

THE IMPLEMENTATION OF INFORMATION AND COMMUNICATION TECHNOLOGY  
(ICT) IN TEACHING AND LEARNING IN REKOPANTSWE AREA OFFICE SCHOOLS

BY

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**Declaration of authorship**

I declare that this dissertation which I hereby submit for the degree

Magister Educationis

in

Educational Management

at the North-West University, is my own work and has

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or any other tertiary institution.

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Signed on the..... day of..... 2015.

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## **Abstract**

The purpose of this study was to assess the implementation of Information and Communication Technology (ICT) in teaching and learning in Rekopantswe Area Office schools. The effective and sustainable use of ICTs has become of utmost importance to meet the educational demands of the 21<sup>st</sup> century for both teaching and learning. Integration of ICT has become more than just an addition to the existing practices. Therefore the role played by teachers and principals in the implementation process, determines the successful integration in the classroom. Constructivism as a theoretical framework was used in this study. This theoretical framework maintains, inter alia that the learner must individually discover and transform information in order to make it the individual's own. In South Africa computers were introduced in schools in the 1980s mainly for administrative purpose. As South Africa experienced democracy in 1994 the Department of Education (DoE) fully implemented ICT into the school curriculum as well as in the school administration. Although different methods and initiatives have been tried in the implementation process throughout Rekopantswe Area Office, no systematic-wide effective and sustainable ICT integration in schools has come about. The implementation process is gradual and teachers avoid using technology in their teaching and learning practices due to lack of confidence, resistance to change and negative attitudes, insufficient training, insufficient technical support and insufficient infrastructure. A qualitative approach was used in this study. Various sources of data collection included semi-structured interviews, focus group interviews and observation.

## **Keywords**

Information and Communication Technology (ICT)

Implementation

Teachers

Integration

Technology

Effective

Sustainable

Principals

Classrooms

**Glory be to God my Saviour for the strength and wisdom to complete this research study.**

## **Dedication**

I dedicate this dissertation to my mother Tebogo Merriam Salome Mokgadi.

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# **THE IMPLEMENTATION OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN TEACHING AND LEARNING IN REKOPANTSWE AREA OFFICE SCHOOLS**

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To Whom It May Concern,

This is to certify that I have edited Thapelo Mokgadi's dissertation titled

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learning in Rekopantswe Area Office**

checking the spelling, grammar, punctuation, spacing and for repetition.

I wish him the best of luck with his submission.

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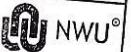
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Signature of Supervisor: [Signature] Date: 2/10/15

Signature of School Director: [Signature] Date: 2-10-15

Signature of Dean: [Signature] Date: 3/11/15

## **CHAPTER ONE: ORIENTATION**

### **1.1 INTRODUCTION AND BACKGROUND**

This dissertation is titled *the Implementation of Information and Communication Technology in Rekopantswe Area schools*. There are two main constructs in this title namely, *the concept*, information and communication technology (ICT) and *the implementation* of information and communication technology. These constructs encompasses a description and listing of all electronic media such as computers, video, internet, mobile devices and associated hardware, software and networks that form part of the study as well as an indication regarding the usage thereof to enhance effective functioning (Ng, 2010:177). The key concept in these constructs is clearly, ICT. When this concept is applied to schools it can be related to what the president of the United States of America said when he remarked,

We're going to work with States to give teachers who want to use these technologies the professional development that they need... So what we're going to be able to do is to get companies to compete to create affordable digital devices designed specifically to these new connected classrooms. I want to see a tablet that's the same price as a textbook. I want to see more apps that can be instantly updated with academic content the day it is available, so you don't have old, outdated textbooks with student names still in them from years ago. These are the tools that our children deserve (Obama, 2004).

In South Africa, the following noteworthy initiatives were undertaken to promote the implementation of ICT in schools. In the Eastern Cape's Cofimvaba municipality, one of the poorest regions in South Africa technology makeover is taking place. The R6 million Cofimvaba School District Technology project, is an experiment in whether and how technology can improve teaching in rural areas (Hole-in-the-wall, 2010). Regrettably, these developments are underscored by difficulties in integrating ICT into rural schools (Mdlongwa, 2012:7).

The Minister of Basic Education, Mrs Angie Motshekga, refers to another initiative when she announced in Cape Town on 17 May 2012 that "The good news is that broader plans on using ICT to enhance learning and teaching are gathering steam. Our Department has developed, with the Department of Communication, a connectivity plan providing a comprehensive framework for achieving cost effective and efficient connectivity for all schools. In 2011, 2 334 schools were connected to the Internet for the purpose of teaching and learning." Mdlongwa (2012:7) however, argues that there is still a struggle among schools to meet basic infrastructure needs.

The fact is, rural schools are faced with overcrowded classes or do not have classrooms at all, have no toilets, lack textbooks, and furniture and other basic infrastructure hence they are likely to see the integration of ICT in education as more of a luxury than a necessity.

The Basic Education Deputy Minister, Mr Enver Surty, also emphasised the government's commitment to the implementation of ICT when he launched a revolutionary initiative in Boksburg, 18 March 2014, in partnership with Modern Information Business (MIB). Prescribed e-textbooks were made available as PDF downloads with support from three publishing companies, Macmillan, Maskew Miller and Longman. This initiative means that teachers and learners were given the ability to log onto a massive portal that contains all the books, on all the subjects, in all the grades as well as access to all material they need (e-Learning, 2014:13). Ertmer, Parisio and Wardak (2013:5), contend that the integration of technologies in any teaching and learning process must take cognisance of the intrinsic "context-based factors – that is, the diverse learner contexts (varying socio-economic backgrounds), the availability of technological infrastructure (more especially the issue of access and connectivity speed), and the type of content being designed and how it is delivered".

It is important to note that the above-mentioned kind of changes must be implemented in an existing regulatory framework. In the following paragraph, some of the key components of such a framework are indicated.

In the NCS it is stated that the South African education system is based on progressive, learner-centred outcome-based education, with integrated approach to knowledge. Both the Need for an e-Education Initiative (South Africa, 2007:81) and the National Curriculum Statement (RSA, 2002:8) for grades R-9, encourage the use of ICT for teaching and learning, especially in learning areas not traditionally taught with the aid of technology. This encouragement is manifested in the critical outcomes, which among others require learners to use science and technology to solve problems and improve their communication abilities (RSA, 2007:58). Learning with ICT is a powerful way to support learners to achieve NCS goals (RSA, 2007:19).

In addition, ICT can only be implemented if there is adherence to policy imperatives. Such imperatives were set out as strategic objectives in the draft White Paper on e-Education (RSA, 2007b) these are:

- ICT professional development

Every teacher, manager and administrator in general and further education and training must have the skills, training and support they need to integrate ICT in teaching and training.

- Electronic content resources

The school curriculum in general and Further Education and Training curriculum is supported through effective and engaging software, electronic content and online learning resources and teachers, content developers and administrators contribute to these resources.

- ICT infrastructure

Every teacher and learner in General and Further Education and Training must have access to an ICT basic set, including computers.

- Connectivity

Every teacher and learner in General and Further Education and Training must have access to an Educational Network and the Internet.

- Community engagement

Schools must work in partnership with families and the wider community to ensure shared knowledge about ICT and extended opportunities for learning and development through ICT.

- Research and development

The research and development community must continuously assess current practices and explore and experiment with new technologies, methodologies and techniques that are reliable and will support teachers and administrators in e-Learning and e-Administration.

The researcher has been a teacher at Letsatsing Secondary School for the past sixteen (16) years and personally experienced challenges in the management and implementation of ICT at this school. It is important to highlight that the school falls within the Rekopantswe Area. In addition, the school is situated in an urban area although most learners come from rural areas. In so far as the researcher could establish there are no examples of successful ICT implementation at the

school. The computer laboratory for example is not functional. Other challenges range from a lack of interest by management, shortage of facilities, and financial constraints.

## 1.2 PROBLEM STATEMENT AND RESEARCH QUESTIONS

The progression from a research topic to research questions can be seen as a sifting process (Creswell, 2009:79). This process is activated by determining what research has already been done on the topic and involves a study of relevant articles, books and theses and the posing of questions like what the research want to investigate, when, why and how (Creswell, 2009:7).

In paragraph 1.1 some challenges that are related to ICT implementation in schools are mentioned. The first practical challenge is whether these schools have the necessary infrastructure to back the implementation of ICT education. Closely linked to the availability of infrastructure is the question on adequate technical support (Poole, 2008:15). Saiti and Prokopiadou (2009:305) indicate that ensuring the quality and permanency of technical assistance contributes one of the important factors for the efficient introduction and exploitation of new technological capabilities. If schools in the Area therefore do not have the necessary technical support, the introduction of a strong ICT component would probably be an exercise in futility.

The socio-economic context of learners and teachers may also affect ICT adoption in disadvantaged schools. In affluent settings, many learners and teachers have access to computers at home. They are therefore confident regarding use of computers in school settings (Muller, Sancho, Hernandez, Giro & Bosco, 2007:175). Teachers and learners in disadvantaged areas have a low propensity to use computers. As a consequence, their computer skills are less advanced, making it more difficult to use computers in teaching and learning situation (Bovee, Voogt & Meelissen, 2007:176). Obviously, the socio-economic conditions of learners and the degree to which they can expect support from their parents and the wider community should also form part of the research questions. Another question that is frequently asked by practitioners is whether technical, managerial and teaching staff has been empowered sufficiently with ICT related skills. Becta (2004:7) stated that “many teachers who do not consider themselves to be well skilled in using ICT feel anxious about using it in front of a class of children who perhaps know more than they do.” Lack of confidence and experience with technology influence

teachers' motivation to use it in the classroom (Osborne & Hennessey, 2003:75, Balanskat *et al.*, 2006:45). In an Australian research study, Newhouse (2002:95) found that teachers lacked the knowledge and skills to use computers and were consequently not enthusiastic about the changes and integration of supplementary learning associated with bringing computers into their teaching practices. Becta (2004:12) claims further that one key area of teachers' attitudes towards the use of technologies is their understanding of how these technologies will benefit their teaching and their students' learning. Schoepps (2005:17) study also found that, although teachers felt that there was more enough technology available, they did not believe that they were being supported, guided or rewarded in the integration of technology into their teaching. According to Empiricia (2006:15), teachers who are not using new technology such as computers in the classroom are of the opinion that the use of ICT has no direct or indirect benefits.

In South Africa, the prohibitively high cost of installing ICT is another aspect that prevents effective implementation of ICT. According to Mdlongwa (2012:12), the government does not prioritise ICT implementation as compared with other basic services. Furthermore the more costs are incurred in computers and their accessories, the fewer computers will be bought with limited resources (Sharma, 2003:35). Tusubira and Mulira (2004:63) maintain that the cost of a desk top computer connected to the internet is often prohibitive for most people in developing countries, where there is affordability for a personal computer (PC), routine maintenance, virus protection and servicing is yet another problem that is not easily manageable.

In formulating a research problem the researcher considered the above mentioned challenges to establish which specific problems can be addressed in this study as research problems. As a first step the following main research problem was formulated as question.

What is the effect of ICT implementation on teaching and learning on schools in the Rekopantswe Area Office?

The study was further supported by the following specific research questions:

- What are the key ICT related aspects that effect implementation in the schools?
- What kind of support is available for ICT implementation in schools?
- What is the relationship between ICT implementation in the schools and teaching and learning?

## **1.3 RESEARCH DESIGN AND METHODOLOGY**

### **1.3.1 Research design**

A qualitative design has been chosen for this study. The reasons for this selection are explained in the rest of this paragraph. Leedy and Ormrod (2005:139) maintains that one of the features of qualitative research is that it is interpretive and practical in character; that is the participants try to explain their opinions or feelings to the researcher. According to Henning, Van Rensburg and Smit (2004:5), qualitative research denotes the type of inquiry in which the qualities, the characteristics or the properties of a phenomenon are examined for better understanding and explanation. The researcher asked questions aimed at establishing the participants' perceptions about all the issues surrounding the implementation of ICT education in their schools.

### **1.3.2 Methodology**

#### **1.3.2.1 Research approach**

Creswell (2009:11) explains research approaches or strategies of enquiry as specific types of qualitative studies. An exploratory case study design was selected for this investigation. Creswell (2009:13) defines a case study approach as “a strategy of inquiry in which the researcher explores in depth a program, event, activity, process, or one or more individuals”. The case study approach to be followed in this study is of an exploratory nature. It is an attempt to understand phenomena through the meanings that people assign to them (Maree, 2008:59). The researcher tried to understand the participants' life worlds by interacting with them about the research questions. The interaction revealed their disillusionment and eagerness in seeing ICT being used in teaching and learning. This was emphasised by the response they gave to the interview questions.

#### **1.3.2.2 Participants and Site selection**

Purposive sampling was selected for this study with specific focus on two secondary schools and a primary school in the cluster of Rekopantswe Area Office. De Vos, Strydom, Fouche and Delport (2010:202) indicate that in purposive sampling, a particular case is chosen because it illustrates some feature or a process that is of interest for a particular study. The selection of participants for the individual interviews was based on their daily involvement with ICT in teaching in their respective subjects at school. The researcher selected twenty-nine participants

who comply with this requirement. The participants interviewed consisted of eighteen learners, eight educators and three principals. Four educators, six learners and a principal were chosen from the primary school, which is school B. Two educators, six learners and the principal of secondary school A and other two educators, six learners and the principal from secondary school C were also chosen. In total eleven participants comprising three principals and eight educators were selected for the individual interviews, with eighteen learners selected for the group interviews.

#### 1.3.2.3 Data Collection Strategies

The researcher used individual interviews, observation and group interviews to obtain a proper understanding of the problem.

- Individual interviews

MacMillan and Schumacher (2010:206) state that in semi-structured interviews, the researcher will have a list of themes and questions to be covered. In addendum H the questions that were used for the interviews with principals and teachers are indicated. These questions were derived from the research questions and approved at a Research Ethics meeting on 14 September 2015. The interviews with teachers and principals were designed with the focus on managing the implementation of ICT in Rekopantswe Area Office. The researcher first requested permission from the participants to use certain parts of the interview and make an interpretation of such throughout the project.

- Group interviews

Group interviews can be described as when a group of individuals are selected, assembled and interviewed by a researcher to discuss a comment on a topic that is the subject of a research based on personal experience (Clarke, 2000:77).

In this study eighteen learners were interviewed from the three selected schools within Rekopantswe Area Office. The researcher conducted three group interviews, consisting of six learners per school. The interviews were arranged with learners after school. This was done so as to avoid disturbance in teaching and learning at the school. The participants were asked to reply to each of the interview questions as indicated in Addendum H.

- Observation

Nieuwenhuis (2010:83) defines observation as the systematic process of recording the behavioural patterns of participants, objects and occurrences without necessarily questioning or communicating with them.

The researcher observed specific aspects such as the seating arrangement of learners, the organisation of furniture, attitude and behaviour of learners during the lesson presented by the teacher. Furthermore the responses of learners during lessons and their interaction with the teacher were observed. The learner's contribution in the lesson was also observed by attending to the non-verbal cues such as style of speaking and non-verbal forms of communication like changing seats. The researcher paid attention to the non-verbal cues, or moving about. Non-verbal cues such as consistent talking and lack of attentiveness were also noted. Some of these observations were recorded as indicated in Addendum F.

#### 1.3.2.4 Data analysis

According to Nieuwenhuis (2008:99), qualitative data analysis is an approach that tries to establish how participants understand a specific phenomenon by analysing their perceptions, attitudes, understanding, knowledge, values, feelings and experiences in an attempt to approximate their construction of a particular phenomenon. Data analyses will make use of breaking down (coding) data into smaller functional parts to expose their distinctive features so that meaning can be made (Leedy& Omrod 2005:150).

#### 1.3.2.5 Trustworthiness

Trustworthiness tells us how reliable the gathered qualitative data is (Nieuwenhuis, 2008:113). The researcher complied in this respect by attending to the verification of new data, stakeholder checks and achieving credibility. On completion of interviews the transcripts were given to the interviewees to correct errors or facts as discussed in paragraph 3. By allowing this to be done the researcher's findings were enhanced. The researcher also kept notes during the research process; especially as far as the data collection and analysis process is concerned to maintain a kind of audit trail and thus increased the credibility of the study (Addendums D and E).

### 1.3.2.6 Ethical Issues

According to McMillan and Schumacher (2010:334), research that is trustworthy does not only engage participants in a responsible way but also observe ethical measures. De Vos *et al.*, (2006:57) and MacMillan and Schumacher (2010:338) maintains that ethics is a set of moral principles about the most correct conduct towards respondents. According to MacMillan and Schumacher (2010:338), qualitative researchers have to be sensitive to ethical principles because of the nature of the research topic and the face-to-face interaction they have with the participants when collecting data. The following two ethical issues were directly applied in this study, *Respect for privacy and informed consent*.

The names of the participants are provided as alphabetical codes and do not appear on any documents. These codes are only known to the researcher. Informed consent was firstly achieved by obtaining permission from the Research Committee of the North-West University to conduct this research when he presented his proposal at a meeting in 2015. At a later meeting the researcher presented a Research Ethics application, which was accepted by the University (Addendum K). Permission was also obtained from the Area Manager to conduct the research (Addendum J).

## 1.4 CONTRIBUTION OF THE STUDY

The significance of the problem to be studied is that findings could be used to advance the body of existing knowledge about the management and implementation of ICT in schools. In addition School Management Teams (SMTs) should be enabled to perform their functions more effectively and diligently by using ICT to a greater degree. Furthermore teachers should be equipped to understand the use of ICT in teaching that could lead to reduction in their teaching. If teachers are empowered the experience and knowledge of technology usage would be passed on to the learners.

## 1.5 DEFINITION OF CONCEPTS

- *ICT (Information and Communication Technology)*

ICT is the combination of hardware, software and networks as well as the means of communication that assist in processing, management and exchange of data, information and knowledge (Department of Education, 2003:12). In this study the term ICT refers to all hardware, software and network components, programmes (operating, utility and application) and internet that enable educators to teach better and learners to learn better.

- *Communication Technology*

The concept *Communication Technology* stems from the word *Technology*. Technology has to do with the usage of machines, equipment, phones, faxes, modems and computers that are based on modern knowledge. *Communication technology* is the term used to describe the process of communication that takes place when technological means are employed to establish and maintain contact between different individuals and organisations.

- *E-learning*

The concept *e-learning* is usually explained as learning that takes place when learners use ICT resources, tools and computer applications in their learning. The focus in e-learning is however wider in the sense that interaction among teachers and learners by accessing information in the online environment, forms part of e-learning. As such it has to do with collaborative learning by using computer technology.

- *Implementation*

In general terms implementation has to do with the putting into practice or execution of policies, plans, designs, ideas, models or standards. In this dissertation the focus is on how ICT policies can be put into practice. More specifically the researcher looked at the ways in which these policies can be applied in practice in schools in the Rekopantswe Area Office.

## **1.6 CHAPTER OUTLINE**

- Chapter 1: Introduction and overview
- Chapter 2: Literature review
- Chapter 3: Research design and methodology
- Chapter 4: Results and discussion
- Chapter 5: Conclusions, recommendations and limitations of the study

## **CHAPTER TWO: THE IMPLEMENTATION OF INFORMATION AND COMMUNICATION TECHNOLOGY**

### **2.1 INTRODUCTION**

A literature review is an important area of study as it establishes links between existing knowledge and the research problem under investigation (McMillan & Schumacher, 2010:73). Leedy and Ormrod (2010:66) concur that the literature review describes theoretical perspectives and previous research findings regarding the problem at hand. The literature review connects with the problem statement and shows a close link with the research questions. The literature investigation would in particular address the following aspects of the research questions in relation to schools; *what are the key characteristics regarding the implementation of ICT?; what kind of support is available for ICT implementation?; what is the relationship between teaching and learning and ICT implementation?; how can the implementation of ICT in schools be improved?*

The role and importance of technology in the curriculum is a given educational reality. With this reality, the challenge facing educational leaders and technology coordinators is to look into the future direction of education and better synchronise learning with modern, technological pedagogies and curriculum (Whitehead, Jensen & Boschee, 2013:1). Researchers, governments and educators have increasingly recognised that ICT presents many opportunities for teaching and learning in education. Furthermore, researchers argue that a lack of ICT in the classroom may be seen as disadvantageous for learners because without access to this, they are denied opportunities to acquire some of the skills and attributes they need to become full participants in an increasingly ICT mediated and globalised world (UNESCO, 2008:40).

It is also important to note that in education ICT needs to be supported by appropriate policies at all levels and effective professional development for teachers (Tondeur, van Keer, van Braak & Valcke, 2008:212-223).

Effective implementation of ICT in schools can be achieved if school leaders, particularly the principals, support such initiatives; learn and use them in their instructional and administrative tasks; support their teachers in the process of change and provide sufficient development opportunities for themselves and their staff (Afshari, Abu Bakar, Su Luan, Say Fooi & Abu

Samah, 2009:79). Schiller (2011:30-41) emphasises that principals as change facilitators carry the responsibility of initiating and implementing school change through the use of ICT and can facilitate complex decisions to integrate it into learning, teaching and school administration.

The use of ICT and computers in particular, can no longer be regarded as optional for teaching and learning. It is a requirement that learners become ICT-capable. e-Education requires that teachers, managers and administrators in public schools have the knowledge, skills and support necessary to integrate ICT into teaching, learning and administration (Tondeur *et al.*, 2008:215). The requirement to effectively manage ICT implementation and resources has become a major responsibility of all school stakeholders, that is educators, principals, learners, parents and business people.

The implementation of ICT in schools could be beneficial for schools and lead to the improvement in students' achievement levels. The implementation process is further closely linked to the fact that although the increased use of technology in a complex school system is very important it must always also be approached in a systematic and well planned way (Hall & Hord, 2001:21). Implementation must be done against the background of achieving academic and organisational goals (Nanjappa & Grant, 2003:38). This means that with the implementation of ICT in schools, teacher's pedagogical practices are determined not only by their academic qualifications and ICT-competence levels, but also by school and system level factors (Law and Chow, 2008:19). Biao and Sivin-Kuchala (2007:7) maintain that students' achievement levels become improved while engaged in learning using technology. Doolittle (2003:71) further states that learners' learning is facilitated when they are challenged, interested and engaged in the processes of learning.

In the rest of the chapter the following sections will be addressed:

- Theoretical framework;
- The implementation of information and communication technology (ICT) in education;
- The role of different stakeholders in ICT-leadership;
- Methods of implementing ICT in schools;
- Benefits of using ICT in schools;
- Challenges with the implementation of ICT in schools.

## 2.2 THEORETICAL FRAMEWORK

The central idea with constructivism is that “the participants can construct the meaning of a situation, typically forged in discussions or interactions with other persons” (Creswell, 2009:8). In this paragraph constructivism is explained as a theoretical framework that underpins ICT learning. As such the roles of teachers and learners are highlighted with the idea that this information serve as a base-line in addressing the research questions of this study.

### 2.2.1 Constructivism as Learning

Constructivism as a “philosophy of learning is based on the concept that during the learning process, individuals do not passively acquire or absorb a new understanding. Instead, new information is actively assimilated into existing cognitive structures while simultaneously altering these structures. For this reason, what is learned by individuals is always framed within the context of what they already know; each of us generates our own individual understanding of the world” (Piaget, 1977:78).

According to Nieman and Monyai (2007:7) the following are the most basic assumptions that underlie constructivism; knowledge development is constructed from experience; a learner actively constructs knowledge as a personal interpretation to make sense of the world; conceptual growth comes from the discovery of knowledge, negotiation of meaning, the sharing of multiple perspectives and the changing of one’s representations through collaborative learning. In the following three paragraphs these basic constructs are discussed as applied to ICT learning in this dissertation.

As mentioned constructivism is an approach to learning in which students form their own knowledge as a result of their experiences and interactions with others, and are afforded the opportunity to contribute this knowledge to a wider knowledge base for the benefit of existing and new learners (Holmes *et al.*, 2001:320). Oluwafisayo (2010:19) said further with regard to ICT learning that it is linked to constructivist theory because of the way that students have access via the internet to massive amounts of information, which they can use to determine their own path of learning. In addition, learning through the internet prepares students for their global existence, being able to use technology outside the classroom in their daily life, to connect with others in the wider community and around the world (Oluwafisayo, 2010:26). This statement is

particularly true of learners in our modern world because as Young (2013:25) explained in the Mail & Guardian “as new technologies like e-reader and tablets are developed, learners embrace them at a faster pace than their parents.”

The second premise that was mentioned is that a learner actively constructs knowledge as a personal interpretation to make sense of the world knowledge. Schunk (2012:65) emphasises in this regard that learners create or construct new understanding rather than reproduce information, by actively building upon prior knowledge and reflecting on own experiences. What is particularly applicable to ICT learning is that learners are said to create meaning directly from external sources such as teachers (Murphy, 2003:17). Morphew (2012:175) added with regard to ICT learning that through technology learners are enabled to true discovery and exploration. Additionally Morphew (2012:146) also said that learning through the use of technology enable learners to discover and transform complex information and make it their own.

The third aspect referred to previously is that deep understanding of knowledge come about through the sharing of insight and the changing of one’s views through collaborative learning. Cohen and Manion (2008:68) argue in this regard that learning by using technology promote understanding because it encourages higher-order thinking, self-regulated learning and co-operative learning. In this way a learner’s newly created knowledge is an integrated feature of the collaborative learning base and contribute to improvement in society (Gardner & Holmes, 2006:85). Learning is thus a key component of the social discourse and the knowledge society (Mouza & Lavigne, 2013:4). Knowledge that is acquired and distributed through e-Learning, via one-to-one exchanges, one-to-many and many-to-many interactions can hence be seen as hugely magnified opportunities for communal support for learning and most importantly for providing a medium to store and make available the knowledge created by the wider learning community.

## 2.2.2 Constructivism and Teaching

The constructivist view on ICT issues as applied to teaching was highlighted by Bhattacharya and Sharma (2007:560) who said that teachers need to go beyond traditional approaches and become acquainted with new methods in order to get a clear understanding of the educational functionality of technological tools in their education practices. The increased use of ICT in schools should lead to improvement of the quality of teaching. The value of using digital

technologies is that they can provide students with real-world experiences. New information and improved use of ICT strategies bring exciting curricula based on real world problems into the classroom and provide scaffolds and tools to enhance learning (Kozma, 2003:145). Doolittle (2003:71-103) is of the view that technology integration into the classroom can transform the teaching of key contents and skills. Nanjappa and Grant (2003:38) believe that teachers can change into facilitators in the classroom and increase the speed of changes in their teaching style if they have access to technology. The application of new, particularly ICT-based methods, is an important factor in improving student performance (Fosnot, 2005:119; Meyer, 2009:334).

More directly on classroom teaching Mikusa and Lewellen (2000:158-163) are of the view that the most valuable quality of a teacher applying constructivistic pedagogy in classroom is where the focus is on the intuitive vision of learners' minds as they grope and fumble to grasp new ideas. In this example teachers' main task is to correct or warrant the knowledge a learner constructs, therefore promoting the development of powerful and effective knowledge formulation (Fosnot, 2005:127). A teacher who teaches in a constructivist learning environment must therefore stimulate an interactive and informative learning environment (Schwartz, 2000:40). According to Murphy (2003:70) a teacher is in a position to intervene in the learning that is occurring, rather than being in charge of the act of learning.

## 2.3 THE IMPLEMENTATION OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN EDUCATION

According to Wozney *et al.* (2006:175), the absence of systematic integration and planning strategies can hinder management efforts to integrate ICT into their educational practices. Cuban *et al.* (2001:830) states for example that "the prevailing assumptions guiding policy on new technologies in schools are deeply flawed and in need of re-assessment". There is a need to develop new curricular and to ensure that ICT integration is done in accordance with school culture (Albirini, 2006:340). In the rest of this section the focus will be on how these kinds of matters affect the integration of ICT in education.

### 2.3.1 ICT implementation in South African Schools

The use of computers was introduced into schools in South Africa during the 1980s, primarily in private schools and a few well-resourced government schools. The educational system had to be

aligned with the international world's education, hence attention being focused on technology-enhanced learning in the hope that it may offer some solutions to the challenges of education (Howei, Muller & Patterson, 2005:5-12). Initially computers were mainly used for administrative purposes such as keeping student records and creating time-tables, but with the continuous advances in ICT, this later changed (Mdlongwa, 2012:2). The advent of democracy in 1994 led to the Department of Education (DoE) stepping up the introduction of ICT into the school curriculum as well as in school administration. Among others the DoE sought to provide connectivity to enhance teaching and learning, and provide the relevant support services such a pedagogical curricular, assessment, managerial and administrative (Department of Education, 2004). According to the Pan African Research Agenda (2008-2011), ICT in South Africa was introduced in schools to give education access to all. Due to ICT schools have become centres of learning for their communities (UNESCO, 2000:15-16).

The Department of Education (DoE) further confirmed the importance of ICT use in Education, suggesting that all students should be computer literate by 2013 (Wilson-Strydom, Thomson & Hodgkinson-Williams, 2005:74). However, despite the opportunities of ICT in education, there are still schools in South Africa that do not have access to ICT. Moreover, those schools that do have access to ICT, tend to use it in a limited manner and mainly focus on learning about computers or acquiring ICT skills rather than integrating ICT into the classroom (Mueller, Wood, Willoughby, Ross & Specht, 2008:1525; Goktas, Gedick & Baydas, 2013:215). Bialobrzeska and Cohen (2003:17) state that generative use, that is implementation with integration is not a norm in South African schools, mainly because many teachers lack the skills required to integrate ICT into teaching and learning activities. Unwin (2005:120) supports this and states that this as a problem across Africa and in many developing countries.

### 2.3.2 School culture and ICT implementation

Maslowski (2001:75) argues that school culture has to do with vision, plans, norms and values that are shared by school members. Focusing on the importance of school culture for ICT integration, Pelgrum and Law (2009:210) indicated that effective ICT integration depends on the perceptions and vision of school leaders rather than teachers' ICT skills. The culture of the school has a mediating role that influences teachers' actions, beliefs and attitudes. In order to explore teachers' perceptions of school culture related to the level of ICT usage, Tezci

(2011:435) examined Turkish teacher perceptions from both the technical and motivational perspectives. The findings showed that their perceptions from both perspectives were not positive, because most of them did not believe that they would receive adequate technical and motivational support from their school. However, as the school culture became more positive, the teachers' ICT usage level increased. Ward and Parr (2010:119-120) indicated that teachers need to feel self-assured in their ability to facilitate student learning with technology in order to integrate technology into their classrooms. Overall, effective implementation of teaching with technology requires changes in teachers' knowledge, beliefs and school culture (Ertmer & Otternbreit-Leftwich, 2010:250).

### 2.3.3 School policies and ICT implementation

The integration of computers in the school environment in many countries came about as a result of government policy pronouncement (Pearson, 2001:35; Crawford, 2000:185; Kirkman, 2000:37-52). A government policy functions as a notice to the citizen at large that a new, revised or accelerated programs of action on particular issues are intended within a given time frame (Koech, 2000:55). As a notice to the citizen about government plans for them, a government policy therefore becomes a public policy (Jansen, 2002:205). According to Jones (2003:163-194) and Kozma (2003:11), ICT policy can serve several important functions. *Inter alia*, it can provide a rationale, a set of goals, and a vision for how education systems might be with the introduction of ICT and how students, teachers, parents and the general population might benefit from its use in schools.

Balanskat, Blamire and Kefala (2006:54) state that educational policymakers should pay more attention to policies that stimulate teachers to integrate ICT more and more effectively. Some researchers point to the importance of perceptions and visions held by educational leaders and policymakers. Pelgrum and Law (2003:45) for example maintain that effective implementation of ICT depends on educational leaders' perception and vision towards ICT and school culture. Similarly, Tondeur, van Keer, van Braak and Valcke (2008:220) emphasise that successful implementation of ICT occurs when a school has a shared vision, develops ICT implementation strategies, and its teachers "share the values expressed within the school policy and understand their implications." Lim and Khine (2006:119) indicate in their study of four schools that a shared vision and ICT implementation plan provides school educators with an opportunity for

communication about how ICT can be used, as well as “a place to start, a goal to attain, and a guide along the way”.

#### 2.3.4 ICT implementation in Curriculum matters

Curriculum policy connects the use of ICT to the development of students’ ICT skills which can be applied in the workforce to develop their capacity to the use of technology to solve complex real world problems that can contribute to productivity, and to their development of new kinds of “21<sup>st</sup> century” and lifelong learning skills which support knowledge creation, innovation and entrepreneurialism in a “knowledge economy” (Kozma, 2003:34). An example of this approach is Singapore where education policy has always been strongly linked to the development of human capital (Ashton, Green, Sung & James, 2002:15). The country integrates ICT with changes in curriculum, assessment, instruction, professional development and school culture to provide students with and prepare them to participate in the country’s knowledge economy (Mui, Kan & Chun, 2004:487). Another example is the Jordanian education policy which commits the ministry to reform curriculum so as to balance traditional subject matter with learning process outcomes that make effective use of ICT and that engender, knowledge creation and management (Ministry of Education: Jordan, 2005). Similarly, the South African education ICT policy document (Department of Education, 2003:13) states, “Learning through the use of ICT is arguably one of the most powerful means of supporting learners to achieve the nationally-stated curriculum goals.

The South African system of 1994 is by implication an inclusive and democratic political system (Howie *et al.*, 2005:76). The country adopted a host of legislation that governs and mandate delivery of education. The *White Paper on e-Education: Transforming Learning and Teaching through Information and Communication Technology* (Republic of South Africa, 2004) acts as the official governing policy on e-Education in South Africa. This policy “... supports larger systematic pedagogical curricular and assessment reforms that will facilitate improved education and improved use of educational resources such as ICT” (Republic of South Africa, 2004:14).

#### 2.3.5 Staff Development as key in ICT implementation

According to Blackmore, Hardcastle, Bamblett and Owens (2003:40), the development of teachers should come long before their ICT use due to the fact that, they are key players in

learning and teaching. The United States of America (USA) one of the developed nations had also highlighted the significance of teachers' professional training and that attitude toward computer use can be improved by training its users. Ming, Hall, Azman and Joyces (2010:75) found that lack of skills and training in ICT makes many of the teachers to be reluctant in using it, which suggest that continuously training teachers will enable them to successfully use ICT in their teaching. Professional development helps update teachers' knowledge and skills and makes them involved in sharing knowledge with one another (Al-Harbi, 2011:61). Alwani and Soomro (2009:9) argue that pre-service and in-service teachers trained on ICT used it significantly more frequently than those not trained on it. Additionally studies found that successful integration of ICT into teaching and learning processes requires developing teachers' knowledge, confidence and skills on ICT use as well as providing them with the hardware and software (Reid, 2002:35; Ortega, 2000:15; Blackmore *et al.*, 2003:95). Hasanain (2005:105) assert that staff improvement program is almost necessary when an institution is changing its objectives or introducing new technology into its system. The quality of school's ICT equipment becomes irrelevant if teachers do not have the required competencies and are not well trained to handle and have appropriate skills with regard to the equipment (Ortega, 2000:25).

The White Paper on e-Education (2004:11) requires that the use of ICT, as a set of flexible tools for teaching and learning be integrated into the Initial Professional Education of Teachers (IPET) and Continuing Professional Teacher Development (CPTD). The implication is that all teachers should acquire relevant and appropriate ICT knowledge and skills and be able to integrate ICT appropriately in teaching, learning and administration (Department of Education: South Africa, 207:5). According to Fullan (2001:79), it is invaluable to invest in technology if teachers are not empowered. Teachers' continuous professional development is the key performance index for any school's growth. Experiences around the world have identified that teachers' effective professional development would help build a new understanding of technology and learning in the technology age (Lee, 2001:2). Additionally Al-Sulaimani (2010:12) purports that in developed countries education authorities have realised the significance of training and development in ICT. Day and Sachs (2004:7) further maintain that teachers' empowerment in terms of incessant training is perceived as a mechanism for driving change in educational systems. The development of teachers in terms of ICT will deepen their knowledge and skills, which is an integral part of the teaching profession (Mansour *et al.*, 2011:1). The strong structure

of education stands on the support offered to the teachers. It is necessary to satisfy teachers' needs and develop their skills to cope with new technology challenges and raise the educational standard. Successful utilisation on technologies depends on its users (Chittleborough *et al.*, 2008:4; Lee, 2002:2). In addition Robertson (2003:5) and Qari (2000:1) maintain that it is necessary to develop teachers for them to keep up with information, knowledge and skills for the ongoing innovations. Training and development will effectively boost the teachers' self-efficacy, motivation and computing habits (Robertson & Al-Zahrami, 2012:1).

## 2.4 THE ROLE OF DIFFERENT STAKEHOLDERS IN ICT-LEADERSHIP

In a study conducted by Tinio (2002:8) with a focus on the use of ICT in education, the findings indicated that ICT has been used over the years to improve access and the quality teaching and learning. In this process, different stakeholders have specific leadership roles to play. The following are considered the most important ones.

### 2.4.1 Principals

A principal who can delegate responsibilities and maintain a clear vision is a transformational leader. Such a person has the ability to influence others by aligning the vision with the values of the school (Dubrin *et al.*, 2006:39). ICT implementation in schools embraces the successful principal as a transformational leader who can set goals, organise and monitor others and build relationships. Such a principal is people centred and able to model values and practices consistent with ethos of the school (Koehler and Mishra, 2009:41). Such a principal's vision sets the goals to be attained with the focus on teaching and learning (Otto and Albion, 2002). Sweeney (2005:48-50) describe the qualities of an effective leader within the context of ICT matters as the ability to lead change and establish clear vision. A vision with an ICT focus on teaching and learning can create enthusiasm in the school and puts learners at the centre of learning. Hately and Schiller (2003:5-7) further maintain that clearly defined vision for ICT includes planning, funding and implementation; improving access and equity for use; understanding of legal and ethical issues; awareness of learning theory, pedagogy and curriculum development. Principals who are visionary and inspirational can develop the same qualities in others (Gurr, Drysdale & Mulford, 2006:371). The principal's vision of the possibilities of ICT in teaching and learning are realised through supporting and developing the skills of others.

The principal as a leader and user of ICT is regarded as a role model to the school community by demonstrating the importance of ICT. Such a role model is essential in developing an ICT learning culture within a school (Cusack, Gurr & Schiller, 2000:230; Day, Harris & Hadfield, 2001:47). While the principal is an effective role model to staff in ICT use and direction, it is not he/she who has to be the expert in ICT use (Haughey, 2006:22-36). As leader the principal should rely upon staff members to assist with ICT implementation and direction. It is reasonable to expect assistance from others to make informed decisions about ICT implementation (Hately & Schiller, 2003:6). Principals who are serious about being leaders in ICT matters should be comfortable with their own ICT to ensure effective ICT development in their schools (Lee, Gaffney & Schiller, 2001:209).

#### 2.4.2 Teachers

ICT leadership stems from a shared vision involving the support of the whole school community (Hately & Schiller, 2003:7). A distributive view of leadership is emerging as a result of ICT integration in schools, further adding to the school leadership reforms. Delegation and distribution of leadership to teachers promote the personal belief in the importance of ICT in the school. Dubrin, Dalglish and Miller (2006:37) describe delegation as a major contribution to teacher-empowerment. The delegation and distribution of responsibilities to teachers should further create a learning community where everyone is given an opportunity to contribute to decision making, thus empowering people by allocating ownership to the shared vision. Shared decision making, distributed leadership and professional learning will accordingly (Gurr *et al.*, 2006:380) motivate and empower teachers with regard to ICT implementation.

Schiller (2003:40) contends that school teachers play a critical role in the implementation of ICT in schools because they are responsible for making changes in their schools by facilitating the integration of ICT. Teachers further have a responsibility to ensure that learners receive information suitable for them to know how to be able to use computers in school. Teachers have to encourage learners to use ICT extensively throughout their studies. A study conducted by the South Africa Institute for Distance Education (SAIDE) revealed much about the reservations teachers in Western Cape had concerning the use and management of ICT in their schools (Bialobrezeska & Cohen, 2003:6). Among other things, the study looked into ways that teachers can be assisted in their educational development by gaining learning skills in imparting

knowledge using computers. The findings were quite remarkable as it was discovered that computers could be used through three different phases of schooling, viz foundation, intermediate and senior. Tinio (2002:23) emphasises the importance of the three phases. In the foundation phase, learners spend their time learning concepts and basic skills. The intermediate phase provides learners with an opportunity to expand their learning features into other learning areas, also enhancing their research skills.

#### 2.4.3 Parents

Parents are a critical component of the school technology process. Children learn more and often like school better if parents are part of the school process (Whitehead, Jensen & Boschee, 2013:164). According to Becta (2003:25), schools are using ICT to enhance and add a new dimension to the learning process and also to increase communication between the home and school. As a result of research, educators have realised the need to use technology to involve parents as stakeholders in their children's education (Whitehead *et al.*, 2013:164). The Becta report on Harnessing Technology Strategy stresses the role of technology in supporting learning in families, emphasising the need to support parents in getting the most from digital technologies for learning, while also recognising parents' concerns about safeguarding their children. Research has identified that learners are more likely to use ICT at home to assist them with their homework and schoolwork (Becta, 2003:1).

#### 2.4.4 The Community

Schools have a responsibility in taking a structured approach to connect with stakeholders like community members such as business people (Beach, 2009:102). The engagement is important for organisational accountability, to obtain stakeholder contributions, construct organisational image and accomplish managerial control. In his research Espinoza (2012:58) indicates that defining systems such as planning, in particular for ICT will be very difficult especially if the views of the school-community are not taken seriously. Burton, Malone and Huq (2005:65) emphasise the importance of community members' involvement in ICT implementation and how the information they provide can be used to influence decisions. According to Hemmen (2012:48-47) such stakeholders are critical to the schools' successful delivery of learning and development services which include ICT implementation.

According to Cox (2012:264), many school leaders are using ICT in powerful ways in alliance with external stakeholders. Principals increasingly use tools like Facebook, YouTube, and Twitter to connect with students, staff, parents and community members. Technology has become more useful for communication with community members than weekly flyers (Stock, 2009:265). Furthermore Whitehead *et al.* (2013:165) emphasises that it is essential to involve business people in ICT in schools. Business leaders do recognise that they can play a fundamental role in improving education. Corporation and non-profit organisations can serve as models for principals who wish to enhance the schools technology-facilitated communication strategies (Stock, 2009:265).

## 2.5 METHODS OF IMPLEMENTING ICT IN SCHOOLS

The following methods that can be seen as ICT resources such as tools and applications are amongst the most common that can be used to implement ICT in schools.

### 2.5.1 Interactive whiteboards

The impact of interactive whiteboards (IWBs) has been investigated and evaluated more than any other presentational technology (Wall, Higgins and Smith, 2005:800; John and Sutherland, 2005:410; Ofsted, 2005:15; Beerton, Harries, Gallannaugh & Galloway, 2005:305). Teachers and learners both provided a positive feedback regarding the use of IWBs in the classroom and teachers believed that attainment levels improved as a result of their use. Higgins *et al.* (2005:49) concluded that there was a significant impact on classroom interactions when IWBs were introduced into schools.

### 2.5.2 Digital video and photography

The literature analysed on the effective use of digital video and digital video editing found evidence that their use immensely increased motivation, improved literacy (particularly writing and speaking skills), allowed differentiation with regard to learning styles, facilitated collaborated working and promoted deeper conceptual understanding in many subject areas (Becta, 2003:70, Burden & Kuechal, 2004:105). Digital image techniques were also found to have a positive effect on nursery pupils with poor speaking and listening skills and low general levels of literacy (Hayton, 2005:40)

### **2.5.3 Video conferencing**

The literature indicated that a wide range of social and educational success could accrue from the use of video conferencing, for example the development of social and communication skills and increased cultural awareness (Condie, Livingston & Seagraves, 2004:170). Rural schools have used video conferencing successfully to share lessons and communicate with other schools and external agencies (HMIE, 2005:103) and it has been used effectively in a cross-border project aimed at promoting citizenship and tolerance in Northern Ireland (Austin, Abbot, Mulkeen & Metcalfe, 2003:75).

### **2.5.4 Mobile technologies: laptops, personal digital assistants (PDAs) and tablets**

Research into the use of mobile technologies, including laptops, PDAs and tablets, are becoming more numerous, with enthusiastic proponents citing evidence of a range of potential benefits (Facer and Owen, 2005:10; Prensky, 2004:25; Savill-Smith, 2005:535). The use of laptop technology in the classroom, by either learners or teachers, to support learning and teaching, has been the subject of several studies and is regularly an element of broader surveys and reports. Cunningham, Kerr, McEune, Smith and Harris (2004:365) maintain that laptops are motivating and engage learners' attention, particularly when used in conjunction with whiteboard technology. In the primary schools, Simpson and Payne (2004:102) state that changes were observed in the teachers' approaches to classroom management and organisation where laptops, a projector and, or an IWB were used.

## **2.6 BENEFITS OF USING ICT IN SCHOOLS**

The benefits or advantages of introducing ICT in schools are closely linked to the different technologies that have been discussed in the previous paragraph and could be explained more thoroughly under the following headings.

### **2.6.1 The introduction of an e-learning strategy**

Per definition e-learning is a flexible learning through the usage of ICT resources, tools and applications, focusing on:

- accessing information,

- interaction among teachers, learners, and the online environment,
- collaborative learning, and
- production of materials, resources and learning experiences (White Paper, 2004:15-17).

Collins and Berge (2000:3-4) maintains that development of an e-learning strategy will enable the school to determine the needs across for capturing and creation of intelligent storage and dissemination of information. As an important tool, e-learning will assist educators to upload online materials, communicate with students and administer or mark online assessments (Mayisela, 2014:120). The development of an e-learning strategy will further assist an educational institution to respond to emerging challenges such as the continual development in ICT; a shift in learner expectations; changing demographics of learners, the rapid development of subject knowledge and decreasing financial support (Ryan, Scott, Freeman & Patel, 2000:105; Alexander, 2001:240).

An e-learning strategy must include methods for designing and deploying solutions, change management, communication planning, performance support solutions, and knowledge management services and technologies (Collins & Berge, 2000:2). The strategy must allow the educational institution to plan, design, develop and deliver solutions that ensure that people have the necessary knowledge to embrace change and perform at a level required for institution success (Collins & Berge, 2007:4). In its broadest sense e-learning is an instruction delivered via all electronic media including the internet, intranets, extranets, satellite broadcasts, audio or videotape, interactive television and so on. For the purpose of this study, e-learning particularly refers to teaching and learning that is web-enabled (Rosenberg, 2001:28-29; Govindasamy, 2002:288; Garrison & Anderson, 2003:2). Harris (2002:79) maintains that the value of e-learning lies in its ability to train anyone, anytime, anywhere; however implementing and sustaining e-learning programmes require more than merely moving education and learning online. An e-learning strategy that meets the needs of the learners and the goals of the institution will successfully lead to an e-learning implementation (Rosenberg, 2001:40). In its successful implementation Govindasamy (2002: 287-299) outlines six e-learning quality benchmarks that could improve instructional technology. These are: institutional support, subject development, teaching and learning, subject structure, student support, evaluation and assessment.

## 2.6.2 Improvement in Teaching

The application of ICT in schools not only has an effect on the traditional ways of teaching, but also requires teachers to be more creative in adapting and customising their own teaching materials (Reid, 2002:40). According to Peeraer and Petergem (2011:979) ICT benefits schools in enhancing learning in classroom, improving management of school by for example helping in timetabling, record storing, secretarial work like typing staff meeting minutes, examinations and letters, using PowerPoint presentations and internet. The implementation of ICT thus has the potential to present high quality teaching (Lowther, Inan, Strahl & Ross, 2008:197). Serhan (2009:443) further argues in this regard that ICT develops autonomy in educators, as they are able to develop their own material, thereby giving them more control over course content than is possible in a traditional classroom setting. Gee (2007:19; 2011:55) also maintains that the creativity of students can be enhanced by using ICT. Keengwe and Onchwari (2011:560-570) further states that schools can offer quality teaching through real time conversation, learning by doing and directed instruction being supported by ICT. According to Higgins and Moseley (2011:291-210), the increased usage of ICT could improve teaching, classroom management and develop significant skills in marginalised communities, hence helping in liberation and their transformation, learning, performance and management, improves impact on school as a whole, and develop significant skills in the marginalised communities, hence helping in liberation and their transformation. In a study by Higgins and Moseley (2011:295) it was found that teachers who use ICT in classroom perceived it as useful for personal work and for teaching and were prepared to continue using it due to its usefulness. The study further found the usefulness of ICT in relation to making teaching more interesting, easier and more diverse, more fun for them and students and more enjoyable and motivating.

## 2.6.3 Improvement in learning

The implementation of ICT recreates a virtual classroom environment and learning space. Students are enabled to take control of their learning using ICT. As a result, they become capable of working on their own but in collaboration with others. Learners are also enabled to virtually interact with the teacher well as peers (Balaam, 2013:78). This creates teaching and learning space where all learners have an equal opportunity to succeed (Carlson, Lively & Nicholas, 2013:58). In essence, the implementation of ICT allows learners to work at their own pace and

have the physical assistance that may be needed through synchronous and asynchronous modes of communication. According to Koc (2005:10), students are enabled through ICT to communicate, share and work collaboratively at any given time. A teleconferencing classroom, for example could invite students around the world to come together simultaneously to discuss a topic.

Hennessy (2010:110) argues that ICT should be used as a tool to support school objectives like cooperation in school, problem solving, communication, developing skills, assessing and searching information, which are essential in preparation of students for a knowledge society. Research further shows that students are motivated when learning activities are challenging, authentic, multi-sensorial and multi-disciplinary. Dzidonu (2010:39) established that students report higher attendance, motivation and academic accomplishment as a result of ICT programmes. The increased use of ICT could further address the challenge of high school dropout rates experienced in sub-Saharan Africa (Aguyo, 2010:40).

#### 2.6.4 Increasing the Effectiveness of school management

Research proves that there is correlation between investment in ICT and school improvement (Tong & Trinidad, 2010:40-55). School managers are for example responsible for allocating budgets to various schools activities including implementation of ICT. The implementation of ICT can thus only be a success if school leaders support, learn, provide up to-date infrastructure, adequate professional development and support staff for the implementation of ICT (Bertz, 2011:4). School leaders have responsibility of supervising implementation of ICT programmes in their schools. In their study on technology leadership behaviour of school principals, Anderson and Dexter (2010:10-15) established that apart from ICT infrastructure being important in school, school leadership was the most determining factor in the process of effectively implementing ICT in schools. More studies support the idea that school leadership behaviour determines success or failure of schools to implement ICT in its activities (Schiller, 2011:30-41, Hennessey, 2010:120, Aguyo, 2010:43, Chang, Chin & Hsu, 2012:235-250).

## 2.7 CHALLENGES WITH THE IMPLEMENTATION OF ICT IN SCHOOLS

Apart from the obvious benefits that arise from the implementation of ICT in schools, there are also a number of challenges. The most important one for this study are addressed in the following paragraphs.

### 2.7.1 Lack of teacher confidence

Researchers indicate that lack of confidence amongst teachers is a major challenge. Dawes (2001:61-79) sees this as a contextual factor, which can act as a barrier. Becta (2004:40) further states that lack of confidence in teachers is harmful to the uptake of ICT by teachers in the classroom. Various studies have been conducted to determine reasons for teachers' lack of confidence with the use of ICT. Beggs (2000:10) on one hand asserted that teachers' "fear of failure" caused lack of confidence. On the other hand, Balanskat, Blamire and Kefala (2007:85) found that limitations in teachers' ICT knowledge, makes them feel anxious about using ICT in the classroom and thus not confident to use it in their teaching. According to Pelgrum (2001:170), the success of educational innovations depends largely on the skills and knowledge of teachers. Teachers' lack of knowledge and skills is one of the main hindrances to the use of ICT in education both for the developed and developing countries (Mamun & Tapan, 2009:207-217, Pelgrum, 2001:170, Ihmeideh, 2009:330).

### 2.7.2 Resistance to change and negative attitudes

Teachers' attitudes have been found to be major predictors of the use of technologies in instructional settings (Almusalam, 2001:45). Mumtaz (2000:319-342) states that teachers' attitudes and beliefs about teaching and learning with ICT are central to integration. If teachers want to successfully use technology in their classes, they need to possess positive attitudes to the use of technology. Such attitudes are developed when teachers are sufficiently comfortable with technology and are knowledgeable about its use (Afshari *et al.*, 2009:91). Additionally an inherent resistance to change to the integration of ICT into education has been found to be a significant challenge (Earle, 2002:5-13; Becta, 2004:12; Gomes, 2005:31; Schoepp, 2005:15). Gomes' (2005:33) analysis of the questionnaires in a study found that science teachers' resistance to change concerning the use of new strategies is an obstacle of ICT integration in science teaching.

The literature further has established that internal variables have a great influence on how teachers integrate technology in the classroom. A mixed study was conducted to investigate whether teachers who frequently integrate technology and work at technology-rich schools shift their beliefs and practices toward a student-centred paradigm (Palak and Walls, 2009:159). The results showed that their practices did not change; whether student-centred nor teacher-centred beliefs are powerful predictors for practices. However, the attitudes of teachers concerning technology greatly predict teacher and student technology application, as well as the use of a variety of instructional strategies. In a study, further conducted by Sang, Valcke, Braak and Tondeur (2010:110) the focus was on the impact of Chinese student teachers' gender, constructivist teaching beliefs, teaching self-efficacy, computer self-efficacy, and computer attitudes on their prospective ICT use. The outcome of the study confirmed the findings of the study by Palak and Walls (2009:170) that the strongest predictors of future ICT use were teachers' attitudes toward it.

### 2.7.3 Lack of time

According to Afshari *et al.* (2009:77-104) as well as Ihmeideh (2002:325-341) teachers do not have time to design, develop and incorporate technology into the teaching-learning situation. Duhaney (2001:23-30) further maintains that teachers are unable to make appropriate use of technology in their own classrooms because of lack of time. A number of researchers further identified time limitations and the difficulty in scheduling enough computer time for classes as a challenge to teachers' use of ICT in their teaching (Al-Alwani, 2005:30; Beggs, 2000:45; Schoepp, 2005; Sicilia, 2005:47). A further study by Becta (2004) found that the problem of lack of time exists for teachers in many aspects of their work as it affects their ability to complete tasks, with some of the participant teachers specifically stating which aspects of ICT require more time. These include the time needed to locate internet advice, prepare lessons, explore and practice using the technology, deal with technical problems, and receive adequate training. In Canada, Sicilia (2005:50) concluded that teachers take more time to design projects that include the use of ICT than to prepare traditional lessons.

#### 2.7.4 Insufficient funds

Effective implementation of technology into education systems involves substantial funding. ICT supported hardware, software, internet, audio visual aids, teaching aids and other accessories demand huge funds. Mumtaz (2000:319-342) stated that many scholars proposed that the lack of funds to obtain the necessary hardware and software is one of the reasons teachers do not use technology in their classes. According to Afshari, Bakar and Su-Luan *et al.* (2009:95), efficient and effective use of technology depends on the availability of hardware and software and the equity of access to resources by teachers, students and administrative staff.

#### 2.7.5 Lack of accessibility

In Sicilia's (2005:50) study, teachers complained about how difficult it was to get access to computers. The study found that in some instances "computers had to be booked in advance and the teachers would forget to do so, or they could not book them for several periods in a row when they wanted to work on several projects with students." According to Becta (2004:18), the inaccessibility of ICT resources is not always merely due to the non-availability of the hardware and software or other ICT materials within the school. It may also be because of factors such as poor organisation of resources, poor quality hardware, inappropriate software, or lack of personal access for teachers. Korte and Husing (2007:4) found that in European schools there are some infrastructure challenges such as broadband access not yet being available. They concluded that one third of European schools still do not have broadband internet access. Toprakci (2006:1-16) further found that low numbers of computers, oldness or slowness of ICT systems, and scarcity of educational software in the school were challenges to the successful implementation of ICT into education in Turkish schools.

#### 2.7.6 Ineffective training

Pelgrum (2001:165) found that there were not enough training opportunities for teachers in the use of ICT in a classroom environment. Similarly, Beggs (2000:27) found that one of the major challenges in use of ICT in teaching students was the lack of training. According to a research conducted by Gomes (2005) lack of training in digital literacy, lack of pedagogic and didactic training on how to use ICT in the classroom, and lack of training concerning the use of technologies in science specific areas were challenges in classroom practices. Sager (2001:55)

further maintains that not only ineffective training but also the shortage of teachers who are qualified to use technology confidently. Balanskat *et al.* (2006:109) in their research indicated that inappropriate teacher training is not helping teachers to use ICT in their classrooms and in preparing lessons. They assert that this is because training programmes do not focus on teachers' pedagogical practices in relation to ICT but on the development of ICT skills. Newhouse (2002:45) further states that "teachers need not only be computer literate but also need to develop skills in interesting computer use into their teaching and learning programmes." Balanskat *et al.* (2006:112) concluded that inadequate or inappropriate training leads to teachers being neither sufficiently prepared nor sufficiently confident to carry out full integration of ICT in the classroom.

#### 2.7.7 Insufficient technical support

Lewis (2003:41-51) states that without both good technical support in the classroom and whole-school resources, teachers cannot be expected to overcome the challenges preventing them from using ICT. Pelgrum (2001:170) identified the lack of technical assistance in primary and secondary teachers to be a hindrance in successfully implementing ICT in schools. Korte and Husing (2007:1-6) on the other hand argued that ICT support or maintenance contracts in schools help teachers to use ICT in teaching without losing time through having to fix software and hardware problems. In Saudi Arabia, Almohaassin (2006:15) maintains science teachers would agree to introduce computers into science teaching except that they believe they will encounter problems such as technical service or hardware problems. In South Africa, there is a shortage of competent ICT personnel to provide technical support to schools (Ward, 2003:10; Rai, 2006:45; Herselman, 2003:97; Kante & Savani, 2003:53).

#### 2.7.8 Lack of infrastructure

Dzansi and Amedzo (2014:342) contend that a lack of infrastructure and inability of the Department of Education to sustain projects are some challenges hindering implementation of ICT into schools in South Africa. In addition Gulati (2008:76) added that despite the positive picture on ICT implementation in schools it should also be kept in mind that the provision of

infrastructure required for the introduction of ICT in teaching is of critical importance. Regarding infrastructure, Cawthera (2001:55) identifies lack of access to rural schools whilst Herselman (2013:72) and Kante and Savani (2003:93) agree on lack of electricity, lack of telecommunication infrastructure and inadequate storage facilities as challenges militating against smooth introduction of ICT into both rural and some urban schools in South Africa.

## 2.8 CONCLUSION

ICT resources are critically important for education, both because their use can improve teaching and learning processes and because they offer an opportunity for innovation in contents, methods and pedagogy. Nevertheless, the implementation of technologies in schools has to be approached in a critical and informed manner, taking into account the complexity of the underlying processes. Successful implementation of ICT in schools calls for understanding of the opportunities technology offers and of the needs emerging from the context of application.

The learners should be active participants in their learning as constructivism emphasises a thorough engagement in their studies. The implementation has to be done to address the disadvantaged schools, in particular those in rural areas. The culture of the school cannot be overlooked as it shapes the future plans of the school. The staff has to be prepared for smooth implementation of ICT to take place. Additionally implementation should be driven by policies as guiding principles for the schools. Furthermore, before implementation can take place teachers as key players should be trained in advance. As stakeholders, their preparedness will facilitate the process of implementation. Other critical stakeholders are parents, principals and community members who would add value in the implementation process. They need to be consulted to assist in the process. During the implementation process, teachers should be familiar with relevant ICT tools, for example interactive whiteboards, digital videos and process of video conferencing. The knowledge acquired in using technological gadgets will lead to benefits of ICT such as the development of e-learning in a school. Teaching and learning becomes interesting through ICT, as it has been proven by literature studies. The implementation of ICT cannot succeed without addressing challenges within the school. Inter alia, the confidence of teachers has to be improved to make them comfortable in acquiring new skills. The teachers' attitude towards ICT has to be dealt with to avoid future hindrances. The management has to also

ensure that funds are allocated towards ICT implementation. The time allocation for teachers within the classroom has to be prioritised. ICT resources have to be made accessible to all members of the school population. Such resources should be accessed by people who are highly trained to minimise costs on repairs. The technical support and infrastructure should be provided for effective use of ICT.

## **CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY**

### **3.1 INTRODUCTION**

In the preceding chapter, the relevant literature regarding the implementation of Information and Communication Technology (ICT) in teaching and learning in schools was discussed. In this chapter the research questions, aims, methodology and research design will be emphasised.

### **3.2 RESEARCH DESIGN AND METHODOLOGY**

#### **3.2.1 Design**

A research design refers to the plan of action that links the philosophical assumption to specific methods like experimental research, survey or ethnographic research (Creswell & Clark, 2007:4). Mouton (2005:55) views a research design as a plan or blueprint of how one intends to conduct the research. Affirming these views though formulated slightly differently Nieuwenhuis (2010:70) mentions that a “research design refers to a plan or strategy which moves from an underlying philosophical assumption to specifying the selection of respondents, the data gathering techniques to be used and data analysis to be done”. In trying to emphasise the importance of a research design in a study, Punch (2009:112) designates that it basically situates the researcher in the empirical world and connects the research questions to data.

A qualitative exploratory research design was selected for this study. The qualitative of the design implies that the focus is on studying people or systems by interacting with and observing the participants in their natural environment and focusing on their meaning and interpretation (Nieuwenhuis, 2010:51). Another reason for selecting this design is because most of the description and interpretations are portrayed in words rather than in numbers (Punch, 2009:3). More specifically a qualitative research design was used in order to put emphasis on the quality and depth of information on how ICT implementation can be achieved in schools. Qualitative research was thus preferred in order to ensure the best understanding of the views of different stakeholders on ICT implementation in schools. The researcher dealt directly with the participants and was able to watch closely the extent of interaction between them while asking

appropriate questions, for example, “How do you use ICT in developing your own teaching material?”

The exploratory nature of the design point towards the fact that the study was started with the literature review on a topic that is relatively unknown (Polit & Beck, 2008:19; Burns & Grove, 2009:696). By reviewing the literature thoroughly the researcher was able to derive an interview guide as indicated in paragraph 3.2.2.4.

### 3.2.2 Empirical investigation

The empirical investigation comprises the following: site-selection, participants' selection, action and competence of the researcher, the data collection process and data analysis.

#### 3.2.2.1 Site Selection

As explained in paragraph 1.3.2.2 the research was conducted on three sites, that is two secondary schools and a primary school. One of the secondary schools is situated in an urban area, whereas the primary and the other secondary are located in a rural setting. The sites were chosen as a result of the researcher being employed in the Rekopantswe Area Office. For purposes of coding the schools were called Schools A, B and C. In each and every school, the researcher took pictures as illustrated in figure (3.1). The researcher used photographs to authenticate data that was collected by means of interviews. Photography is regarded as a complimentary technique, and photographs are useful for corroboration of data, as they record non-verbal behaviour and statements resulting in everlasting evidence (McMillan & Schumacher, 2006:359). The photos are a true reflection of ICT equipment used by the schools visited in using technological gadgets to improve teaching and learning.

#### 3.2.2.2 Participants Selection

In accordance with the qualitative method, purposeful sampling which enables the researcher to select participants based on specific criteria, was used. The participants selected consisted of those individuals who had particular characteristics or experiences that contributed to a greater understanding of the phenomenon under study (Hennink, Hutter & Bailey, 2011:84; Best &

Kahn, 2003:1). The three principals were selected because they are regarded as the participants who have the most influence on taking final decisions on ICT implementation. The researcher further hand-picked eight teachers to be interviewed. These teachers are all known to the researcher because they usually represent their schools at meetings that deal with ICT matters. The eight teachers selected are also known in the Area to be the ones who act as leaders in the development of ICT curricula in collaboration with the Education Department. The selection of learners as participants for the group interviews were chosen in consultation with the eleven teachers who have also been selected as participants.

In total the researcher selected twenty-nine participants consisting of eighteen learners, eight teachers and three principals. In the primary school, which is school B, four teachers, six learners and a principal were selected. In school A, which is one of the secondary schools, the researcher selected two teachers, six learners and the principal. The remaining participants were selected from school C, comprising two teachers, six learners and the principal. As mentioned the participating teachers identified learners as participants based on the learners' involvement in the usage of ICT in their classrooms.

### 3.2.2.3 Action and competence of the researcher

De Vos *et al.* (2010:63) posits that researchers are ethically obliged to ensure that they are competent and adequately skilled to undertake the proposed project. The researcher ensured that he observed ethical responsibilities towards all involved. The handling, collection and analysis of data were done in a responsible manner. The researcher ensured the participants that the information gathered would only be used for scholarly purpose and the interviews would remain confidential. The interviews were recorded and transcribed and later returned to the participants for verification of facts.

As mentioned, the researcher is familiar with the schools selected for the study because he teaches in a school in Rekopantswe Area Office. As a result of being known to the selected schools, the researcher was able to establish a rapport with the participants. The researcher however strived to maintain neutrality by allowing participants to speak freely without being disturbed in their responses. The school in which the researcher is employed (Letsatsing

Secondary school) was left out of the investigation. The findings from the other schools would be beneficial to this school as they could be used to advance the body of existing knowledge about the management and implementation of ICT in schools.

### 3.2.2.4 The data collection process

The researcher requested permission to conduct the study in the Rekopantswe Area Office. A reply granting permission was received a few days later (Addendum J). The researcher approached the school principals of the three schools and requested permission to conduct the research in their schools. The school principals were briefed about the purpose of the research and as participants they signed the consent form (Addendum G). The letters requesting permission to conduct the personal interviews were delivered to the participants (Addendum A). Furthermore, the researcher requested permission from the participants to use certain parts of the interviews for research purposes. Firstly, a meeting was held with the principals and selected teachers to build a good mutual relationship by talking informally about the purpose of the study. During this meeting the participants were also presented with a letter in which they were requested to participate in the study (Addendum A). In the second meeting the researcher met with the participants to discuss the dates, time and their preferred venue for the interview (Addendum B). The researcher further briefed the participants about the purpose of the research and requested them to sign the consent forms (Addendum G). A letter explaining the handling of observation was also given to them (Addendum F). At this meeting the teachers were also asked to nominate 6 learners per school for the group interviews. In order to abide by the ethics committee's recommendations, permission was specifically asked to conduct observation from the teachers involved in the selected schools (Addendum C).

- Interview guide

The compilation of the final interview guide was done in accordance to what McMillan and Schumacher (2010:195) states when they say, "It is the most widely used technique for obtaining information from participants". As indicated in paragraph 1.3.2.6 and 3.2.1 the different list of questions were finalised after meeting with the University Research Committee on 13 August 2015. The lists are relatively economical, have the same kind of questions and ensure anonymity.

The questions were used to elicit the participants' views on the implementation of Information and Communication Technology in teaching and learning in Rekopantswe Area Office schools. In effect, this means that a relatively conversational and situational approach was employed and even the sequence and wording of questions were changed during the interviews.

The following questions were posed to participants during the individual interviews:

#### Questions for interview with the principals

- How do you understand the concept “Information and Communication Technology” (ICT)?
- Do you implement ICT in your school? Explain.
- How was ICT funded?
- Does ICT benefit the school? Explain.
- How can it be improved?

#### Questions for interview with the teachers

- How do you understand the concept “Information and Communication Technology” (ICT)?
- Do you have access to a computer? In which subjects can ICT be used?
- Give examples of how you use ICT in your class?
- How do you use ICT in developing your own teaching material?
- Which specific ICT have you used? Give examples.
- What challenges do you experience in using ICT in teaching?
- How does ICT assist in teaching?
- Did you receive any training on ICT usage?
- What other support would you like to have?
- Is the use of ICT beneficial to you? Explain.
- Do you make use of the computer laboratory? What do you do when you are there?
- Are there enough computers to be used by learners? If not, how are the current computers beneficial to learners?

## Questions for the group interviews

- How do you understand the concept “Information and Communication Technology” (ICT)?
- Do you use ICT in class?
- How does your teacher implement ICT in your class?
- Does ICT benefit you? Explain.

### 3.2.2.4.1 Interview Procedure: Personal interviews

During the interviews the researcher kept in mind that Leedy *et al.*, (2005:184) sees a typical interview as an informal conversation, with the participants doing most of the talking and the researcher most of the listening. The procedure followed during the interviews was first explained to each of the participants. The participants’ confidentiality during the documentation and reporting process was also emphasised. The participants were also referred as for example “participant A or B”. The pseudonyms were used for the recorded interview, transcription and the reporting process. The researcher explained to the participants that the recorded interview and transcribed documents would only be available to the researcher and his supervisor.

In addition, the recording of the interviews was agreed upon with the participants. The participants were also given a copy of the *verbatim* transcript days after the interview session. They were asked to read the transcript and make necessary corrections where they felt their responses were incorrectly captured. Furthermore, they were also requested to correct any inaccuracies and make sure that the statements accurately portrayed the information they provided and their experiences of using ICT. The researcher requested the respondents to return their comments within one to two weeks after receiving their transcripts.

### 3.2.2.4.2 Group interview procedure

As mentioned the group interviews were held with individual learners from each school in three separate sessions. This type of interview offered the researcher an opportunity to obtain specific information from individuals about their involvement in ICT matters in their schools. The participants were asked to reply to each of the interview questions as indicated in Addendum H.

The researcher recorded both verbal and non-verbal communications from individual participants and spend time towards the end of the interview with each individual to affirm that their views were correctly reported.

The researcher explained the procedure to the group participants. *Inter alia*, participants were told that the response to the questions asked should be from each every member of the group. This was explained to the participants prior to the interviews. They were further requested to respond to the questions in the best possible way they understand. The participants were informed that their names would not be revealed during the recording process and transcription of the interview.

#### 3.2.2.4.3 Observation procedure

The researcher asked for permission (Addendum C) from the teachers in the three schools selected for the study. The teachers in all three schools introduced the researcher to the learners. The researcher introduced himself to the class and explained to them that the purpose of being in their class was to obtain data that would be used for the purpose of the study. The researcher wanted to observe how ICT was implemented in teaching and learning in schools.

#### 3.2.2.5 Conducting of Interviews

Creswell (2012:218) states that interviews are the most commonly used qualitative data collection method. Furthermore Creswell (2012:221) explains an interview as a question and answer method of collecting information in a one-on-one situation and an interchange of views between two or more people on a topic of mutual interest. Interviews in a qualitative research are categorised in structured, unstructured and semi-structured interviews (Nieuwenhuis, 2008:87). Semi-structured interviews were used in this study (Addendum H). The researcher asked questions as indicated in the interview guide but based on the responses of the participants it was felt necessary to ask more individually probing questions so as to get clarity on certain vague responses.

As mentioned in paragraph 1.3.2.2 the researcher interviewed eleven participants being eight educators and three principals. Four educators and a principal were selected from a primary

school and the rest from the two secondary schools. The in-depth individual interviews were conducted after working hours, whereas the group interviews took place during break time. The researcher secured appointments with participants four (4) weeks in advance.

During the sessions, the participants in the individual interviews were informed about the purpose of the research project. The participants were asked at the beginning of each session “How they understood the concept, Information and Communication Technology (ICT)?” The question helped them to relax and provide valuable information. The researcher encouraged the respondents to express themselves freely without any fear or prejudice. A provision was made at the end of the interview session for participants to clarify their recorded answers and raise concerns.

### 3.2.2.6 Conducting of group interviews

The group interviews were conducted with the idea to involve as large a number (18) of learners as possible within a limited time. These interviews were conducted to obtain a better understanding of a problem or an assessment of a problem, concern or idea (McMillan & Schumacher, 2010:363). The researcher through the assistance of teachers selected six learners at each of the three schools to take part in these interviews. The questions posed during the group interviews were all based on the interview guide (Addendum H). The participants were informed of the purpose of taking part in the study. They were further told that their participation in the study was voluntary. In addition, participants asked to respond to the questions individually. In order to organise the session participants were asked to write down their answers for each question. While they were busy with this task the interviewer spent time with each individual to corroborate their answers.

### 3.2.2.7 Conducting observation

The researcher did observation in order to obtain data that could not be gained through interviewing. Nieuwenhuis (2008:83) defines observation as the systematic process of recording the behavioural patterns of participants, objects and occurrences without necessarily questioning or communicating with them. It is an everyday activity whereby we use our senses of seeing, hearing, touching, smelling, tasting and also our intuition to gather bits of data. In this study

observation as a data gathering technique was used to gain a deeper insight and understanding of how learners participate in the implementation of ICT in teaching and learning in schools.

The researcher throughout the observation applied Best and Khan's (2003:300) guidance. Their advice is based on the fact that the following standards of observation should characterise the observations; observation is carefully planned, systematic and perspective. Observers know what they are looking for and what is relevant in a situation; observers are objective.

The researcher was introduced to the class. The learners were told that the researcher is gathering information to assist in his study. The researcher observed attitude and behaviour of learners throughout the lesson, the seating arrangement of learners, the organization of furniture, learner's responses, and usage of ICT equipment by teachers and the teacher's handling of the lesson. After the lessons photographs were taken to authenticate data that was collected by means of interviews. Photography is regarded as a complimentary technique, and photographs are useful for corroboration of data, as they record non-verbal behaviour and statements resulting in everlasting evidence (McMillan & Schumacher, 2006:359). The photos are a true reflection of ICT equipment used by the schools visited in using technological gadgets to improve teaching and learning.

### 3.2.2.8 Data analysis

According to Creswell (2009:175), qualitative researchers typically gather multiple forms of data such as interviews and observation rather than relying on a single data source. He holds that with multiple sources of data collection, the researcher reviews the data collected and make sense of it by organizing it into themes and categories that cut across all of the data sources. In this study personal interviews, group interviews and observation were used for data collection.

In determining codes Creswell's (2009:187) system of the so called *qualitative code book* were followed. It is suggested that such a notebook should contain a list of predetermined codes on theory being examined. According to Nieuwenhuis (2008:109) thus constituted an a-priori approach to the data analysis where one works with pre-set categories and pre-set codes by starting with a list of categories in advance, and then search the data for these topics.

In this study a-priori codes and categories were designed as best trends and formulated as questions for the interview guide. These questions as well as the categories were derived from an overview of the literature which was thus used as basis for interviewing. The categories, broken up into more meaning making sub-categories, and research questions which emerged as key aspects from the literature study were used in the personal interviews as well as the group interviews and to a degree also served as basis for the observations. Triangulation was achieved by cross-validation of the data from the different data collection methods (McMillan & Schumacher, 2010:379). In this way the trustworthiness of the investigation was improved.

### 3.3 RESEARCH ETHICS

As said in paragraph 1.3.2.6 McMillan and Schumacher (2010:338) maintains that ethics is a set of moral principles about the most correct conduct towards respondents. They (McMillan & Schumacher, 2010:338) further maintain that qualitative researchers have to be sensitive to ethical principles because of the nature of the research topic and face-to-face interaction they have with the participants when collecting data. The researcher in this study made an attempt to win the trust and confidence of the participants by ensuring to them that the interview conducted will remain known to the supervisor and the university. Their anonymity and confidentiality was ensured and guaranteed with a consent form (Addendum G) further elaborating on ethics matters. The following ethical issues, respect for privacy and informed consent as outlined by De Vos *et al.* (2006:57) were adhered to. The researcher appeared before the North-West University ethics committee where a presentation was made. The presentation was based on the motivation on how the researcher will deal with the gatekeepers and a motivation on the classification of the study as a low risk (Addendum I). The committee discussed the presentation to ensure that the researcher adhered to the stated ethics. At the end of the thorough engagement with the ethics committee, the researcher was granted permission (Addendum J) and a clearance (Addendum K) to start collecting data from the selected sites.

#### 3.3.1 Respect for privacy

The respect for privacy is the individual's right to decide when, where, to whom and to what extent his or her attitudes, beliefs and behaviour will be revealed. The participants' privacy in

this research was assured by using pseudonyms and by not documenting information, which might provide clues to their identity (McMillan & Schumacher, 2010:338).

### 3.3.2 Informed consent

Informed consent is the procedure by which participants choose whether or not to participate in the project (McMillan & Schumacher, 2010:338). In this study, the researcher ensured that the participants were given accurate and complete information about the study so that they could fully comprehend the investigation and consequently make thoroughly reasoned decisions about their participation (De Vos *et al.*, 2006:59). The researcher told participants at the beginning of each and every interview session that the participation is voluntary and no one is forced to take part.

## 3.4 TRUSTWORTHINESS

An interpretive process is often relied upon in qualitative research. Bogdan *et al.* (2007:37) argue that what the researcher believes and has experienced can influence how data is interpreted and this may have an effect on the trustworthiness of the research. According to De Vos (2006:345), it is important for the researcher to think about his own beliefs about the research topic, to increase the “soundness” of the research. In order to achieve trustworthiness the information gathered should not be tampered in a way favouring the researcher’s interest. The researcher retained the data gathered in its original format without any addition to what the participants presented and what was observed. The interviews were transcribed and returned to the participants for verification and corrections on errors committed. The observations were recorded on the observation sheet (Addendum F) and the field notes (Addendum E) prepared by the researcher. The aspect of credibility is also emphasised in a qualitative research, this is maintained when the context, participants and settings become earnestly presented and interpreted. It is also of importance to use a set of strategies in a qualitative research to improve the trustworthiness of a research design. In this study, the researcher used the two strategies, namely verifying new data and stakeholder checks.

### **3.4.1 Verifying new data**

The researcher provided the participants with the transcripts of the interviews. Furthermore, the researcher requested the participants to verify the data gathered in previous interviews. The participants were given a day to go through the transcripts and the researcher collected them back the following day. This was done to ensure that the researcher's interpretation with what the participants' said was correctly understood.

### **3.4.2 Stakeholder checks**

The strategy was used by the researcher to enhance the authenticity of the study by allowing research participants to comment on and make an assessment of the findings.

### **3.4.3 Credibility**

According to McMillan and Schumacher (2010:102), credibility is enhanced when the research design provides an opportunity to show relationships and takes into account potential sources of error that may undermine the quality of the research and may distort the findings and conclusions.

The researcher carefully designed the study so as to eliminate or at least reduce complexities. During the individual interviews and group interviews the researcher tried to restate, summarise or paraphrase the information received from the respondents to ensure that what was heard was in fact correct. Additionally the participants were contacted afterwards to confirm what they said with what was captured. This was done by visiting the schools selected as per telephonic appointment done with the participants.

## **3.5 CONCLUSION**

In this chapter, the research methodology and design were explained. In addition the chapter made provision on the characteristics of qualitative research and the reason for choosing the qualitative study. The chapter also described how the selection of site and participants was made as well as the researcher's role in ensuring confidentiality and anonymity. The action and

competence of the researcher was stated. The chapter elaborated on the research process, data analysis strategies and research ethics.

## **CHAPTER FOUR: ANALYSIS OF RESULTS**

### **4.1 INTRODUCTION**

In chapter three, the researcher described the research design, methodology and the reasons for using the qualitative method. The choice regarding the selection of participants was also justified. The purpose of this chapter is to make a report on the analysis of the data obtained from the individual interviews, group interviews and the observation.

### **4.2 INTERACTION WITH THE PARTICIPANTS**

The process of empirical research was started with a presentation of the research project that lead to clearance (Addendum K) to conduct data collection being obtained from the University Ethics Committee. Subsequently a letter in which a request was sought to conduct the study was written to the Area Manager of Rekopantswe Area Office (Addendum J). The purpose of the letter was to seek for permission to conduct an enquiry into “The implementation of information and communication technology in teaching and learning in schools”. In addition, the researcher requested permission to conduct research from the principals of the identified schools and from the participants selected for the study within those sites (Addendum A). The participants were provided with a consent form indicating their agreement to take part in the study and also ensuring a guarantee of their confidentiality and anonymity concerning the collection of data (Addendum G).

Furthermore, the researcher agreed with the participants on the venue, date and time for the interviews (Addendum B). In reaching the agreement with the participants the researcher arrived on time at the selected sites to conduct interviews. The one-on-one individual interviews, group interviews and observation were conducted (Addendum H). The observation was done in classes after a letter requesting this process was presented to the teachers identified for the study (Addendum C). The interviews were manually transcribed and coded according to a-priori coding system whereby categories were established by linking data with the themes identified with the literature study (Nieuwenhuis, 2008:109). According to McMillan and Schumacher, coding begins by identifying small pieces of data that stand alone.

#### 4.3 ANALYSIS OF PERSONAL INTERVIEWS

The data obtained from the interviews were linked to the following categories.

- Understanding the functionality of ICT.
- The provisioning of ICT equipment in schools.
- The integration of ICT in learning.
- Capacity development for ICT.

Table 1: Categories and sub-categories

CATEGORIES	SUB-CATEGORIES
1. Understanding the functionality of ICT	<ul style="list-style-type: none"><li>• Communication</li><li>• Accessing information</li></ul>
2. The provisioning of ICT equipment in schools	<ul style="list-style-type: none"><li>• Efficiency of computer equipment</li><li>• Applicability of computer Laboratories</li><li>• Financial support</li></ul>
3. The integration of ICT in learning	<ul style="list-style-type: none"><li>• Developing teaching material</li><li>• Lesson presentation</li><li>• Learner centred-education</li></ul>
4. Capacity development for ICT	<ul style="list-style-type: none"><li>• Formal training</li><li>• In-school development</li></ul>

#### 4.3.1 Understanding the functionality of ICT

ICT was generally understood as a term that describes all forms of computer hardware, data storage, computer software and computer systems. There is a feeling amongst the participants that the increased use of computers will help to bring speed and efficiency in schools and that two key issues that are closely linked to the functioning of ICT in schools are *communication and information*.

- Communication

It was indicated during the interview that there is a good understanding at all schools of the importance of good communication. In broad terms the participants however aired the view that the main kind of communication that this investigation should be linked to is where contact is established through technical communication skills, which include methods, processes, techniques and procedures related to effective teaching and learning. Although the focus is placed on skills directly associated with instructional leadership this sub-category was also singled out as *dealing with administrative school matters*. These *school matters* have to do with using ICT in the academic administration of the school, and involve aspects such as general school management and financial school management.

Further discussion of the functioning of ICT in schools illustrated the very close connection with communication. It was clearly shown that ICT in schools is characterised by improved communication, and vice-versa. Schools are using ICT to enhance and add a new dimension to the learning process and also to improve working relations in the school, and between different stakeholders and the school. Participant E said in this regard that *ICT is a way of communicating with other people technologically*. The same view was shared by participant K by saying *ICT allow us to communicate and share ideas*. Participant D stated that *to a large extent, in a sense ICT is a means of establishing communication between various parties using technology*. ICT is thus only seen as a tool to improve communication in a school but as a comprehensive school-improvement mechanism.

The above mentioned views chime with what was found in the literature overview namely that the increase use of ICT in schools deal with the evolution of technology and that internet usage has created new ways of communication which impacts on all regions and sectors including

educators and learners and also higher education institution (Ismail & Idrus, 2009:55). In the literature review it was also stated that ICT has become more useful for community members by creating a link between the higher education institutions and the community (Stock, 2009:265).

- Accessing information

Data and information have been singled out as key aspects in schools in the Area. Although it is widely understood that new technology will improve efficiency one of the principals still remembered with fondness *the days when everything was done by hand*. Schools currently understand that electronic media have placed manual organization and calculation of data. Documents that contain important information such as time tables, mark lists and budget are already in use in the secondary schools in the Area in particular but there are still a number of constraints that will be highlighted in other sections.

Participants also mentioned that irrespective of the posts that they occupy, the amount of information and data must be handled tend to increase all the time. In addition to *normal* requests for data from the Education Department, information that must be distributed to parents and correspondence in the school there are nowadays various other stakeholders and non-stakeholders that request information. These include research organizations, School Governing Body (SGB) members and private organizations. It therefore not just a matter of complying with requests but sound judgement on whether information should be supplied, also forms part of the process.

More specifically participant D stated that *ICT is a means to derive information between individuals or between an individual and a group of individuals or vice versa*. Participant B further said *ICT enables learners as well as teachers to get information*. Participant A added that *through ICT we are able to get information that is valuable to the school and the community*. In addition participant J maintained that *through ICT we are in a better position to acquire information that is important*. There is thus a clear understanding in the schools that information and the distributing thereof is critical for effective and efficient management of the school.

Two of the most important points that emerged in the literature overview is where Cox (2012:264) was quoted as saying principals increasingly use tools like Facebook, YouTube, and Twitter to connect with students, staff, parents and community members (Par. 2.4.4). in the same

paragraph Beach (2009:102) stated that schools have a responsibility to use ICT to connect with stakeholders like community members such as business people.

#### 4.3.2 The provisioning of ICT equipment in schools

ICT equipment in schools is of vital importance for the complete implementation to take place. In the Area it was emphasized by the participants that the *provisioning of ICT* was at a slow pace. In a world where information and communication technology has made it possible for more people to access, generate and share ideas it is urgent that the basic education system maximize these new possibilities.

- Efficiency of computer equipment

The participants acknowledged that ICT in schools bring about improvement in both teaching and learning. In interviewing the participants it was realized that teachers become highly inspired and motivated when ICT gadgets like laptops are applied in schools. Amongst other the participants were of the view that ICT reduces the workload as it makes it easy to organize and prepare in advance. The participants felt that through the technological gadgets, they are able to make one classroom test that could be written by many learners without re-writing on the chalkboard. Learners also derive pleasure and an interest in learning as they are motivated by visualizing what they are taught. The participants however showed a lack of approval in terms of supply of ICT material. The major concern was on the shortage of equipment, as highlighted by participant F by saying *we do have enough computers and this is real. I can also suggest that the Department of Education could also furnish schools with modern gadgets.* Participant C added that *the school needs computers to be able to provide all the children with computer skills.* Furthermore participant A maintained *that honestly the computers are not enough for learners* with participant E adding that *the computers that we are having are not so much enough... now when you take them to a computer lab... about seven has to share.*

The literature review in the study conducted by Becta (2004:18) in paragraph 2.7.5, found that the inaccessibility of ICT resources is not always merely due to the non-availability of the hardware and software or other ICT materials within the school. It may also be because of factors such as poor organization of the resources, poor quality hardware, inappropriate software, or lack of personal access for teachers.

Furthermore in paragraph 2.3.5, it was mentioned that successful integration of ICT into the teaching and learning process requires developing teacher's knowledge, confidence and skills on ICT use as well as providing them with the hardware and software (Reid, 2002:35; Ortega, 2005:15; Blackmore *et al.*, 2003:95).

In paragraph 2.2.2, learners are said to create meaning as internal representation based upon their experiences, rather than acquiring meaning directly from external sources such as teachers. In the same paragraph, Meyer (2009:335) was quoted as saying in implementing ICT in schools learners will manipulate the technological tools and actively construct knowledge in their attempts to make sense of their world.

- Applicability of computer laboratories

Learning how to use a computer can provide even the youngest students with rare knowledge of necessary job skills, from typing and basic research. Participants viewed a computer laboratory as a place where computer skills can be nurtured thereby allowing a child to become exposed to new ways of thinking using both their creative and logical thought processes. In addition the interviews revealed that not only is the laboratory useful to learners, but also resourceful to teachers, as it provides teachers with more time to practice and improve their ICT use in the classroom. This view is shared by participant E by stating that *I make use of the computer laboratory... we have started with the learners, they need to know the basic procedure of operating computer... switching it on and off.* Additionally participant F maintained that *most of the time I use the computer laboratory to search for information... scholarly information.*

The views above correlates with what was found in the literature that lack of infrastructure and inability of the Department of Education to sustain projects are some challenges hindering implementation of ICT in schools in South Africa (par. 2.7.8). In addition Gulati in the same paragraph stated that despite the positive picture of ICT implementation in schools it should be kept in mind that the provision of infrastructure required for the introduction of ICT in teaching is of critical importance. This includes physical space, furniture, electricity and Internet connectivity.

- Financial support

If ICT is sensibly deployed and with carefully selected software, it can positively affect many aspects of school life, for example from a healthy questioning of present teaching practices to a gradual improvement of the quality, scope and depth of the learning environment, as well as to provide a remarkable opportunity for teachers' development. However the need to acquire good quality ICT equipment is often hampered by the shortage of funds. This view is further enhanced by the participants as they emphasise the need for *financial support* in schools. Even though there is provision of financial support, it is at a minimal level, as it is evident from participant D that *we have funding from the Department of Education, they provide a certain fund which they give to schools in a period of three months. We use a certain portion of our budgets from the school. This lead to us running short of funds.* Schools should profoundly revise teaching practices and resources to create more effective environments and improve life-long learning skills and habits in their students. This further view is shared by participant C in agreeing for the need to financial support provision of ICT equipment, and also maintaining that *we have computers, we have laptops, which we got from our sponsors. My wish is for the school to get more funds to buy computers.* In one of the schools, the School Governing Body (SGB) and the School Management Team (SMT) joined hands in acquiring suitable ICT material. In such a school participant B expressed that *the school bought the laptops for the heads of departments and then we also have about twenty-one laptops that were donated by the Department of Education.*

The literature review in paragraph 2.7.4 stated that ICT supported hardware, software, internet, audio visual aids, teaching aids and other accessories demand huge funds. Mumtaz (2000:319-342) in the same paragraph stated that many scholars proposed that lack of funds to obtain the necessary hardware and software is one of the reasons teachers do not use technology in their classes. The literature review further in paragraph 2.4.1 describes the qualities of an effective leader within the context of ICT matters as the ability to lead change and establish clear vision. The leader in a school set up will have to work jointly with others to ensure that there is provision of ICT equipment. In this regard, the leader will have to engage business people to request sponsorship to equip the school with the needed gadgets.

#### 4.3.3 The integration of ICT in learning

The integration of ICT in learning deals with the enriching of the learning process by assimilating technological means into the learning practice.

- Developing teaching material

Students can be highly motivated towards learning and even towards regularly attending school if technology makes part of their classroom experience. Teachers can fruitfully use this positive attitude to explore new learning strategies in which students can be more actively involved in learning, as opposed to being simply passive information receivers. The findings from the interviews proved that in most cases teachers use ICT to develop their teaching material and they also value ICT in their teaching. They regard ICT as a means for information sharing and as a measure suitable for knowledge improvement towards the subject matter. This was evidently stressed by participant E by maintaining that *normally with teaching material, before I can go and present a lesson, I need to have prepared and my preparation is when there is a new topic, which is to be given to learners. I go and Google, I go and make a research about that topic.* The need for utilizing ICT in *developing teaching material* was further highlighted by participant F by adding that *I use my computer to search for information, to look for other materials from the internet to be able to help me in my teaching and learning process.* The participants mainly stressed the need to *research* their work before being formally presented in class. This was illustrated by participant H in maintaining that I am using ICT mainly for research, because you will find that the textbooks that we have are not enough, so as a teacher you will need to research. Furthermore developing teaching material in view of ICT, was emphasized by participant A by stating that *I use ICT in a fashion that I'm able to access work from the internet and other work that had been prepared by other educators, then you are able to get the job and integrate with yours and make sure that whatever you give learners is beefed up with the understanding of learners to become easy.* Participant I also maintained that *while I use the computer I log on into the internet and look for additional information that I may use in my lesson preparation.*

In the literature review paragraph 2.2.2, Sharma (2001:560) said that teachers need to go beyond traditional approaches and become acquainted with new methods in order to get a clear

understanding of the educational functionality of technological tools in their education practices. Mayisela (2014:120) stated that as an important tool e-learning will assist educators to upload online materials, communicate with students and administer or mark online assessment (par. 2.6.1). In paragraph 2.6.2, Serhan (2009:443) argued that ICT develops autonomy in educators as they are able to develop their own material, thereby giving them more control over course content than is possible in a traditional classroom setting.

- Lesson presentation

The interviews showed that most teachers are confident with regard to lesson presentation. They are also self-assured on how to use overhead projectors and to make power-point presentations. The use of PowerPoint in particular is regarded as an important technological tool since it helps learners to visualize learning materials. In subjects where diagrams are presented learners also seem to understand better than before these practical aids were used. Participant B said on these technological aids that *we use the overhead projectors as visual means and then the data projectors that helps a lot. I encourage teachers to use them in their everyday teaching.* Participant A said *I prepare my slides then I use my projector to display whatever I have prepared at school, even when there are models or simulation videos. I also bring the speakers to connect in order to show learners.* Participant F stated that *sometimes you can type whatever you want to, for example, the notes you want to give learners... so it's already in your computer and then you present the lesson through PowerPoint.* Participant G said *you can use computer in a classroom maybe like giving an assignment or maybe you can just write questions at home and just screen it on, the learners can just catch or follow what you wanted them to do.* Participant E said *I've got what is known as a Viewer, the one which I use when I draw. It has got a projector that which I'm doing on my table learners are able to see it on the projector and they are also given a chance to do that. Now there is no way I can do something that they don't see.*

A more comprehensive analysis of the findings showed further that the usage of ICT tools is of utmost importance in all subjects. These tools are used by teachers in all subjects. Participant F said *ICT can be used in almost all the subjects.* Participant H also said, *I think that ICT can be used in all subjects, not necessarily for a particular subject.* Participant A emphasised that *ICT can be used to any subject of choice depending from one teacher to another, but is mostly important in the content subjects that is where you have lots of diagrams, lots of models that*

*takes time in class to draw, to demonstrate to learners.* The main challenge that most teachers experience however is to use their laptops efficiently in teaching. Apart from connectivity problems many teachers are still not computer literate and find it easier to resort to the old talk-and-chalk method (Participant G).

The above findings seem to match what was noted in paragraph 2.5.1 when a study was quoted in which it was stated that teachers and learners both provided a positive feedback regarding the use of technological tools such as interactive whiteboards (IWBs) in the classroom, and teachers believed that attainment levels improved as a result of their use. In the same paragraph Higgins *et al.* (2005:49) were quoted as saying that there was a significant impact on classroom interactions when IWBs were introduced in schools. Cumminham, Kerr, McEune, Smith and Harris (2004:365) further maintained that laptops are motivating and engage learners' attention, particularly when used in conjunction with whiteboard technology. Hayton (2005:40) further also stated digital image techniques have a positive effect on nursery pupils with poor speaking and listening skills and low general levels of literacy.

More specifically on the importance of using ICT in schools in South Africa it was noted in paragraph 2.3.1 that the advent of democracy in 1994 led to the Department of Education (DoE) stepping up the introduction of ICT into the school curriculum as well as in school administration (Mdlongwa, 2012:2). In the same paragraph it was mentioned that the Department of Education confirmed the importance of ICT use in education, suggesting that all students should be computer literate by 2013 (Wilson-Strydom, Thomson and Hodgkinson-Williams, 2005:74). It is also important to note that Tinio (2002:23) was quoted as saying that in the foundation phase learners should spend their time learning concepts and basic skills by using computers and, that the intermediate phase provides learners with an opportunity to expand their learning features into other learning areas, also enhancing their research skills.

- Learner centred-education

Participants indicated that they are very sensitive about learners' rights. In a sense this means that learners must be handled with care in the school. This view is reflected in classrooms in schools in the Area schools where learners are placed at the centre. There is further, the belief in the schools that learners learn best when they form part of a positive learning environment.

Some of the interviewees mentioned that learners feel comfortable in a well organized classroom where technology is used effectively.

Additionally learners in the Area apparently learn best when they are allowed to work in groups where ideas can be shared. Part of learning is when the learners are given opportunities to take the initiative in their own learning and construct their own understanding of concepts and ideas. There is a general feeling amongst the participants that the increased application of ICT in school brings about a change in learner attitudes. ICT enhances learners' understanding and help to create a more positive attitude towards their studies. The participants were all in agreement that ICT brings the best out of the teaching and learning situation. Participant D said *we have noticed a change in the attitude of the learners, they seem more interested when information is disseminated to them through ICT*. Participant C added that *learners learn better when they see things, like when you see things you're able to recall*. Participant K stated that *learners attention become captured when they visualise*.

Obviously the above mentioned positive ideas must be seen against the background that in this century learners are living and learning in a technologically advanced, information rich, knowledge-based, and highly competitive global society. Teachers play a critical role in the implementation of ICT in schools because they are responsible for implementing changes in schools by facilitating the integration of ICT. This statement is in line with Ertmer and Otternbreit-Leftwich (2010:250) who said that overall, effective implementation of teaching with technology requires teachers to be at the forefront of change (paragraph 2.3.2).

The idea of learner centredness is also closely connected to the main premise of constructivism that was discussed in paragraph 2.2.1. The main ideas that emerged from the literature review are that learners constructs knowledge actively to understand the world better and that must therefore be afforded opportunities to contribute this knowledge to a wider knowledge base. More specifically Oluwafisayo (2010:19) was quoted as saying that ICT learning is linked to constructivist theory because of the way that students have access via the internet to massive amounts of information, which they can use to determine their own path of learning.

#### 4.3.4 Capacity development for ICT

In this investigation the focus was obviously on the development of teacher's knowledge and their skills in ICT related matters. These aspects are addressed by referring to *formal training* and *in-school development*.

- Formal training

The teachers are key players in any educational innovation effort inside the classroom. Appropriate training is necessary for educators to transform their traditional modes of delivery into new delivery modes. In light of the interviews, educators are not properly offered training that can bring meaningful change in the application of ICT. The interviewees strongly believe that *formal training* should be conducted in order to acquire the skills in ICT usage. This view is emphatically expressed by participant F in saying *I would like to have a formal training*. The participants in the Area furthermore reiterated the need to be trained on *continual* basis by *facilitators*. This expression is derived from both participants H and E respectively, who said *we need more facilitators to go and empower educators* and *training should be continual*. It is important that the process the process of training should be continuous, as both the technology and the functions it facilitates are constantly changing. This view is shared by participant I by stating that *technology is ever changing, therefore it is important to be formally trained and continuously so*.

The above findings reflect on the importance of teachers as they are instrumental in the ICT usage in a school. These findings also do match a reference that was made about the need to empower teachers as people responsible for ICT usage in schools (par. 2.3.5). Additionally Blackmore, Hardcastle, Bamblett and Owens (2003:40) stated that the development of teachers should come long before their ICT use due to the fact that, they are key players in learning and teaching. In the same paragraph the United States of America (USA) one of the developed nations has also highlighted the significance of the teachers' professional training and that attitude toward computer use can be improved by training its users. Training and development will effectively boost the teachers' self-efficiency, motivation and computing habits (Robertson & Al-Zahrami).

The purpose of formal training is also linked to constructivism as a theoretical framework discussed in paragraph 2.2.3. The idea derived is that the teachers' knowledge, beliefs and actions all affect the success of the learner (Meyer, 2009:334).

- In-school development

Participants highlighted the need for *in-school development* as that will also improve the schools' culture. ICT in schools provide an opportunity to teachers to transform their practices by providing them with improved educational content and more effective teaching and learning method. Each school in the Area offers a different kind and degree of acceptance of innovations such as the use of ICT in the curriculum. The view of in-school development is of critical importance as it leaves a lasting legacy in the Area. In most instances the participants emphasized the need for in-school development as it does have a long term benefit.

Furthermore participants in the Area indicated that if schools take the responsibility of developing their own staff members that will have a major impact to the Area in general. This view is shared by participant J by maintaining that *I believe that if my school is provided with professional people, we'll be well developed as a staff to introduce ICT in our teaching*. The same view is further developed by participant K by saying *in-school development will motivate me to bring change in my lesson*. One important aspect of in-school development is that it apparently builds leadership capacity at the school level. This idea is expressed by participant D by stating that *it is good to plan for the future and that can be achieved by preparing staff members internally to use ICT equipment*.

The above findings similarly relates with the statements made in paragraph 2.3.5. In a policy document it was quoted that the White Paper on e-Education (2004:11) requires that the use of ICT, as a set of flexible tools for teaching and learning be integrated into the Initial Professional Education of Teachers (IPET) and Continuing Professional Teacher Development (CPTD). In the same paragraph Lee (2001:2) further stated that teachers' continuous professional development is the key performance index for any school's growth. More research support the idea that in-school development and school leadership behaviour determines success or failure of schools to implement ICT in its activities (par. 2.6.4).

#### 4.4 FINDINGS FROM THE GROUP INTERVIEW

In this study eighteen learners were interviewed during three group interview sessions, consisting of six learners per school. The interviews were arranged with learners after school. This was done so as to avoid disturbance in teaching and learning at the school. The participants were asked to reply as individuals in writing to each of the interview questions as indicated in Addendum H. Towards the end of the interview sessions the researcher met individually with the participants and confirmed the meaning of answers that were not clear.

The findings from the interviews according to the questions are as follows:

##### 4.4.1 How do you understand the concept “Information and Communication Technology”?

It was obvious that ICT gadgets such as laptops play an important part of learning and teaching in schools. Learners indicated that *ICT is when we use computers at school or maybe iPad as they are using them in Gauteng for school purposes*. They further mentioned that some of them have internet access at their homes but the majority had to visit cafeterias and shops with Wi-Fi. They also feel that studying *ICT kind of subjects* and using computers in school laboratories they would become computer literate and being enabled to use their cell phones more efficiently.

The participants further explained that technology (their cell phones) are very important for communication purposes. The participants in school B in particular said that they think *ICT teaches us about communication, so after communication things become easy*. In school C, the participants stated that *ICT is of value to our learning because it improves our learning and communication*.

The literature in paragraph 2.5.4 maintained that changes were observed in the teachers' approaches to classroom management and organization where laptops, a projector and, or an interactive whiteboards (IWBs) are used. These views correspond with the literature findings where it was mentioned that ICT learning experiences are linked with constructivism theory in the sense that students have access via internet to massive amounts of information which they can use to determine their own path of learning (Oluwafisayo, 2010:19). An interesting connection to this statement was made by Koc (2005:10) maintained that a teleconferencing classroom could invite students around the world to come together simultaneously to discuss a

topic (par. 2.6.3) in the same paragraph Bulaam (2013:78) was quoted as saying that learners could be enabled through ICT to virtually interact with teachers.

#### 4.4.2 Do you use ICT in class? Explain

- Listening to the radio and watching television

It was proven that learners do use ICT in their classes. The learners indicated that they use ICT in a form of *listening to the radio and watching television*. In listening to the radio the learners' listening skills and vocabulary becomes developed. Watching television will assist them in analyzing visual images and enhancing their lives. The participants in school B maintained that *we listen to the radio and ma'am instructs us to listen, and if we don't understand what is said from the radio we watch educational channels from the television*. In school A, the participants stated that *we sometimes listen to the educational programmes on the radio and also watch plays or dramas on the television*. In school C participants said *we watch English drama on television*.

Furthermore participants stated that they use ICT in class to prepare and write their assignments. It is of critical importance for learners to actively take part in their studies by writing assignments pertaining to what they are taught as a form of assessment. In school A participants said *we use ICT when we have assignments in class*, whereas in school C participants stated that *sometimes you find questions being difficult to understand, so for the purpose of getting good marks in our assignments, we discuss in class using our phones to research*.

In the literature, Hayton (2005:40) stated that digital image techniques were found to have a positive effect on nursery pupils with poor speaking and listening skills and low general levels of literacy. Higgins et al (2005:49) in paragraph 2.5.1 concluded that there was a significant impact on classroom interactions when interactive white boards (IWBs) were introduced into schools. In paragraph 2.6.3, Balaam (2013:78) maintained that students are enabled to take control of their learning using ICT. They become capable of working on their own but in collaboration with others.

#### 4.4.3 How does your teacher implement ICT in your class?

The teachers were indeed proven to be instrumental in the implementation of ICT in their classes. Digital technology enhances learning in the classroom, and when learners are provided

with ICT gadgets their understanding becomes improved. The teachers were mainly found to be implementing ICT in class as *laptops and projector usage* was evident. Additionally teachers felt confident with *using digital video* in class. Digital video images improve the learners' understanding as they learn through seeing the material being presented to them. Visual images are easy to remember as they stay for a long time in the memory.

The participants in school B stated that *our teacher uses a laptop and a projector. We get the notes from what is projected*. Furthermore in school C, the participants added that during *our Physical Science lesson, our teacher uses a projector and we are able to see from the whiteboard*. In relation to *using digital video*, participants in school A said *we watch English material from the digital video in our school. We understand better after watching*.

The literature in paragraph 2.5.4 stated that the use of mobile technologies, including laptops, personal digital assistants and tablets provides a range of potential benefits. In addition the effective use of digital video and digital video editing immensely increased motivation, improved literacy, allowed differentiation with regard to learning styles, facilitated collaborated working and promoted deeper conceptual understanding in many subject areas (Becta, 2003:70, Burden and Kuechal, 2004:105).

#### 4.4.4 Does ICT benefit you? Explain

In seeking for information ICT seemed beneficial and a success to learners. The learners appreciated the value of ICT as it made them able to study on their own without the presence of a teacher. Additionally the learners felt encouraged as *independent learning* took place in their classes.

The participants in school A stated that *through ICT, we get question papers from previous years and we use them to prepare for the coming examination*. In school C participants said *ICT allow us to research and compare notes with our classmates*. An addition was further made by participants in school A that *we no longer rely on the textbook but we are also able to add more facts by accessing more learning materials using ICT*.

The above mentioned findings correspond with the literature in paragraph 2.6.3 where it is stated that students are enabled to take control of their learning using ICT. As a result, they become

capable of working on their own but in collaboration with others. In addition Becta (2003:1) further stated that learners are more likely to use ICT at home to assist them with their homework and schoolwork.

## 4.5 FINDINGS FROM OBSERVATIONS

### 4.5.1 Classroom observation

Observation assisted the researcher to have an understanding on how ICT implementation is done in teaching and learning in schools. The researcher observed how the teachers use ICT equipment in class and how learners become part of the process. Data collected through observation was from observation of classroom interaction between the teachers and learners. In total three observations from the selected schools were done. Special focus was taken on the non-verbal communication of participants during the lesson. Findings from data collected through observation on the implementation of ICT in teaching and learning in schools are organised and discussed under the following sub-headings:

- Attitude and behaviour of learners,
- Seating arrangement of learners,
- Learner's responses,
- Usage of ICT equipment by teachers,
- The teacher's handling of the lesson.

#### 4.5.1.1 Attitude and behaviour of learners

It was noted that learner's attitude and behaviour plays a critical part in the implementation of ICT in teaching and learning. At each lesson observed the teachers announced that they were ready to start the lessons. They then gave instructions about expected behaviour and how ICT technology would be applied. In school B, the learners waited for the teacher to give them instruction proving their eagerness and good discipline in class. The teacher further turned the radio on (figure 3.3) tuning in to a programme in relation to the lesson. However in school C, the learners' were not well behaved and continuously disobeyed the teacher. Part of the class was noisy and disturbing. In school A, the learners' kept quiet and attended to what the teacher was saying. This good behaviour was maintained throughout the lesson. The researcher noted that the

teacher at school A achieved more in terms of using ICT technology than at school C. at school C the disciplinary problems formed a central part of the lesson presentation in the sense that more time was spent on disciplinary measures than on teaching. It was evident that in school C teaching time, including time that would have been used for ICT matters, was used to discipline learners. The literature largely supports the positive role that students' attitudes and behaviour play in improved academic achievement when ICT technology is being used (Akey, 2006:1).

#### 4.5.1.2 Seating arrangement of learners

The seating arrangement in school C was done in a traditional arrangement where classrooms typically consist of about five to six rows, each containing five to seven chairs. The learners had a view of what was projected. Furthermore in school B, the tables were arranged in a circular manner with learners seated on their chairs and the radio in the centre. The learners were able to get good audio sound from the radio. In school A, the computers were placed back to back in the middle of the classroom on one table. Learners who were seated close to the computers did not have a good view of the projected material. It seems obvious, but teachers who use ICT technology must think about seating arrangement to maximise learning opportunities.

#### 4.5.1.3 Learner's responses

Throughout the lessons, learners in both schools A, B and C were very responsive to what the teachers were engaging them on. However, as indicated previously, in school C learners were disruptive and noisy at times. The teacher had to pause and repeat parts of his lesson to ensure that all learners understand what he was saying. Learners attention and disruptive behaviour however improved when teachers started using the Overhead Projector and sound system. As soon as worksheets that were similar to the ones projected were handed out their behaviour changed. It was obvious that active engagement and participation assisted in maintaining good order. Learners clearly enjoyed working with the teacher while completing interesting material. In this activity, learners had to draw up a diagram on which the steps for internet login were explained. On completion of the activity learners in school A were instructed to login on their computers using their profiles. In most instances they managed to do this without further assistance from the teacher. In school B, after listening to the educational radio programme

learners were able to respond to the questions that were asked to test their understanding of the lesson.

#### 4.5.1.4 Usage of ICT equipment by teachers

As mentioned both teachers introduced ICT early on in their lessons. In school A, the teacher started his lesson by projecting the activity using a computer, a projector and a drop screen. The teacher assisted learners who were struggling to switch their computers on. Some computers were not functional in school A and the teacher had to attend to sort these problems out before he could continue. The teacher in school B used a radio (figure 3.3) to play an educational programme that was related to the lesson. In school C, the teacher used a document camera and a projector (Figure 4.5) and a whiteboard in his lesson.

Several studies concluded that a willingness to use ICT depends heavily not upon its usability, but also its perceived usefulness (Lam, 2000:382; Preston, Cox & Cox, 2000:85; Yuen & Ma, 2000:367). The teachers' confidence and competence are critical components of technology implementation in schools. ICT resources for example software and hardware, effective professional development, sufficient time and technical support need to be provided to teachers.

#### 4.5.1.5 The teacher's handling of the lesson

The teacher in school A made the learners understand what was requested of them in terms of the lesson. Additionally learners were allowed to seek for clarity so as not to be left behind. They were also given an opportunity to switch on their computers with the teacher providing assistance to those who encountered problems. In school B, the teacher requested the learners to be attentive as part of the lesson required listening to the radio. Furthermore in school C, the teacher explained to the learners that the lesson would be projected and they had to indicate anything that was not clear to them. Constructivists' views of learning have tended to assume that it is possible to move seamlessly from informal knowledge worlds into the more formal worlds of school knowledge in a self-guided manner (Godwin & Sutherland, 2004:133).

#### 4.5.2 ICT equipment in schools

- School A

The school is situated in Magogoe-Tlhabologo village, which is approximately 10 kilometres outside Mahikeng. The school has a roll of 1200 learners and a staff of 39 educators, which includes management. In this school, the computer laboratory is functional. The computers are in good condition, and effectively used (figure 4.1). Even though the computers are old fashioned they are equipped with the latest software suitable for teaching and learning.



Figure 4.1: A computer laboratory in school A



Figure 4.2: A laptop trolley with laptops used for learners in School A

- School B

The school has a roll of approximately 400 learners with a staff of 12 educators including management. The school is located in Lothakane village, which is more or less than 20 kilometres outside Mahikeng. In this school, two radio sets (figure 4.3) are used in teaching and learning. They are mainly used for audio purposes, where learners are able to listen to educational programmes and through the assistance of the teacher respond to activities presented to them. The Wi-Fi connection assists the teachers in accessing information pertaining to the development of the teaching material and research into improving their teaching.



Figure 4.3: Radios used for teaching and learning in School B



Figure 4.4: Wi-Fi connection in School B

- School C

The school is located in Montshioa Township less than 5 kilometres from Mahikeng. It is also near Rekopantswe Area Office, which is part of the study undertaken. The school has a roll of 996 learners with a staff of 36 educators including management. The school has a computer laboratory with a mixture of old fashioned and latest computers. The latest computers have a flat screen with more upgrades done. The old-fashioned computers are not compatible with the latest softwares as compared to the new ones. As a result, this renders them not useful to the school as they cannot be used in research purposes by both the teachers and learners. Additionally the school has a projector and a document camera (figure 4.5) which are mainly used by the Engineering and Graphic Design teachers.



Figure 4.5: A projector and a document camera in School C



Figure 4.6: A computer laboratory in School C

#### 4.6 CONCLUSION

In chapter four, the data interpretation and recording of findings from the empirical research were presented. The general aim and objectives of the study were achieved in the results of the data collected, analysed and interpreted. The main research question and sub-question were all answered.

The following chapter being chapter five will focus on conclusions, findings, recommendations and limitations of the study.

## **CHAPTER FIVE: CONCLUSIONS, FINDINGS, RECOMMENDATIONS AND LIMITATIONS OF THE STUDY**

### **5.1 INTRODUCTION**

The usage and implementation of ICT in schools has become part of normal standards in the 21<sup>st</sup> century as ICT dominates every sphere of life. The availability of information communication and collaboration presented through ICT has afforded teachers the opportunity to excel in their work allowing them to meet the demands of educational challenges at school. The importance of ICT cannot be overlooked as it empowers both the teachers and learners to overcome challenges in learning and teaching. It provides teachers with and learners with knowledge to do new things and the existing things best and more efficiently. The potential that ICT can present on intensifying and improving the quality of education in South Africa has been noticed, further different ICT initiatives have been identified trying to implement and maintain the use of ICT (GautengOnline, 2003:45; Thutong Educational Portal, 2004:35). McCain and Jukes maintain that if the education system is to survive and rise to the challenges faced within the 21<sup>st</sup> century, the system must take on the qualities of a learning organisation and the teachers must take on the qualities of new millennium learners. Even though the value of ICT in the educational fraternity has been realised, system-wide effective and sustainable ICT implementation in schools has not yet been realised in South Africa (Law & Chow, 2007:30). The implementation is been carried at a very slow pace and the teachers are avoiding using ICT as part of their teaching and learning practices (Buckenmeyer, 2005:55; Jimoyiannis & Komis, 2007:150). A number of challenges disturb the process of implementing ICT (Asan, 2003:153-160). Becta (2004:19-20), however points out that factors that have influenced ICT implementation should not be looked at in isolation. Pressure and much attention have been placed on teachers to implement ICT into their teaching and learning practices (Becta, 2006:70). Much as teachers play a significant role in the implementation of ICT, the change agents are the principals for effective and sustainable implementation in schools (Di Benedetto, 2005:4; Vallance, 2008:290).

The study sought to discover the implementation of ICT in teaching and learning in schools in Rekopantswe Area Office. The data was collected through interviews with learners, teachers and principals of selected schools in Rekopantswe Area Office and through observation of the classroom teaching and learning. All these formed the sample of the study. In this chapter, the

literature review and the empirical research findings summaries are presented. This presentation is with the view of making recommendations for the practical implementation of these findings and suggestion for further research and concluding remarks. In the North-West Province, initiatives have taken place to close the gap on the implementation of ICT in schools. In 2012 a partnership emerged between Internet Service Providers' Association of South Africa (ISPA) and the provincial government to embark on a "Train the Teacher" campaign. The programme aimed at equipping teachers with practical computer skills, enabling them to use technology to produce materials, subject plans, assessments and marks records, as well as complete administrative tasks (Microsoft SA, 2012:40).

## 5.2 SUMMARY

Chapter one of the study provided an introduction and background indicating the importance of the implementation of ICT in teaching and learning in schools (RSA, 2007:58). The researcher provided an overview in South Africa and made comments on different initiatives, objectives, strategies and the stages planned by the Department of Education (RSA, 2002:8). The chapter further presented the statement of the problem, research question, aims and objectives of the study, research design and methodology and significance of the study (Creswell, 2009:79).

In chapter two, the researcher looked deeply into the literature pertaining to this study. The researcher brought together the work of different authors to explore the implementation of ICT in teaching and learning in schools. The chapter also provided the theoretical framework that underpinned the study. The focus of the chapter discussed the implementation of Information and Communication Technology (ICT) in education, the role of different stakeholders in ICT leadership, methods of implementing ICT in schools, benefits of using ICT in schools and challenges with the implementation of ICT in schools (Wozney *et al.*, 2006:175).

The researcher in chapter three explained the research design and methodology (Leedy & Ormrod: 2005:139). The chapter also outlined the nature of the study being a qualitative design. The case of analysis was the implementation of ICT in teaching and learning in schools. The researcher made a motivation on the utilisation of certain approaches to identify knowledgeable respondents that had a significant role to play in providing information rich data (McMillan & Schumacher, 2012:138). Additionally the researcher in this chapter indicated and explained the

rationale for using qualitative research in this study. This chapter also presented the data collection methods for the study as being the in-depth individual interviews, group interview, observation and literature review.

In incorporating the field notes, the researcher was provided with an opportunity to record and comment on the thoughts about the setting, the respondents and activities. The steps of ensuring trustworthiness of the study were also explained. The chapter outlined the coding of the data according to categories and sub-categories and elicit meanings from the data as findings for this study. The data analysis was outlined as well as the ethical considerations.

Chapter four made a report on the researcher's analysis of the data. In applying an interpretive approach, the researcher was allowed to explore the meaning and interpretations that the respondents put on their social background (Seale *et al.*, 2004:475). The analysis in this chapter was conducted from the transcribed in-depth interviews, group interviews, observation, field notes and the researcher's comments. The researcher started by coding each incident into as many categories as possible (McMillan & Schumacher, 2010:376). Further the researcher as the analysis continued reduced the categories by clustering them as certain patterns emerged.

Chapter five dealt with presentation of synthesis; critic of findings; recommendations and conclusion to the study. In addition, this chapter provided a summary of the chapters (paragraph 5.2) in the study. The chapters made provision on the discussion of the findings (paragraph 5.3) from literature survey as well as findings of the empirical research. Finally, a correlation was made on the findings (paragraph 5.3.3). Additionally the chapter presented the recommendations to the findings of the study and for further research. The chapter concluded by making an indication to the shortcoming (paragraph 5.6) of the study and the final remarks.

### 5.3 DISCUSSION OF FINDINGS

The findings in the rest of this section are on challenges regarding the implementation of ICT in Rekopantswe Area Office.

5.3.1 Findings regarding research question 1: What are the key ICT related aspects that affect implementation in the schools?

Clear and specific definitions of the concept ICT (*Information and Communication Technology*) are not really used or regarded as very important or used in normal practice. ICT is regarded as a broad idea that includes aspects such as hardware and software, networks and internet, computers and laboratories. Obviously everyday related terms that are used on a daily basis by school stakeholders with regard to ICT matters are terms such as laptops, Facebook, cellphones and Wi-Fi access.

Although the official use of ICT in the schools for teaching and administrative purposes are not always up to standard, learners and teachers are very aware of the existence of aspects such as teleconferencing facilities and e-learning. Both teachers and learners are aware of radio and television programmes that can assist in learning. Learners in particular are conscious of the fact information can be obtained easily by accessing internet applications.

On the official side data and information are currently not used very efficiently in schools. Outdated and inefficient labour intensive data storage facilities in particular are still to be found. ICT are not fully integrated into schools with the result that administrative systems, the usage of time, the quality of data as well as decision-making are not up to standard. The use of ICT is also not very effective in the sense that critical school information such as time-tables, mark lists and budgets do not seem to reach important stakeholders. There is an apparent weakness in the way in which the different schools communicate or attempt to communicate with the department, parents and the business community. Although schools understand that electronic media have replaced manual organization and calculation of data they have not achieved good and successful implementation in all cases.

### 5.3.2 Findings regarding research question 2: What kind of support is available for ICT implementation in schools?

The findings on this research question are presented in three sections namely, on financial support, support for human development and support of computer resources.

Although the main focus in this study was not on funding it is clear that schools know that their school finances are affected by matters such as targeted funding, budgeting and quintile divisions. It is evident that schools realise that in addition to Departmental money they are also assisted when ICT courses and workshops are offered. Never less the importance to acquire

better quality ICT equipment is still hampered by the shortage of funds in schools in the Area. There is a strong feeling that more earmarked should be made available by the authorities. Private sector support is also available. This kind of support will however always be dependent on the efficient use of existing equipment. In order to acquire support from the private sector for ICT equipment, schools will have to ensure that they deploy current equipment sensibly and only use carefully selected software.

Inappropriately trained teachers and ineffective technical support are two major stumbling blocks that affect ICT implementation in the Area. It is clear that teachers' lack of knowledge limits their confidence and implementation of ICT. They also do not have enough experience in the usage of computers in their classrooms. It is further realistically expected that focused staff training in ICT matters will improve teachers' overall classroom performance and that all forms of staff development include knowledge and skill development of ICT matters. There is acceptance of the fact that provision must always be made for professional and continuous staff development but within this provision, training in ICT is a priority.

Resources such as computer laboratories, projectors, television sets and DVD recorders are provided sporadically to the schools but applicable software, consistent electricity and internet linkages are not up to standard. In this regard the schools in the Area can be at best categorized as semi-urban rural schools with a shortage of computer resources. Inefficiencies also exist because of factors such as poor organisation of the resources, poor quality hardware, inappropriate software, or lack of personal access to teachers.

### 5.3.3 Findings regarding research question 3: What is the relationship between ICT implementation in the schools and teaching and learning?

As it can be expected there is a closer relationship between ICT implementation and various aspects of teaching and learning such as classroom discipline, learner's ability to concentrate and lesson presentation. ICT is a core component of effective teaching and learning and must always be viewed as an integrated aspect of the curriculum. In addition both teachers and learners are inspired and motivated when ICT sources are available and used in schools.

Learners are confident in using computers and they have positive feelings about the usage of ICT in lessons. In addition their ability to study and memorise are improved when ICT is applied in

classrooms. Independent learning is also stimulated by exploring and doing research for homework such as assignments.

It was further found that by introducing ICT into their teaching, teachers feel that they are changing from traditional methods to methods that are compatible with modern society. These new methods such as Powerpoint presentation and e-mail communication make information sharing easier. It is also regarded as a tool that brings new meaning to teaching and learning. They see ICT as a means of reducing too much load in terms of books carried by learners. Increased use of ICT further assist teachers to develop their own material and thereby give them control over course content that is not always possible in a more traditional teaching set up.

#### 5.4 RECOMMENDATIONS

The following are the recommendations about the implementation of ICT in schools in the Rekopantswe Area Office.

##### 5.4.1 The awareness of the idea of ICT implementation in schools should be enhanced by

- Making stakeholders who are currently not involved in any ICT matters conscious of the role and importance of ICT in schools. This group obviously includes teachers and other school staff who still do not understand how to apply technological sources. These people have to be convinced by involving them and showing them how technology can be applied. This is a matter that can be handled internally by each school. The basis for this recommendation lies in the fact that all teachers should eventually use ICT in their teaching. An important first step would thus be to make them familiar with the idea of ICT.
- Updating and informing stakeholders such as SGB members and influential community members about the importance of ICT for schools. These stakeholders should be encouraged to support and introduce ICT initiatives at governance level. The information referred to in the next recommendation must also be made available to this group. The involvement of these people is important because school staff would see it as support for an important cause.

#### 5.4.2 Department support and provisioning should be improved by

- Implementing government regulation

Government regulations that are linked to ICT matters such as guidelines on resource acquisition should be implemented. In this regard the strategic objectives in the draft *White Paper on e-Education* are important together with the recommendations made in the document *Need for an e-Education Initiative and the National Curriculum Statement*. The Education Department should in this regard also take note and attempt to implement the ICT connectivity plan as well as the plan on providing textbooks in as PDF downloads as announced at ministerial level in addition to the agreement already made with the Internet Service Provider's Association of South Africa (ISPA). The acceptance of these recommendations will go a long way in improving education and the image of education in the province.

- Providing computer laboratories

There is a need to develop resources that promote ICT implementation and emphasise the need for advanced technological competence. Such resources should be in a form of computer laboratories. The Department of Education should ensure that schools have fully functional computer laboratories so as to effectively implement ICT. The schools' current laboratories should be refurbished. The only way that learners can attain digital literacy is by having hands-on experience with computer equipment. Many children do not have any access to computer equipment at home and limited technology in the classroom does not give learners an opportunity to use it to the extent that they can build computer skills.

A computer laboratory will allow learners to become comfortable in the use of computer equipment. In addition, learners will be able to conduct their individual research projects in a computer laboratory. A teacher will also be able to use monitoring software to supervise and guide the research process.

- Providing technical support

Technical support should be provided to schools to assist in the maintenance and fixing of ICT equipment and in maintaining laboratories. Teaching and learning cannot be interrupted due to teachers attending to technical aspects of ICT. An unreliable and unsupported information and

communication technology (ICT) infrastructure will result in staff losing confidence in ICT as an integral teaching tool. The technical support should be in a form of dedicated on site technicians who will perform regular updates, hardware and software solutions. Such technicians should also work through any issues on the curriculum network and provide support for servers, personal computers (PCs) and printers. They should also provide technical support to ensure that the network runs at its optimum performance throughout the school day. Additionally the technicians should advice on how the school's ICT vision can be developed and on the purchase of new equipment.

The implementation of these recommendations will go a long way towards ensuring that teachers and learners can focus on their main task and not be burdened by computers that are not functioning.

#### 5.4.3 Staff development should be focused on ICT matters by

- Changing teacher's perceptions about ICT

Teachers should be motivated to change their negative perceptions about the use of technology in their classrooms. Before and during any implementation of any new innovation teachers go through a series of psychological stages regarding their concerns toward the new innovation. Timely identification of teachers' concerns is a crucial task for successful technology integration in the classroom. The knowledge of computer use is of importance as it will lead to smooth integration in the classroom. The teachers should know how ICT would benefit their students so as to influence the use of technology in their learning.

- Improving training for teachers

Teacher development in ICT skills is a crucial recommendation. It is accepted that the general development of teachers is being handled properly. Teachers should however also be thoroughly trained in ICT matters since they are responsible for its implementation in the classroom. Training should also not only be conducted on a short term basis but must be done on an on-going process.

In the information age, where innovations are constantly introduced and change is happening rapidly, the demand for on-going professional development on ICT is in high priority. The training of the teachers will maximise the return of the investment in staff development.

### **5.5 RECOMMENDATION FOR FURTHER RESEARCH**

This study concentrated only on one primary school and two secondary schools in Rekopantswe Area Office of Ngaka Modiri Molema District in North-West Province. In total the researcher selected twenty-nine participants consisting of eighteen learners, eight teachers and three principals. In the primary school which is school B, four teachers, six learners and a principal were selected. In school A, which is one of the secondary schools, the researcher selected two teachers, six learners and the principal. The remaining participants were selected from school C, comprising two teachers, six learners and the principal. As mentioned the participating teachers identified learners as participants based on the learners' involvement in the usage of ICT in their classrooms.

The focus was on ICT implementation of selected schools within the delimitation of this study. The study firstly recorded the inputs from the interviews with three principals and eight teachers. In addition information was also obtained with the group interviews and observations. It is therefore, recommended that a comparative study be conducted within other population groups, Area Offices and in the rest of the Province to further assess the implementation of ICT in teaching and learning in schools in the province.

### **5.6 LIMITATION OF THE STUDY**

Limitations of a study empower a researcher to appreciate constraints imposed and to understand the context under which claims are set (Souls, 2005:11). The application of both qualitative and quantitative research methods is of significance importance in a study. The implementation of only one research method can limit the findings of a study. The researcher in this study only used qualitative research methodology and this could be one of the reasons for some limitations in the sense of addressing all the aspects relating to the main research question.

Furthermore, the data analysis had a representation of a small number of respondents as a result no generalisation to a wider population could be made. The findings of this research were not tested to determine whether it is statistically significant or due to change.

Additionally the researcher is not highly skilled and had insufficient experience of qualitative research. According to Merriam (1998:22), the sensitivity in the data-gathering phase is needed, “knowing when to allow for silence, when to probe more deeply, when to change the direction of the interview”. The researcher realised during transcribing of the interviews that he lacked experience in interviewing techniques especially with the first interviews. Merriam (1998:20) states: “The human instrument is fallible as any other research instrument”. The researcher as human instrument is limited by being human – mistakes are made, opportunities are missed, personal bias interferes. The researcher strived to be objective and neutral in the collection, interpretation and presentation of data, however being biased might have crept into the qualitative research practice. Ritchie and Lewis (2003:20) point out: “... while researchers ‘strive’ for neutrality and objectivity, we can never attain this aspiration fully.”

Due to financial constraints, the researcher only concentrated on three schools within Rekopantswe Area Office. The researcher was unable to expand the study to as many schools.

Some respondents decided not to take part in the research even though they initially agreed. This was because they could not fit the interview into their busy schedules. Mouton (2001:107) refers to another limitation that could have taken place in the interview, viz, “the social desirable effects”. In other words, the respondents could have answered what they felt would please the interviewer.

## 5.7 CONCLUSION

The implementation of ICT in teaching and learning in schools is of paramount importance. The role of technology in the curriculum is a given reality. The Department of Education (DoE) further confirmed the importance of ICT use in education, suggesting that all students should be computer literate by 2013 (Wilson-Strydom, Thomson and Hodgkinson-Wiliams, 2005:74). However, the government initiative had challenges that led to ICT implementation in schools being delayed. Amongst other, the Department lacked in supplying electricity, computer laboratories and ICT equipment in general.

The implementation process further cannot be achieved without cohesion in schools. The principal, teachers, parents and the community play a critical part in ICT implementation in schools. The school has to adhere to government policies, as they are the guiding documents for ICT implementation. A government policy function as a notice to the citizen at large that a new, revised or accelerated program of action on particular issues are intended within a given time frame (Koech, 2005:55).

At ground level teachers must ensure that ICT implementation is effectively done in the classrooms. They have direct involvement with learners and their knowledge in ICT matters is of vital importance. According to Schiller (2003:40), school teachers play a critical role in the implementation of ICT in schools because they are responsible for making changes in their schools by facilitating the integration of ICT.

The findings from the empirical investigation indicate that schools in Rekopantswe Area Office are committed in the implementation of ICT in teaching and learning. The schools are trying in the best possible way to ensure that they integrate ICT in the classroom. As an example the schools make use of the laboratory for searching of information beneficial to both the teachers and learners, and using ICT for developing the teaching material. However much as there is a commitment from the schools a series of challenges exist, for example financial constraints leading to ineffective implementation of ICT.

Consequently based on the findings from the empirical investigation it is recommended that; in Rekopantswe Area Office there should be an enhanced awareness of ICT implementation in schools, the Department's support and provisioning should be improved, and the staff development should be focused on ICT matters.

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A letter of request for participants

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Dear Participant

I am currently registered as a student at North-West University: Mafikeng Campus studying towards an M.ED degree. As part of completing my studies, I am expected to conduct interviews and have selected you as a participant. This selection is based on your involvement in Information and Communication Technology (ICT) at your school. The primary objective of the study is to obtain data relevant to the implementation of ICT in teaching and learning in Rekopantswe Area Office schools. The information obtained will be confidential and used for study purposes only.

Thank you in advance for your willingness to take part in the study.

Participant's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Researcher's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Yours sincerely

---

THAPELO MOKGADI (Mr)

A letter for discussion on a date, time and venue for an interview

---

Dear Participant

I appreciate your willingness in taking part in the study that I am presently conducting. In this letter, I am making a humble request on how the interview will be done. I will gladly accept your approval on the date, time and preferred venue for the interview. As indicated in our previous meeting, please note that any information obtained through the interview will remain confidential and be used for study purposes only.

Thank you for having agreed to take part in this study.

Participant's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Researcher's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Yours sincerely

---

THAPELO MOKGADI (Mr)

A letter requesting observation

---

Dear Participant

I kindly request your permission to conduct an observation in your class. The purpose of this procedure will be to assist in the study that I am conducting towards an M.ED degree at North-West University: Mafikeng Campus. As part of my studies, I am expected to do an observation in the implementation of Information and Communication Technology (ICT) in teaching and learning in Rekopantswe Area Office schools.

Thank you in advance

Participant's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Researcher's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Yours sincerely

---

THAPELO MOKGADI (Mr)

Field Notes: School A

---

Class: Information and Technology

Date: 27/08/15

Time: 13:30-14:30

- The classroom furniture is well arranged.
- The classroom structure does not allow all learners to have a good view of the projected work on the screen.
- At the beginning of the lesson, the teacher instructs the learners to log on to their computers.
- Some of the learners have to share a computer.
- The learners log on without being assisted by the teacher.
- The teacher projects an activity that learners have to work on from the textbook.
- The teacher explains to the learners how they should attempt the questions based on the activity.
- The computers still on, learners listen attentively to the teacher.
- After the explanation, the learners start working on their computers.
- Those sharing delay in their work.
- Some computers start giving learners problems and the teacher has to attend to them.
- As a result, there is a delay in doing the activity.

Field Notes: School C

---

Class: Engineering and Graphic Design

Date: 19/08/15

Time: 09:45 – 10:15

- The classroom furniture is well arranged.
- Some learners start changing the arrangement.
- They claim their positioning is not good.
- They start being noisy delaying the start of the lesson.
- The teacher uses a document camera and a projector.
- The lesson starts with a diagram being projected by the teacher.
- Learners become attentive and listen to what is said.
- The teacher distributes sheets to work on based on the diagram projected.
- The teacher instructs learners to compare the projected diagram with the one being distributed.
- The learners start working jointly with the teacher using the projected material.
- After working on the activity with learners, the teacher starts doing inspection on the work done.
- Some learners ask the teacher to assist them.
- The learners are able to compare their work with that of the teacher still being projected.

## Addendum F

### Observation: School A and C

Date and Time	Situation	Participants	Actions observed	Reflection
27-08-15 13:30 - 14:30	Inside the classroom	Mr X and learners	Arrangement of furniture	The furniture is arranged in a manner that allows learners to see the projected material
			Classroom structure	The structure obscures learner's vision
			Learners logging on computers	Learners master the operation of a Computer
			Learners sharing a computer	Unavailability of resources hampers running of the lesson
			Computers giving problems	The technical problems on computers
19-08-15 09:45 - 10:15	Inside the classroom	Mr X and learners	Arrangement of furniture	Furniture arranged properly
			Behaviour of learners	Some noisy and delay the lesson
			Interaction of learners with the Teacher	Others asked for assistance from the Teacher
			Movement of learners	Movement of learners disturbs the Lesson



## **Informed Consent**

---

Dear participant, before agreeing to participate in the research study it is important that you read and understand the following information:

- Any information obtained in this study will be completely anonymous. My responses will not be made known to any other person by the investigator.
- I understand and agree that the data obtained from this research may be used for scholarly publication.
- I understand that I have the right to discontinue participation in this study and can exit the research process at any time without any negative consequences to me.
- If I have any questions or if any problems arise in connection with my participation in this study, I should contact Mr G.T Mokgadi.

Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Researcher's Signature: \_\_\_\_\_

## **Interview Guide**

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### **QUESTIONS FOR INTERVIEW WITH PRINCIPALS**

- How do you understand the concept “Information and Communication Technology” (ICT)?
- Do you implement ICT in your school? Explain.
- How was ICT funded?
- Does ICT benefit the school? Explain.
- How can it be improved?

### **QUESTIONS FOR INTERVIEW WITH TEACHERS**

- How do you understand the concept “Information and Communication Technology” (ICT)?
- Do you have access to a computer? In which subjects can ICT be used?
- Give examples of how you use ICT in your class?
- How do you use ICT in developing your own teaching material?
- Which specific ICT have you used? Give examples.
- What challenges do you experience in using ICT in teaching?
- How does ICT assist in teaching?
- Did you receive any training on ICT usage?
- What other support would you like to have?
- Is the use of ICT beneficial to you? Explain.
- Do you make use of the computer laboratory? What do you do when you are there?
- Are there enough computers to be used by learners? If not, how are the current computers beneficial to learners?

## QUESTIONS FOR INTERVIEW WITH LEARNERS

- How do you understand the concept “Information and Communication Technology” (ICT)?
- Do you use ICT in class?
- How does your teacher implement ICT in your class?
- Does ICT benefit you? Explain.

THE PANEL OF PROPOSAL COLLOQUIUM

NWU: MAFIKENG CAMPUS

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I selected a yes for question 11 on research ethics for the following reasons:

Motivation on dealing with gatekeepers

Gaining access to sites was of critical importance to the study. Every time I had to gain access to the sites, that is school premises, I had to register with the Area Manager, principals and teachers. I had to state who am I; where am I going; time of entry and why, with the use of an identification document. In all instances, I carried a letter from the office of the director for the school of educational leadership development, North-West University: Mafikeng Campus. Despite of the work that had to be performed by the officials at the sites visited, they were in all respect highly co-operative and willing to offer assistance.

Motivation on the classification of study as low risk

This study was termed low risk based on the following NWU ethical risk level descriptors:

- Face-to-face surveys by means of validated interview schedules.
- Documented data or analysis with identifiable human participants.
- Simple biophysical research with humans.
- Biophysical research with no drugs involved.
- Biophysical research not involving human tissues or drugs.
- Interventions based on professional, scientific base protocols.
- Document/artefact analyses without identifiable human participants.
- Research budget under R250 000 but higher than R100 000.

List of things to be observed

- Participants' reaction during interview
- Attitude of participants in relation of their day to day work

List of documents analysed

The following documents were analysed for purpose of this study:

- Unpublished books and journals relating to implementation of ICT in schools,
- Newspapers and magazines with reported cases on ICT implementation in schools,
- Minutes of meetings, departmental circulars and memorandums.

Addendum J



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The Area Manager  
Rekopantswe Area Office  
C/o TheleshoTawana and ModiriMolema Road  
Montshoa  
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Education Leadership Development  
Tel: 018 3892500 (Secretary)  
Email: [eliza.senne@nwu.ac.za](mailto:eliza.senne@nwu.ac.za)

Date: 14/08/15

Dear Sir/Madam

**REQUEST FOR PERMISSION TO CONDUCT RESEARCH**

This is to confirm that Mr G.T Mokgadi (16234561) is a Masters student registered at the North-West University, Mafikeng Campus. The title of the dissertation is: **The implementation of information and communication technology (ICT) in teaching and learning in Rekopantswe Area Office schools.**

Permission is hereby kindly requested to enter Barolong, Boitseanape and Mosenogi schools to collect data from the teachers, principals and learners. Data collection will be by way of interviews, observation and focus group interviews.

Collection of data will involve teachers and learners. Interviews with teachers will be arranged outside school contact time so as not to interfere with teaching and assessment processes or office duties. The request is further to conduct a group interview with a small group of learners (4 or 5) after school and to attend one class where ICT is being used, in an observational capacity. The dates and times of the collections are to be agreed upon by the principal and all other participants.

Participants will participate voluntarily in the data collection. The identity of the participants and the school and Area Office will be kept confidential and anonymous. The information collected therefore cannot and will not be used to evaluate the Area Office/school in terms of its performance in comparison with others, because the information collected will not be about academic results or teachers' teaching performance in specific schools.

Should you enquire more information about the project, kindly contact the supervisor for this project: Prof Christo van Wyk (0835009019).

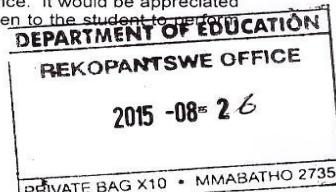
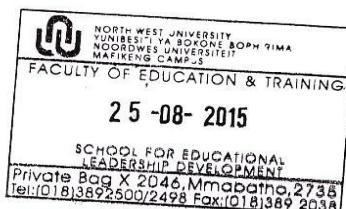
Herewith permission is kindly requested to perform this research in your Area Office. It would be appreciated if you would kindly grant **written** permission to this student. Any assistance given to the student to perform the research will be appreciated.

Yours sincerely

*Arrest*  
Prof P du Toit

Director: School for Education Leadership Development (School in which the Masters and PhD programme is registered)

Mafikeng Campus



Approved that  
provided a lesson  
teaching & learning  
is not compromised  
*J. H. E. Mammom*



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Email [Ethics@nwu.ac.za](mailto:Ethics@nwu.ac.za)

**ETHICS APPROVAL CERTIFICATE OF PROJECT**

Based on approval by the **Human Resource Research Ethics Committee, Mafikeng Campus**, the North-West University Institutional Research Ethics Regulatory Committee (NWU-IRERC) hereby approves your project as indicated below. This implies that the NWU-IRERC grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the project may be initiated, using the ethics number below.

**Project title:** The implementation of information and communication technology (ict) in Rekopantswe Area Office schools.

**Project Leader:** Prof C van Wyk  
**Student:** GT Mokgadi

**Ethics number:**

N	W	U	-	0	0	2	2	9	-	1	5	-	A	9	
Institution				Project Number				Year				Status			

Status: S = Submission; R = Re-Submission; P = Provisional Authorisation; A = Authorisation

**Approval date:** 2015-06-01      **Expiry date:** 2020-05-31      **Category:** N/A

Special conditions of the approval (if any): None

General conditions:

*While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following:*

- The project leader (principle investigator) must report in the prescribed format to the NWU-IRERC:
  - annually (or as otherwise requested) on the progress of the project,
  - without any delay in case of any adverse event (or any matter that interrupts sound ethical principles) during the course of the project.
- The approval applies strictly to the protocol as stipulated in the application form. Would any changes to the protocol be deemed necessary during the course of the project, the project leader must apply for approval of these changes at the NWU-IRERC. Would there be deviation from the project protocol without the necessary approval of such changes, the ethics approval is immediately and automatically forfeited.
- The date of approval indicates the first date that the project may be started. Would the project have to continue after the expiry date, a new application must be made to the NWU-IRERC and new approval received before or on the expiry date.
- In the interest of ethical responsibility the NWU-IRERC retains the right to:
  - request access to any information or data at any time during the course or after completion of the project;
  - withdraw or postpone approval if:
    - any unethical principles or practices of the project are revealed or suspected,
    - it becomes apparent that any relevant information was withheld from the NWU-IRERC or that information has been false or misrepresented,
    - the required annual report and reporting of adverse events was not done timely and accurately,
    - new institutional rules, national legislation or international conventions deem it necessary.

The IRERC would like to remain at your service as scientist and researcher, and wishes you well with your project. Please do not hesitate to contact the IRERC for any further enquiries or requests for assistance.

Yours sincerely

**Linda du Plessis**

Digitally signed by Linda du Plessis  
DN: cn=Linda du Plessis, o=NWU,  
ou=Vaal Triangle Campus,  
email=linda.duplessis@nwu.ac.za,  
c=ZA  
Date: 2015.08.11 13:07:53 +02'00'

**Prof Linda du Plessis**

Chair NWU Institutional Research Ethics Regulatory Committee (IRERC)