacher admin, recording and setting papers	ADMIN,TRAIN
	T7	Trying to overcompensate in your multimedia approach and not finishing syllabus, etc.	
	T8	People born before technology who don't want to even try and are so afraid of failure.	TRAIN
	T9	Not sure if my answer here is relevant for the question. I'll explain the hurdles I face with the use of ICT in my teaching. Problems I encounter are the following: complete lack of ICT in my classroom. The separate classroom causes congestion and essentially doubles the time needed to complete the syllabus but the given time remains the same. Our ICT classroom accommodates twenty students in a department although I have five classes with an average of 40 students in a department of seven teachers who get the classroom. Then what happens to the remainder at the class that don't fit in the ICT classroom. Having had the privilege to teach in an up-to-date equipped ICT classroom. I can confidently say teaching takes place in a proficient and profound manner.	EQUIP,ATT
	T10	Infrastructure at the school and lack of ICT facilities and ICT training, as well as financial backing from DoE	
	T11	No support from the school or DoE. You must buy your own programmes or software if you want to make use of ICT.	EQUIP

	T12		
	T13		
	T14	Mindset change from education department. Shortage of facilities and ICT skills, and limited data management capacity.	ATT
	T15	Technology is changing fast. There are too many digital tools to choose from and teachers aren't able to make effective and informed choices about what technologies to focus on.	TECH.COST
	T16	No.	
	T17	Availability of resources	EQUIP
	T18	Lack of funds; teachers' attitudes towards ICT; ICT media are expensive; lack of security to protect these media; maintenance of ICT media.	EQUIP
	T19	None. Possibility of theft of equipment	SEC
	T20	Availability of Wi-Fi in school is restricted and should be lifted.	NET
	T21	Finances security upgrade of your implement data projectors	EQUIP,COST,SEC
	T22	The technology keeps upgrading and it's hard to keep up with the constant upgrades.	COST
	T23	Poor kids need free classes and training.	TRAIN
	T24		
	T25	The technology keeps upgrading and it is hard to keep up with the constant upgrades.	COST

Codes

Table 4.11: Codes, descriptions and frequencies regarding other ICT challenges

Code	Description of code	Frequency
NET	Internet as teaching tool	1
PART	Participating in learning	0
ATT	Attitude of role-players towards ICT	2
SEC	Security measures	3
COST	The cost and maintenance of ICT are too high	5
EQUIP	Lack of equipment and resources	6
TRAIN	Provision of training and development	5

Question 7: Can you suggest any strategies for the development and enhancement of ICT literacy development among secondary school teachers?

Question Number	Interview respondent		Code
1	T1	Have a workshop for all educators at the same time per school.	TRAIN
	T2	More resources could be provided. The Department could try and ensure that resources are equally distributed.	EQUIP
	T3	They should use workshops to help teachers with ICT.	TRAIN
	T4	Proper training	TRAIN
	T5		
	T6	Training courses	TRAIN
	T7	Training in software that can enhance learning experience. Exposure to what programs and techniques are available. Conversion of some of curriculum of CAPS into PPT and multimedia clips, etc.	TRAIN
	T8	Networking on how it makes their lives much easier.	TEAM
	T9	Equip all classes with ICT tools.	EQUIP
	T10	Training of teachers at school.	TRAIN
	T11	With the help and training from the DoE, I think that ICT could be incorporated into our school; most teachers are not aware of the effectiveness of ICT, thus an ICT seminar or workshop would be a good way to inform those who do not know about all the advantages.	TRAIN
	T12	They can work with CUT and UOFS to give training on a monthly basis over a period of one year.	TRAIN
	T13		
	T14	Provide equitable access to all teachers, enabling education and training; facilitate acquisitions of basic applicable and affordable ICT equipment, building ICT capacity of skills; promote e-learning amongst all schools; standardise ICT in education	TRAIN,EQUIP,

		sector; make use of best practise from other countries.	
	T15	Make it compulsory for teachers to participate in ICT training, not just computer literacy.	TRAIN
	T16	Build into teacher training. More workshops to address illiteracy amongst educators. Grade exposure higher at CPTD. This will encourage educators to participate in such programmes. More assistance from the Department to schools and educators. Equip schools with facilities to enhance the use of ICT in classes.	TRAIN
	T17	Equip a whole subject group with ICT so all the learners and teachers, e.g. Life Sciences, can use it for presentations.	EQUIP
	T18	The Department should provide schools with necessary technology. The Department of Education should also create programmes for teachers to attend so that they can learn how to integrate ICT skills into their teaching.	EQUIP, TRAIN
	T19		
	T20	Boot camp for teachers; training sessions for teachers away from school.	TRAIN
	T21	Bi-weekly updates at school level to strengthen the use of basic skills. To develop yourself and beware of new ICT tools.	TRAIN
	T22	Start with the young teachers and let them show and tell the rest about time saving, etc. Let an IT person take one-on-one teaching.	TRAIN
	T23	We already have CAT as a subject. Maybe we must start with ICT training from here on.	EQUIP
	T24		
	T25	Yes, they should implement training facilities of schools for the teachers.	EQUIP, TRAIN

Codes

Table 4.12: Codes, descriptions and frequencies regarding their opinions about ICT literacy strategies for secondary school teachers

Code	Description of code	Frequency
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TRAIN	Provision of training and development	16
TEAM	Team- and group work	1
EQUIP	Lack of equipment and resources	7

Question 8: What is your personal view on the use of ICT in the classroom?

Question Number	Interview respondent		Code
1	T1	It is a good thing to have and learners enjoy themselves. It takes less of your time to prepare.	MOT,ADMIN
	T2	I wish I could use ICT.	PART
	T3	I am a big believer that ICT helps education and learners respond easier in the ICT classroom than in the traditional classroom.	TEACH,STAND
	T4		
	T5	I am in favour of it. It helps to present work in a creative way. It also helps to keep the attention of the more difficult classes.	TEACH,STAND
	T6	I am on the fence. At times, it can be very useful and at other times, it misses the mark.	STAND
	T7	Positive and motivated. We just lack the time to convert text syllabus into multimedia instruction.	MOT,STAND
	T8	Very good and effective tool. Makes life so much easier.	ADMIN
	T9	Brilliant, effective and should be considered a necessity.	STAND
	T10	Very good. Work is neater than classrooms without ICT.	STAND
	T11	I personally think that ICT is a good resource in the learning environment. It promotes the learners' interests in the subjects but proper training is a must.	RES,TEACH,STAND
	T12	I love it if children find it very interesting because most of our lessons are presented with a projector and include video clips and colour with protectors.	APP
	T13		

	T14	We are living in the 20 th century and ICT is here to stay. We need to up the skills of all teachers and introduce ICT into all schools. The sooner we start, the better for all. ICT will enhance teaching and learning at school. All role players to become involved: Education Department, government, teachers, schools parents business	TEACH,STAND
	T15	ICT can create a better learning environment for learners.	MOT
	T16	The use of ICT enhances teaching in different ways. <ul style="list-style-type: none"> - Learners can be approached by using different kinds of stimulation – visual auditory, etc. Conclusively, it is a plus point when using IG. - Learners’ ability is tested and broadened. - All using ICT correctly. I am able to assist learners more individually. 	APP,TEACH,ST AND
	T17	I feel very positive about it and think it will be a positive attribute in classrooms.	MOT,STAND
	T18	ICT in the classroom is a necessity for all teachers. It also encourages teachers to plan lessons more effectively. Makes teachers lives easier.	ADMIN,STAND
	T19		
	T20	ICT in class is the future. Teachers should jump in and adapt.	MOT
	T21	Love it, use it, can do without it.	MOT
	T22	It will make life easier; preparation is better over the years; learners enjoy it.	ADMIN
	T23	I am for it, but within reason – not having to spend all my own money.	TEACH
	T24		
	T25	It can contribute to universal access of education, quality learning and teaching; teachers’ professional development; as well as improve education management.	TEACH,ADMIN,S TAND

Codes

Table 4.13 Codes, descriptions and frequencies regarding teachers' perceptions about the use of ICT in the classroom

Code	Description of code	Frequency
NET	Internet as teaching tool	0
PART	Participating in learning	1
RES	Research	1
MOT	Capturing attention as visual or motivational aid	6
ADM	Administrative activities	5
TEACH	ICT use to teach	7
APP	Application or real-life examples	2
STAND	Raising standards or educational outcomes	12

INTERVIEW CODING AND FREQUENCY BY QUESTION

QUESTION	Code	Description of code	Frequency
1	NET	Internet as teaching tool	4
	PART	Participating in learning	2
	RES	Research	3
	MOT	Capturing attention as a visual or motivational aid	1
	ADMIN	Administrative activities	6
	TEACH	ICT use to teach	10
	POS	ICT use has a positive impact on grasping capacity	1
	QUIK	Quickness or efficiency	1
	FAC	Facilities or technology associated with ICT	1
2	NET	Internet as teaching tool	4
	PART	Participating in learning	1
	RES	Research	3
	POS	ICT use has a positive impact on grasping capacity	2
	TEACH	ICT use to teach	5
	ADMIN	Administrative activities	2
	VAR	Variety of approaches in teaching and learning	7
	PROJ	Projector technology	1
	FAC	Facilities or technology associated with ICT	6

	XLS	Spreadsheet software	5
	MOT	Capturing attention as a visual or motivational aid	1
	STAND	Raising standards or educational outcomes	1
QUESTION3	Code	Description of code	
	NET	Internet as teaching tool	0
	RES	Research	2
	ADM	Administrative activities	0
	TEACH	ICT use to teach	3
	STAND	Raising standards or educational outcomes	10
	POS	ICT use has a positive impact on grasping capacity	7
	SUBS	ICT is not acting as a substitute for good quality education	1
	VAR	Variety of approaches in teaching and learning	3
	MOT	Capturing attention as visual or motivational aid	2
4	TRAIN	Provision of training and development	12
	PART	Participating in learning	2
	EQUIP	Lack of equipment and resources	8
	TEACH	ICT use to teach	1
5	NET	Internet as teaching tool	1
	PART	Participating in learning	1
	APP	Application or real-life situation	1
	ADM	Administrative activities	1
	TEACH	ICT use to teach	3
	SEC	Security measures	1
	EQUIP	Lack of equipment and resources	10
	ATT	Attitude of role-players towards ICT	10
	TRAIN	Provision of training and development	6
6	NET	Internet as teaching tool	1
	PART	Participating in learning	1
	APP	Application or real-life situation	1
	ADM	Administrative activities	1
	TEACH	ICT use to teach	3
	SEC	Security measures	1
	EQUIP	Lack of equipment and resources	10
	ATT	Attitude of role-players towards ICT	10

	TRAIN	Provision of training and development	6
7	TRAIN	Provision of training and development	16
	TEAM	Team- or group work	1
	EQUIP	Lack of equipment and resources	7
8	NET	Internet as teaching tool	0
	PART	Participating in learning	1
	RES	Research	1
	MOT	Capturing attention as visual or motivational aid	6
	ADM	Administrative activities	5
	TEACH	ICT use to teach	7
	APP	Application or real life examples	2
	STAND	Raising standards or educational outcomes	12