

**Analysing the Availability and Potential Utilisation of Technology in Grade 12
Geography Classes in Mankweng Circuit Limpopo Province**

BY

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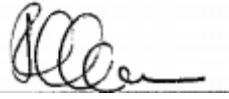
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DECLARATION

I declare that the dissertation hereby submitted to the University of Limpopo, for the degree of Masters in faculty of Humanities has not been previously been submitted by me for a degree at this or any other university; that is my work in design and in execution, and that all material contained herein has been duly acknowledged.

PHALANE MN

SIGNATURE



DATE: 12 NOVEMBER 2020

DEDICATION

In memory of my late husband, Malose David Phalane. Dedicated to my children Pabalelo, Moses, Mpho and my granddaughter Khumo Phalane. They have been my inspiration and motivation all the time as I studied and wrote the research.

ABSTRACT

The aim of this study was to investigate the availability and potential utilisation of educational technology in the teaching and learning of Geography in Grade 12 in Mankweng Circuit, in the under resourced area of Limpopo Province. The researcher used the constructivist theory with an emphasis upon constructivism as a theoretical framework. A qualitative research approach and a case study design were adopted for this study. Furthermore a purposive sampling strategy was used to sample seven teachers and four principals. In this study all the Secondary Schools fall under Quintile one-the Department of Basic Education's classification category for no fee paying schools. There are no private or independent high schools that are privately owned, governed or funded in the Circuit. Government has made several attempts to improve the results by providing policies, resources such as infra-structure like classrooms and books, extended additional training of teachers and in some cases, schools took learners to camps for further studies. However, despite these efforts, the problem of the declining of results continues unabated.

Data was collected through three methods, namely interviews, observation and document review. Data was analysed through the use of thematic content analysis method. The study came up with three major findings on availability and the use of computers in Grade 12 Geography, namely: (a) inadequate supply of and access to computers in schools and lack of security,(b) Lack of skill on the use of computers by teachers and (c) intermittent power interruptions at these schools influence the performance of learners negatively.

These findings have major implications for the use of computers in the teaching of Geography in schools. Firstly, there is an urgent need to supply schools with computers if teachers and learners are to use them to enhance their teaching and learning of Geography and other subjects. Secondly, there is a need to train teachers in the use of computers in the teaching of subjects like Geography otherwise the demands of the Fourth Industrial Revolution will overtake these schools and performance of learners will not improve. Thirdly, principals should attend training workshops to learn about their responsibility as ICT leaders at schools moreover there is a need to tighten security at schools in order to safeguard computers and other valuable equipment that support teaching and learning.

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Participants

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Key Words

Educational Technology,

Information Communication Technologies, Technology,

Constructivism, Potential Utilisation

Qualitative Research

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ACRONYMS AND ABBREVIATIONS

AV----Audio visual movement

BSPZ----Better School Programme of Zimbabwe **CK**----Content Knowledge

GIS----Geographic Information System **GPS**----Global Positioning System **DoE**----
Department of Education

ICT----Information Communication Technology **IT**----Information Technology

LAN---- Local Area Network, a system that links together various pieces of electronic equipment from a small area.

MC----Mediated Communication

NGOs----Non-governmental organisations

PCK----Pedagogic Content Knowledge

PK----Pedagogical Knowledge **TEL**---Telkom

TCK----Technological Content Knowledge **TK**----Technological Knowledge

TPACK----Technological Pedagogical Content Knowledge **TPK**----Technological Pedagogical Knowledge

SMT----School Management Team **SGB**---School Governing Body

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CHAPTER 1

1.1 INTRODUCTION AND BAKGROUND TO THE STUDY

The purpose of this chapter is to present the introduction and background to the study and an overview of the study. The chapter is structured as follows: background to the study, research problem, brief literature review, the role of theory in the study, definition of concepts, purpose of the study and research question, research methodology, significance of the study and ethical considerations.

Educational technology and its continuous innovations have improved efficiencies in various domains of modern living (Gupta, 2011). Within the economic domain, as Wolf (2016) has added, educational technology has led to the rise of e-commerce, the transformation of industries and the rise of sharing economy within and between countries. Furthermore, socially it has altered human interactions and affected relationships between the rulers and the ruled within the political domain. In another study by Lynchm (2017), which supports Gupta (2011), it is alleged that educational technology has led to learners' active engagement with the learning material because technology is interactive, thereby enabling students to learn by doing, researching and receiving feedback. Lynchm (2017) further argues that simulation software helps to bring to the classroom real activities that would be impossible to see without technology. By using specific simulation tools, learners can see, amongst others, planetary movements and how tornadoes develop. Consequently, this helps learners to become passionate about what they are learning. This is also true for subjects such as Geography in which learners may study by using interactive software like Google Maps or Google Earth, instead of resorting to text books only. Hence, with improved efficiencies in ICT, various domains of modern living are positively affected.

The above discussion shows that the presence of educational technology is growing in South African schools. In support of this view, a study by Nonyane (2012), argues that the availability of educational technology in schools is providing expanded opportunities for countries in Africa to make education available for all people. This implies that access to technology in schools may improve the lives of residents in a number of ways. This

includes, amongst others, helping the people to meet community and societal needs that were hard to meet in the past. Besides, within the educational domain, it promotes quality and efficiency from lower levels to the highest, thereby equipping learners with required skills and knowledge in life. This would benefit both learners and the entire society (Bulman G. &, 2015). Therefore, the approach towards teaching and learning has drastically changed as a result of the advent of technology, in particular computers. Hence, the new generations of kids come to schools ready to work with these technologies. According to Lowther, Smaldino & Russel, (2012), this plays an important role in children's learning as they acquire various cognitive knowledge, and enables schools to incorporate educational technology in their curriculum.

The concept "educational technology" has evolved over time. Despite lack of a standard definition of the term, different authors have defined it in various ways. According to Hsu, Hungi, & Ching (2013) educational technology is the study of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources. Spector (2015), explains that educational technology involves the disciplined application of knowledge for the purpose of improving learning, instruction and performance. However, this study adopts Aziz's (2010) definition of educational technology as the implementation of appropriate tools, techniques or teaching processes to facilitate the application of senses, memory and cognition to enhance teaching practices and improve learning outcomes. Despite the differences in definition, they all show that the concept entails the transformation of the traditional textbook teaching and learning model to a digital approach. It is hoped that by integrating Information Communication Technology in education, it would have a positive impact on the teaching and learning process.

This impact of ICT would be evident when learners acquire skills and cognitive characteristics. This makes its role more important than ever in teaching and learning. As Mukhari (2016), has noted, computer technology has become an important part of education in order to bring about new ways of teaching and preparing learners for their future in the information age. Hence, access to quality education in particular, is enriched through web-enabled educational software, systems and networked applications (Bunt-

Kokhuis, 2012). Therefore, with the help of new technology comes an explosion of learning and receiving of new information.

For this reason, South Africa established its e-Education policy in 2003(Department of Education, 2003),According to DoE white paper (2003) policy, educational technology is viewed as a resource for teaching and learning, and an enabler of development of the school as a whole. The implementation of the Information Communication Technology (ICT) in South African schools is being led by School Net, which also provides staff development, ICT support to schools and makes provision of computers in all provinces as table 1 shows.

Table 1: Distribution of computers in South African schools by provinces: Department of Education’s (DoE) White Paper on Education (2003).

Provinces	School with computers	Schools using computers
Eastern Cape	8,8%	4,5%
Free State	25,6%	12,6%
Gauteng	88,5%	45,5%
Kwazulu-Natal	16,6%	10,4%
Mpumalanga	22,9%	12,4%
Northern Cape	76,3%	43,3%
Limpopo	13,3%	4,9%
North West	30,5%	22,9%
Western Cape	82,4%	56,8%

Gauteng, the Western Cape and Northern Cape have made significant progress, but the other six provinces continue to lag behind due lack skills although the South African government has promised that all schools, including those in rural communities, will be equipped with the best infrastructure, equipment and resources (especially ICT infrastructure) to strengthen their role in countering historical disadvantages. This is a call for concern, as it shows that

There are clearly still barriers to growth and implementation of new technologies and limitations to making e-learning solutions available to everyone in all provinces.

Consequently, the government has undertaken through its educational policy of 2004 to equip all schools with ICT (Mlitwa, 2013). As the policy states, it would also facilitate the incorporation of ICT into the curricula, and improve communication, engagement as well as collaboration amongst teachers and between learners (Department of Education, 2007). Hence, the goal was to ensure that every teacher and learner is able to use ICT confidently and creatively and to develop skills and knowledge needed to achieve personal goals. In this quest, further provisions were the integration of technology into all South African schools by the year 2013 (Department of Education, 2013).

However, interest by governments in integrating educational technology in learning and investment in software and hardware puts pressure on teachers to find valid and effective ways of using computers in the classrooms. It is what the teacher plans and does with technology that matters most, not the mere availability (Mukhari, 2016).

On this basis, the researcher aimed to investigate the availability and potential utilisation of educational technology in Grade 12 Geography classrooms of Mankweng Circuit in Limpopo Province. By potential utilisation, the researcher refers to knowledge of pedagogical strategies for teaching with computers, assessment methods for student products created with the aid of technology, awareness of student capabilities and common obstacles (Rupp, 2013).

1.2 RESEARCH PROBLEM

The educational system in Mankweng Circuit is facing some huge challenges as it attempts to cope with the inclusion of ICT in its secondary schools. This is because the prevailing culture of talk and chalk within the teaching fraternity has not yielded the desired results. Consequently, for the past five years or so, results in Grade 12 Geography have been in the decline in most schools, especially in rural under-resourced remote schools like in Mankweng Circuit.

Studies on possible causes of this decline have been conducted, and some of the causes have been identified as lack of training of teachers (Keengwe & Onchwari, 2011). Lack of textbooks (Mukhari, 2016; Mwencha, 2012) and of resources (Mayer, 2005).

Government has made several attempts to improve the results by providing policies, resources such as infra-structure like classrooms and books, extended additional training of teachers, et cetera (Nonyane, 2012). In some cases, schools took learners to camps for further studies. However, despite these efforts, the problem of the declining of results continues unabated.

This has led to a general consensus amongst academics, business and politicians that the advancement of the school system is being jeopardised by insufficient provision and utilisation of ICT resources. Hence, it would appear that the use of ICT in teaching has not been fully explored especially in subjects like Geography in which more contact requires such integration. Therefore, this study sought to investigate the availability and potential utilisation of ICT (Computers) in the teaching and learning of Grade 12 Geography. So far available studies have focused on the use of ICT resources in general, but not on the use of computers in Geography in particular. Studies that have attempted to look at this area come from urban settings but few have focused on rural schools.

1.3 BRIEF LITERATURE REVIEW

Netanda (2018), definition of literature review is that it is a central element of research that serves as the groundwork on which actual research should be built. Thus, in order to achieve the broad purpose of creating the base for a vital study, an assessment and integration of pertinent information becomes a means to an end. This subsection focuses on a brief literature review to determine the level of ICT availability and utilisation in schools by various Departments of Education from selected developed and developing countries. It would further highlight the level of investment of those countries in the field of ICT integration in education. This would assist the researcher to see how ICT is provided and utilised in those countries to avoid a duplication of the same data. The way in which those countries experience and solve their challenges would also be a lesson to be learned in Mankweng Circuit.

The focus of the review is on the United State of America. And Finland as overseas countries and Kenya, Nigeria, Zimbabwe and South Africa within the African continent. This would provide a better perspective of how the issue of ICT (Computers) availability and its utilisation are integrated within the school system. The choice of these different

countries, African and their counterpart is based on their resource base and advancement in ICT integration in education. The researcher can then position this study in its proper perspective based on information from secondary data. Available literature (Klein, 2010; Aleksander, 2012), shows that the use of ICT in education has been a key priority in most countries, but progress has been uneven. According to Klein (2010), the use of computers in education opens a new area of knowledge and offers a tool that has a potential to change some of traditional and ineffective educational methods. In contrast, Aleksander (2012) asserts that schools use educational technology as a means to promote creativity empowerment and equality and produce efficient learners and problem solvers.

According to Bester & Brand (2013) findings, the availability and proper utilisation of ICT has proved to have a positive impact on learners' attention and achievement in the classroom. The authors further found that there were significant differences between the average achievements of a group of learners exposed to technology during a lesson as compared to a group not exposed to technology during the lesson. In another study by Bordbar (2010), the utilisation of computers promotes interactive teaching and learning. As a result, learners do not only receive content in a visual or auditory way, but actively react to what is presented to them. This shows that the ability to collaborate, communicate, create, innovate and think critically is vital in ICT curriculum implementation (Hannesty, Harrison, & Wamakote, 2010).

Telkom, (2015), conducted a study on technology in education. The findings revealed that as a result of recent development in technology; computers and the internet have become important teaching tools in the classrooms. The study argues that computers and the internet as supported teaching strategies have a crucial role to play, such as increasing active participation and creativity, improving knowledge and skills, increasing motivation, collaboration, responsibility and self-esteem (Mukhari, 2016). Another study by Bukalunga & Mubika (2011), indicate that teachers' competence in ICT is a very trendy theme, and ICT curriculum implementation needs core competencies which are mandatory for secondary schools teachers in order to keep themselves abreast with contemporary technologies. Furthermore, Brown (2011) stated that the incorporation of technology in the classroom can be quite useful because the use of virtual environments for collaboration

and learning can result in unprecedented flow of ideas, leading to higher levels of productivity.

In addition, there are many supporters who claim that there are many benefits of internet use in the classroom such as the ability to break down the classroom's physical limitation, development of students' inquiry, analytical skills and expanding students' experiences of visual technologies. Likewise, Graham, (2011), reports that web-based teaching does not only improve students' academic skills, but also has positive effects on the development of the democratic consciousness of students.

1.4 INTERNATIONAL PERSPECTIVE OF EDUCATIONAL TECHNOLOGY

1.4.1 United States of America

It is generally acknowledged that nearly 100 percent of public schools in the United States have internet access, with 97% having a broadband connection (United State of America, Department of Education, 2012). This view has been supported by a study conducted by Bordbar (2010), which asserts that student learning in America is being enhanced by the use of computer technology in their classroom activities. Significance of the usage of technology has been evident when the US Department of Education in 1989 earmarked close to a billion dollars for experiments to find convincing reasons in the usage of technology in public education (Grey, Thomas, & Lewis, 2010).

Furthermore, five years later the American Congress passed the improving America School Act, and pledged an amount of 49 million dollars to enhance the usage of education technology in American education. This showed the commitment of the American government towards technology in education. According to Honan (2010), computers serve as "valuable and well-functioning instructional tool" in American schools and classrooms. However, for the usage of technology to be effective, teachers should be able to use the technology at near expert level. A study conducted by Americans;Montrieux, Vanderlinde, Schelles, & Marez in (2015), further argue that integrating innovative technology during classroom practices inevitably demands teachers to acquire new technological and pedagogical skills.

1.4.2 Finland

In Finland, Dede (2010) conducted a study about the usage of educational technology in schools. The study found that technology in Finnish primary schools is a compulsory subject. To ensure the provision of quality education, Finnish teachers hold a master's degree in education, and most have studied technology education as part of their teacher preparation programme. This country's technology education can be characterised mainly as an aided design approach that has evolved from the craft oriented approach. Additionally, it involves elements of the high tech approach using computers, computer aided design and electronics (La Porte, 2010).

1.5 AFRICAN PERSPECTIVE

1.5.1 Kenya

A study by Osodo, Indoshi, & Ongati (2010), maintain that several schools in developing countries face escalating demands on access to finite computer based resources in teaching and learning. However, in Kenya, for example, the authors argue that there is an increased advocacy and adoption of computer resources in education. The study further argues that the government of Kenya in 2005, for instance, provided new opportunities for teaching and learning, including offering student-centred learning approach, opportunity for teacher-to-teacher and student-to-student, communication and collaboration and greater opportunities for multiple opportunities delivered by teachers creating motivation in learning amongst students.

1.5.2 Nigeria

In Nigeria, the Nigerian Federal government has placed educational technology under educational services(Hooker, Mwiyeria, & Verma, 2011). As a result, organs of the Federal government are responsible for the formulation and implementation of educational principles and practices, especially at the three tiers of the educational system in countries that include primary, secondary and tertiary institutions (Ann, Umeh, & Nsofor, 2014). This is due to the fact that educational technology is seen as providing solution to some pressing problems of curriculum practice in particular and educational issues in general. It is further seen as a tool in solving the problem of rote learning in the Nigerian education system.Allen (2011), noted that the systematic classroom use of educational

technology can accomplish significant increases in learning, particularly in foreign languages, science, mathematics and social studies.

1.5.3 Zimbabwe

The Zimbabwean government developed a national ICT policy in 2005(Dambuzo, 2014). The policy makes significant references to the promotion of ICTs in education, including the pedagogical use in educational institutions. The ex-president R. Mugabe's office also launched a campaign to provide most schools with computer-related equipment. This resulted in most schools, including schools in remote areas of the country, benefiting. This enabled them to utilise ICT in the teaching and learning process (Musaruwa, 2011).

Government has further established building programmes such as the Better School Programme of Zimbabwe (BSPZ) to assist in integrating ICT into the curriculum. Non-governmental organisations (NGOs), in particular World Links, have also stepped in recent years to establish at least two self-sustaining computer labs in each province to train teachers and students in the use of ICT (Muswingwini, Chitanana & Munyaradzi, 2014).

1.5.4 South Africa

According to Telkom (2015), one of the country's e-Education policy goals states explicitly that every South African learner should be ICT literate. This would enable the learners to use ICT confidently and creatively in the development of their skills and knowledge to achieve personal goals, thereby being able to participate fully in the global community. For example, in a Geography lesson two classes in different schools may link via internet to explore cultural differences in relation to a particular global issue such as pollution. The groups could work together to understand not just the issue itself but its impact on communities and individuals by talking to real people(Luckin, Bligh, Manches, Ainsworth, Crook, & Noss, 2013).

Brown (2011), who studied the link between teacher classroom practices and students' academic performance, conducted a study observing the "one computer per child" programme in South Africa. He concluded that TEL systems can increase overall academic performance for students regardless of socio economic status, age or race

(Brown 2011). This is a positive step for Mankweng Circuit to learn from these initiatives and to assist learners in the Circuit. This might help them to improve the quality of results in Geography and other subjects in Grade12.

The general usage of computers in the USA is admirable. This is ascribed to the fact that nearly all instructional classrooms in that country's public schools have computers with Internet access (U.S. Department of Education, 2012). It shows a great deal of investment that the Department of Education is embarking upon. Apart from the U.S.A, most countries in Europe(European, Commission, 2013), Germany, the UK, Japan and other OECD countries have a high level of computer access in classrooms(Bulman & Fairlie, 2015).

Despite this high level of computer access, most developing countries still face an escalating demand of access to computer-based resources (Osodo, Idoshi & Ongati, 2010). But, although there are challenges faced by most African countries in Kenya (Osodo, Idoshi & Ongati, 2010), Nigeria (Horker, Mwiyeria & Verma, 2011), Zimbabwe (Dambuzo, 2014) and South Africa (Telkom, 2015), policies have been established in support of the integration of ICT in education.

These studies show that although there has been some breakthrough in the general usage of computers in education, in some countries and schools particularly in developing countries, computers are still limited to a small number of schools and teachers who use them mainly for administration purposes. The usage and integration of computers in teaching subjects such as Geography is still low. A lack of enough software, time and

Insufficient and lack of adequate training are cited as constraining factors. This shows that the general usage of computers in education in developed countries is ahead of developing countries due to a lack of adequate resources and limited investment in ICT within the educational system. The next section focuses on the role of theory.

1.6 THE ROLE OF THEORY

A theory can be defined as a set of ideas, assumptions and concepts ordered in such a way that it tells us about the world, ourselves or an aspect of reality (Landberg & Krueger, 2013). In this study, which investigates the availability and potential utilisation of

educational technology in Grade 12 classes of Mankweng Circuit, Limpopo Province, the constructivist theory was used.

The constructivist theory proposes that "knowledge is being actively constructed by the individual and knowledge is an adaptive process, which organises the individual's experiential world" (Bull, 2013). One of the main beliefs of the theory is that people develop and build understanding from their own personal and subjective experiences. Constructivist theories are based on the belief that children construct their own knowledge and conceptual understanding as they interact with reality and with other learners who bring different perspectives (Thermos, 2012). Constructivists contend that people construct meaning through their interactions with and experience in their social environments.

For the purposes of this study, if teachers and learners do not use educational technology as a powerful aid to "doing" and to "addressing" real problems in Grade 12 classrooms, the quality of results may decline. Teachers can allow learners to investigate various topics through the use of the internet, thereby learning on their own while addressing their real learning problems. The use of ICT provides learners with activities, with hands on learning, and with opportunities to experiment and manipulate the objects of the world.

1.6.1 Constructivism

Constructivism refers to the idea that learners construct knowledge for themselves; each learner individually (and socially) constructs meaning as he or she learns (Thermos, 2012). Therefore, the constructivism approach would open learners' curiosity in the process, thereby leading them into critical, analytical thinking and knowledge discovery (Kharade & Thakker, 2012). Constructivism presumes that prior knowledge and experience play a significant role in learning and form the basis for subsequent activities. The constructivist learning theory enables the mobile technology to focus on students' ability to be self-directed and draw conclusions.

The theory explained how students work independently and with a teacher as a facilitator. Constructive reading theories are important because they indicate that educators cannot provide learners with knowledge. Students learn more when they have to explore and experiment rather than being told why something works. Constructivism argues that the

responsibility of learning resides increasingly with the learner (Thermos, 2012). Students born from 1980 are technologically savvy - they are surrounded by technology, they are familiar with digital tools such as video cameras, computer games, digital music players and mobile phones (Hlagala, 2015).

Constructivism suggests that the use of ICT in learning is not the passive acceptance of knowledge which exists out there, but that learning involves the learners engaging with the learning process. In a learning situation, learners must be able to construct knowledge in their own minds (Slavin, 1994). Constructivists encourage children to constantly use prior knowledge to understand new information.

When students use what they are learning, it is understandable and stays with them for a longer period of time. Constructivist learning theory allows the individual to place worth on mobile technology, rather than mobile technology imposing value on the individual. Constructivist theories are based on the belief that children construct their own points of view of the world, philosophy of living, technical expertise and knowledge structures, and emphasise one's learning initiative, and social and situational learning experiences. Students learn by doing, as noted by Dewey (1859- 1952), that practising is the foundation of learning, and without learning practice students would fail.

Constructivism moves the concept of learning beyond the rote memorisation of facts and procedures towards a process of knowledge creation (Bryant & Charmaz, 2010). ICT provides many students, especially the unmotivated, with a link between school and the real world. It moves the concepts of school beyond the notion of a place where knowledge is imparted to one of classrooms, organisations, and societies as knowledge building communities (Kamil, Mosethal, Pearson, & Barr, 2018). In support of this view, Woolfolk (2010) found that through this theory, learners would be able to explore and use their abilities to process their acquired information.

1.7 DEFINITIONS OF CONCEPTS

The following key words form the pillar of this study. Therefore, they were worth defining to make them clear and understandable throughout the study: Educational Technology is the considered implementation of appropriate tools, techniques or teaching processes that

facilitate the application of senses, memory and cognition to enhance teaching practices and improve learning outcomes (Aziz, 2010).

Technology is the science of knowledge, or knowledge put into practical use to solve problems. It applies a systematic or invents useful tools, techniques, methods or approaches to solve problems (Marriam Webster Dictionary, 2010).

Information Communication Technologies (ICT) refers to the computer and internet connections used to handle and communicate information for teaching purposes (Mikre, 2014).

E-learning is a learning programme that makes use of an information network such as the internet, intranet (LAN) or extranet (Wan) whether wholly or in part, for course delivery, interaction and/or facilitation. Web-based learning is a subset of e-learning, and refers to learning using an internet browser such as modem, blackboard or internet explorer (Mikre, 2014).

Constructivism is a theory of knowledge that argues that humans generate knowledge and meaning from an interaction between their experiences and their ideas (Thermos, 2012).

Potential utilisation refers to knowledge of pedagogical strategies for teaching using computers and assessment methods for student products created with the aid of technology, awareness of student capabilities and common obstacles (Rupp, 2013).

Qualitative Research is an iterative process in which improved understanding to the scientific community is achieved by making new significant distinctions resulting from getting closer to the phenomenon studied (Akpan & Beard, 2016).

1.8 PURPOSE OF THE STUDY AND RESEARCH QUESTION

This study aimed to investigate the availability and potential utilisation of educational technology in the teaching and learning of Geography in Grade 12 in Mankweng Circuit.

The main question to answer the research problem is: Do schools have access to technology? And if available, are educators able to utilise it to the benefit of their learners?

The following sub questions will be used to explore the study further:

- I. Which educational technologies are available in the teaching and learning of Geography in Grade 12 classrooms in Mankweng Circuit in Limpopo Province?
- II. Are teachers competent in the use of ICT?
- III. What are challenges faced by teachers when using educational technology in the teaching of Grade 12 learners?
- IV. How do teachers address these challenges?

1.9 RESEARCH METHODOLOGY

The researcher made use of the qualitative approach. Qualitative researchers rely on the collection of non-numerical data such as words and pictures (Castellan, 2010). Qualitative research is designed to reveal the audience's range of behaviour and perceptions that drive it with reference to specific topics or issues. Mannay (2010), points out that qualitative research uses in-depth studies of small groups of people to guide and support the hypotheses, and the results are descriptive. In this study, a case study design was undertaken to uncover clues for future researches about the availability and potential utilisation of educational technology (ICT) in Grade 12 classes in Mankweng Circuit, Limpopo Province.

1.9.1 Research design

In this study the case study was used as it provided with an in-depth, multi-faceted understanding of the teachers' experiences in the use of computers for teaching from their life context (classrooms). According to Yin (2014), case studies can be used to explain, describe and explore events or phenomenon in everyday contexts in which they occur. Also that the case study approach can offer additional insights into what gaps exist in the delivery or why one implementation strategy might be chosen over another.

Furthermore, case study was used and the participants offered their insights and experiences. Moreover, a case study is largely regarded by many researchers as the most effective tool of gathering information because of having a close contact with the participants (Dumay, 2011). In the present study, the researcher used this approach to

start from a perspective free from preconception to describe the availability and potential utilisation of ICT in Grade 12 Geography classrooms in Mankweng Circuit.

1.9.2 Population and sampling

Mankweng Circuit has 10 high schools most of which are rural schools. The circuit had 2287 Grade 12 learners with 50 teachers in 2017. A total of 1189 were Geography learners in 2017. The research population was for all schools in Mankweng Circuit. However due to the constraints of time, resources and the impossibility of engaging all schools, the researcher used her judgement (purposive sampling strategy) to identify and select schools. Schools in Mankweng Circuit were selected on their proximity to the researcher. Furthermore all the selected schools fall under Quintile one- the Department of Basic Education's classification category for no fee paying schools. Purposive sampling was used in this study because it illustrates a process that is of interest for this particular study as the aim was to select cases that were likely to have rich information that was relevant enough to study (Gall, Gall, & Borg, 2010). A list of schools from Mankweng Circuit was used to identify and select schools for sampling. Purposive sampling is the typical approach chosen with the aim of generating insight and obtaining in depth understanding of the topic of interest (Clarke & Luckin, 2013).

The participants were selected based on their willingness to participate in the study. Geography teachers must have been teaching Geography for the past ten years. A total of 11 participants were selected of which 7 were teachers, from a population of 6 secondary schools in the Circuit. Participant teachers were one teacher from school A, B and D while school C and E allocated two teachers, which the researcher included in the sampling. Four principal representatives from the schools were also included in the sample as respondents. The principals were from school B, C.D and E. The researcher used her judgement to identify and select accessible teachers and principals in terms of the location and the time scheduled for the interviews.

1.9.3 Data collection and instrument

Collection of data was done by using different data collection methods, namely fieldwork, semi-structured interviews, observations and document analysis.

1.9.4 Fieldwork

Webster (2015) defines a fieldwork research method as a method whereby the researcher develops an understanding of the composition of a particular setting or society by taking part in the everyday routines alongside its members. Fieldwork was carried out at identified secondary schools in Mankweng Circuit. The aim was to gather information about the usage of educational technology in teaching and learning of Grade 12 Geography classes. In each case, a teacher in Grade 12 class was the respondent.

1.9.5 Semi-structured Interviews

Interviews are discussions, usually on one on one between an interviewer and an individual meant to get the information on a specific set of topics (Alqudah, 2014). Interviews were held with teachers and principals. The interviews provided an opportunity for a two-way communication (McMillan & Schumacher, 2010). There was also the possibility of collecting detailed information. The researcher had direct control over the flow of the process and a chance to clarify certain issues during the process if needed (Powell, 2010). The researcher intended to obtain in-depth information about perceptions of teachers in the application of educational technology in Grade 12 classrooms in Mankweng Circuit.

1.9.6 Observations

Observations were part of the research instruments used to collect data because what was observed was the researcher's version of what existed. According to Dhurumraj (2013), when a researcher observes facial expressions of the interviewee, he or she researcher is likely to discover various unspoken emotions, fears, aspirations and hopes. Observation allows for the natural behaviour of the subjects in the study (Mc Millan & Schumacher, 2010). For the purposes of this study, the researcher used an observation sheet to record available educational technologies and challenges encountered by teachers when using technology in Grade 12 classes.

1.9.7 Document analysis

Document analysis is a systematic procedure of reviewing or evaluating documents both printed and electronic (computer based and internet-transmitted material). It requires that data be examined and interpreted in order to elicit meaning, gain understanding and develop knowledge (Corbin & Strauss, 2010). In the present study, analysis of equipment

register was used to get information that might not have been accessible during interviews.

1.10 Data analysis

The data gathered from various people and sources was analysed using Thematic Content Analysis, which involved identifying common themes that emerged when applying interviews and observations in the qualitative approach. Cresswell (2014), defines data analysis as a spiral that is equally applicable to a variety of qualitative studies. In this study, the researcher analysed data systematically by following steps mentioned by Braun and Clarke (2013), which are 1. Becoming familiar with the data, 2. Generating initial codes; 3. Searching for themes; 4. Reviewing themes; 5. defining themes; and 6. writing up.

1.11 Quality criteria

In order to ensure quality, the researcher took down notes and recorded the perceptions and experiences of the participants about the use of educational technology in Grade 12 classrooms. The following criteria were used:

1.11.1 Dependability

Dependability refers to the stability or consistency of the inquiry processes over time. The more consistent the researcher has been in the research process, the more dependable the results are (Horward, 2016). The researcher is held accountable for describing the variations that occurred in the setting and how the variations will influence the manner in which the research will be approached (Mqulwana, 2010). Dependability ensures that the findings of the study are repeatable. In this study, the researcher captured the conditions that appeared in the setting of every school during the separate interviews as this helped her to compare data in addition to the findings. The inquiry audit was done by the researcher with relevant supporting documents such as equipment registers from different schools scrutinised to ensure dependability. The researcher documented all the processes to allow any future researcher to repeat the work and possibly to obtain identical results.

1.11.2 Transferability

Transferability refers to the process of applying the results of research in one situation to other similar situations. If there are enough similarities between the two situations, readers

of the research may be able to infer the results of the research to their own situation. In this study the researcher supplied highly detailed description of the research situation and methods to ensure transferability.

1.11.3 Confirmability

Confirmability refers to the degree to which the results of the study could be confirmed or corroborated by others (FHI, 2016). To ensure confirmability, the researcher actively searched for and described negative instances that contradicted prior observations. After the study, the researcher conducted a data audit that examined the data collection and analysed procedures and made judgments about the potential for bias or distortion.

1.11.4 Credibility

Credibility involves establishing that the results of the qualitative research are credible or believable from the perspective of the participants. From this perspective, the purpose was to describe or understand the phenomena of interest from the participants' point of view. The participants were the only ones who can legitimately judge the credibility of the results (FHI, 2016).

1.12 SIGNIFICANCE OF THE STUDY

The study may assist policy makers within the Department of Education to align their policy formulation, especially with the provision of funding for the procurement of technological resources and training of teachers to equip them with technological skills that would promote a favourable environment in the teaching and learning processes so as to improve teaching and learning in the circuit. The findings from this investigation will alert the School Management Team (SMT), School Governing Body (SGB) and educators to ensure that their funding considers educational technology in their respective schools.

Through the usage of educational technology, learners' potential not only in Geography but also in other science-related subjects and languages would be developed, leading to their better performance in science, thereby establishing a good foundation for future skilled human resource base in Geography and Science to service the nation. This would make Mankweng Circuit more competitive with others in taking the lead in focusing heavily on science-oriented education to harness the wealth of the province as a mining

and agricultural area. This would have a positive effect in the teaching and learning of learners in all Grades.

1.13 ETHICAL CONSIDERATIONS

Creswell (2014) indicates that in order to gain the right of entry in any field of research, this right of entry should be authorised by the management office. Mukhari(2016), further elaborated that social research and other forms of research, which study people and their relationships to each other and to the world, need to be particularly sensitive about issues of ethics. The present researcher adhered to the University of Limpopo's policy on Ethical Code. A clearance certificate was applied for before the study was carried out, and permission was sought from the Department of Education in Mankweng Circuit to conduct the research. The following ethical factors were considered before, during and after the study was conducted:

1.13.1 Informed consent

In order to receive informed consent, the researcher's aim of the study and the process was explained in full to the participants. The researcher and participant signed a consent form to pledge confidentiality (Hlagala, 2015). Arrangements were made prior to visiting the schools so as not to interrupt lessons when conducting the interviews.

1.13.2 Voluntary Participation

The participants were informed that their participation in the study was highly valued and that they were to do so voluntarily. In other words, there was no stipend for their participation. If they decided to withdraw from the research, they could do so without any form of penalty or offence (Shahnasarian, Hagemann, Aburto, & Rose, 2013).

1.13.3 Research integrity

The researcher strived to maintain integrity when carrying out the research project. Professionalism was observed at all times while dealing with participants. The data was captured and used raw, making sure that there was no bias or manipulation by the researcher (Muwencha, 2012).

1.13.3 Confidentiality and anonymity

Any study involving the participation of human beings should respect the participants' rights and privacy (Mukhari, 2016). The participants were assured that their information would be treated as confidential and their identity would not be revealed. Feedback was forwarded to principals of participating schools and Geography teachers in the form of a complete written document.

1.14 STRUCTURE OF THE DISSERTATION

This structure of the dissertation provides introductory remarks of each chapter. It outlines what each of five chapters in this study deals with-namely, chapter one: introduction and background; chapter two: literature review; chapter three: research methodology; chapter 4: presentation, discussion and interpretation of findings; and chapter 5, which provides summary, conclusion and recommendations.

1.14.1 Chapter one (Background to the Study)

This chapter (introduction and background) provides an explanation of the background upon which the study evolves, and introduces what the study discusses in its ensuing chapters-namely, the literature review; methodology; presentation, discussion and interpretation of findings; as well as conclusion and recommendation. The background expounds the context of the study and presents the research lacuna that this study wants to fill by briefly explaining the extent of the identified problem, how it has been attempted to be addressed and how the study aims to address the research gap. The study further discusses the research problem, overview of the literature review, the theoretical model which has been applied in this study through which to investigate the availability and potential utilisation of educational technology (computers) in Grade 12 Geography classrooms in Mankweng Circuit.

In addition, the study further explains the research questions to which it seeks answers. The research methodology used in this study is discussed next and it is comprised of the epistemological aspects such as, research design, sampling techniques, data collection instruments and methods employed to analyse collected qualitative data and criteria to ensure valid findings. Then, the chapter highlights the essence of undertaking this study, explicating how it contributes to the existing body of literature on the availability and

potential utilisation of educational technology. The chapter concludes by explaining how applicable ethics –related concerns were taken into account when embarking into the research process.

1.14.2 Chapter two (Literature Review)

The first detailed discussion starts with the literature review beneath the chapter which the study calls the ‘Literature: a traditional (narrative) review. Thus in order to achieve the broad purpose of creating the base for a vital study, an assessment and integration of pertinent information becomes a means –to –an- end. The purpose of the literature review chapter into the study is to provide a theoretical foundation on which this research is built. The definitive motive to conduct the study is to examine the availability and potential utilisation of educational technology in Grade 12 classrooms of Mankweng Circuit. The chapter focuses on literature review to determine the level of ICT availability and utilisation in schools by various Departments of Education from selected developed and developing countries. It further highlights the level of investment of those countries in the field of ICT integration in education. This assisted the researcher to see how ICT is provided and utilised in those countries to avoid a duplication of the same data. The way in which those countries experience and solve their challenges would also be a lesson to be learned for Mankweng Circuit.

The chapter follows this design: firstly, it gives the conceptualisation of the key concepts of the research problem. Secondly, it gives the models that are used to integrate ICT in teaching and learning as well as international perspectives on the availability and potential utilisation of educational technology in schools, and particularly in Geography classrooms. Thirdly, the chapter looks at African countries on the availability and potential utilisation of technology in Grade 12 Geography classrooms. The chapter is summarised and concluded.

1.14.3 Chapter three (Research Methodology)

The chapter discusses the methodology used in this study. It commences by introducing the research methodology and other aspects. First, the chapter discusses the research design. Second, it will address the research paradigm (approach). Third the researcher will describe how she collected data. The discussion on analysis of data will then follow. Thereafter, the ensuing aspect will be the quality criteria (trustworthiness). Next the

researcher will discuss issues relating to research ethics, which were carefully considered. In wrapping this chapter, important issues are recapped under the summary section.

1.14.4 Chapter four (Presentation and Interpretation of Findings)

In this chapter, the findings of this study are presented and interpreted. Following the introduction of the chapter, the researcher presents data. First, the researcher presents findings that have emerged from in-depth interviews with Grade 12 Geography teachers. Third, the chapter will present findings divulged by school principals. The fundamental aspects dealt with in the chapter are packaged under summary section.

1.14.5 Chapter five (summary, conclusions and recommendations)

This chapter gives an overview of the study as a whole by summarising essential aspects that have been discussed in previous chapters. It also provides conclusions, which are minimally drawn from literature review that was conducted and, largely, from findings that have been unveiled by the empirical study. The chapter will be wrapped with recommendations, which are also influenced by findings, and new directions for future studies are given.

1.15 CONCLUSION

The purpose of the chapter on orientation to the study was to introduce the research topic, issues relating to the availability and potential utilisation of educational technology, the research problem from which the study originates and the research questions for which answers were sought. The chapter also introduced the theoretical paradigms through which to study the topic. Part of the primary intention of the introduction was to motivate the rationale behind undertaking this research and the contribution that this study hopes to make into the proliferated academic discourse on the availability and potential utilisation of educational technology in Grade 12 Geography classrooms. To this end, the introduction element resented a synopsis of the most imperative aspects that are discussed in detail in the body of this study.

The chapter on study orientation started by debating the general research problem that this study evidently claims that it exists, from both theoretical and practical contexts. The chapter further discussed the research problem statement to narrow down the general research problem into a specific gap that this study wants to address. The purpose has

been achieved through a reflection of assertions that despite a huge volume of literature so far available, studies have focused on the use of ICT resources in general, but not on the use of computers in particular. Studies that have attempted to look in this area come from urban settings but few have focused on rural schools. The second major component of the chapter on orientation of the study is the background to the study in which the purpose was to provide the contextual background to the study by referring to the theoretical discourse that influenced the study. The purpose was achieved by presenting an overview of the literature that was centred on the availability and potential utilization of educational technology in international and African countries. The chapter also provided an introduction to the research methodology and its related aspects applied in this study such as the research ethics, research design, sampling procedure, target population, data collection methods, data analysis methods as well as steps undertaken to ensure the dependability of the data collection instruments and valid findings.

The next chapter is the 'literature review', which comprises and discusses three broad issues that are valued pertinent and essential for this study:

- Firstly, the theoretical framework that guides the study- behaviourism, critical theory and constructivism.
- Secondly, the international perspective on the availability and potential utilisation of educational technology.
- Thirdly, the African perspective on the availability and potential utilisation of educational technology.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The previous chapter dealt with the background and motivation of the study, research problem, a brief literature review, purpose of the study, the research questions, and the research methodology. This chapter deals with the literature review within which this study is located. The chapter follows this design: firstly, it gives the conceptualisation of the key concepts of the research problem. Secondly, it gives the models that are used to integrate ICT in teaching and learning as well as international perspectives on the availability and potential utilisation of educational technology in schools, and particularly in Geography classrooms. Thirdly, the chapter looks at African countries on the availability and potential utilisation of technology in Grade 12 Geography classrooms. The chapter is summarised and concluded.

2.2 CONCEPTUALISATION

It is important that the understanding of what ICT means be clarified right from the onset of the review. In this section the researcher explains different conceptualisations of what ICT is. These conceptualisations have evolved overtime. Some could be regarded as simple and straightforward and others as more complex. The following presents these different understandings of what ICT encompass. In order to do this, firstly, the researcher discussed the definition of ICT, and secondly looked at the history of ICT.

2.2.1 Defining Information Communication Technology

There are different ways in which people define ICT. The researcher only looked at four different views of ICT, namely ICT as a storage system, ICT as a supporting system, ICT as a development of infrastructure, and finally ICT as a tool of communication.

2.2.1.1 ICT as storage system

ICT is a term used to refer to technologies that are used in accumulating and storing information in various forms (Akinfolarin, Extent of information and communication technology (ICT) utilisation for students learning and tertiary institutions in Odo State Nigeria.3 (3), 2014). This view is supported by Ifueko, (2011), who mentions that ICT comprises, amongst others, the storage, retrieval and conversion of information.

Furthermore, ICT is sometimes synonymously used with Information Technology (IT). However, ICT is generally used to represent a broader, more comprehensive list of all components related to computer and digital technologies than IT (Murray, 2011).

2.2.1.2 ICT as a supporting system

(Akinfolarin & Rufai (2017), argue that ICT is the application of modern technological facilities to ensure the effective flow of information among teachers, learners and administrators for better communication within the education system. They believe that ICT can enhance effective communication in the society. Seemingly, their view links with that of Tang and Chong (2011), who regard ICT as an application of information and communication technology, including computer network, software and hardware required for internet connection. To add, Menzel (2013), refers to ICT an input in a learning process that should help produce an output.

2.2.1.3 ICT as a development of infrastructure

Kaffash, Korgiban, & Ramesani (2010), reiterate that ICT is a combination of computer, video and telecommunication technologies, as observed in the use of multimedia computers and services, which are based on them. The authors further emphasise that ICT also refers to the applications found on most desktop computers, digital cameras and recorders. Similarly, like the three above, Fo (2013) chooses to give a developmental aspect of what ICT is by saying that it is also used to refer to the convergence of audiovisual and telephone networks with computer networks through a single cabling or link system.

2.2.1.4 ICT as a tool for communication

Contrary to the views by the authors above, Murray (2011) argues that ICT is an extensional term for IT that stresses the role of unified communications. This definition is supported by Goyal and Purohit (2010), who regard ICT to refer to those technologies that determine the efficiency and effectiveness of communication and devices that allow us to handle information. Like the two above, Bidarian, Soheila and Dovoudi (2011) and Mohammed and Yarinchi (2013) agree that information communication technologies are those technologies for the collection, recording, processing, researching, transferring and receiving of information for teaching and learning. Their view is more of a general term

that stresses the role of unified communications and the integration of telecommunications such as telephone lines and wireless signals as well as the necessary software, storage and audio-visual systems that enable users to create access, store, transmit and manipulate information. In another study by Babalobi (2010), it is further acknowledged that ICT is the processing and maintenance of information, and the use of all forms of computer communications, network and mobile technologies to mediate information. This implies that ICT is seen as a tool to extent the curriculum, method, content, product and process to new and useful territories which have not been possible in the past.

According to Linways (2017), ICT is the mode of education that uses information and communication technology to support, enhance and optimise the delivery of information. There seems to be some agreement between Azis (2010) and Linways (2017) as he defines educational technology as the implementation of appropriate tools, techniques or teaching processes to facilitate the application of senses, memory and cognition to enhance teaching practices and improve learning outcomes in a didactic situation. In yet another study by Bordbar (2010), ICT is defined as a tool to enhance learning. Similarly, the view is approved by Capacho (2016) who refers to information communication technology as a collection of tools and resources for further relations and creation.

The definitions cited above provide evidence that ICT has been evolving over time. Despite the evolution, there are still many definitions of ICT. Some researchers define ICT as a bunch of merged technologies, while others refer to it as an infrastructure. This study sought to investigate the availability and potential use of ICT in Grade 12 Geography classrooms. Of these four conceptualisations above, the researcher align herself with Linways (2017), who regards ICT as the mode of education that uses information and communication technology to enhance and optimise the delivery of information. Therefore, the study uses ICT to refer to the use of computers by teachers. The researcher is of the view that the essence of teaching is to change the behaviour of learners from the unknown to the known. In an attempt at changing this behaviour, there is a need to effectively communicate for proper dissemination of information to the learners using the given device, the computer. The message normally runs

through this channel, teacher as the sender, channel as the device, and the computer and the learner who is the receiver.

Therefore, instructional technologies such as computers should be integrated into the Geography classroom because when used appropriately, they can have a positive impact on learners learning as well as increase achievement. The use of instructional technologies will help to improve student achievement while facilitating communication and collaboration, and helps to prepare students for the working environment of the 21st century. Having explained what ICT means, the next section focuses on the history of ICT.

2.2.2 History of Information Communication Technology

ICT is a broad subject and the concepts are evolving. This section focuses on the different perspectives during the evolution of ICT. For this study, the researcher will explain the origin of the term ICT, ICT as a media and audiovisual communications, ICT as an instructional systems and instructional design, educational technology as a vocational training, and lastly educational technology as it evolved to become a computer system.

2.2.2.1 The new term of ICT (Information Communication Technology)

The phrase “information and communication technologies” has been recently used by academic researchers since 1980 (Blackwell, Laricella & Wartell, 2014). However, the abbreviation “ICT” became popular after it was used in a report to the UK government by Dennis Stevenson in 1997 and then revised by the National Curriculum for England and later used in Wales and Northern Ireland in 2000 (Murray, 2011). Since 2012, the Royal Society recommended that the use of the term “ICT” should be discontinued as it has attracted too many negative connotations (Royal, 2012). Therefore, from 2014 the National Curriculum in England has used the word computing, which reflects the addition of computer programming into the curriculum. By the 1990’s, educators began to see computers as a combination of technology resources, including media, instructional systems and computer based systems (Ally & Bacon, 2010).

2.2.2.2 Educational technology as a media and audiovisual communications

Firstly, ICT developed as a media and audiovisual communications. This perspective grew out of the audiovisual (AV) movement in the 1930s. The higher education instructors seemingly proposed that media such as slides and films delivered information in a more concrete way, and therefore were more effective ways than books. This resulted in the National Task Force in 1986 equating educational technology with media, and treated computers simply as another medium (Ally & Bacon, 2010).

2.2.2.3 Educational technology as an instructional systems and instructional design

Secondly, the view of educational technology as instructional systems and instructional design originated with the post-world war 11 by military and industrial trainers who were faced with problems of preparing large numbers of personnel quickly (Ally & Bacon, 2010). The United States Army was the first to use transparencies for overhead projection in 1960 in training (Epidemoll, 2016). Their view was based on the belief that both human (teachers) and non-human (media) resources could be part of an efficient system of addressing any instructional need. Therefore, they equated “educational technology “with educational problem solution.

2.2.2.4 Educational technology as vocational training

Thirdly, educational technology was seen as vocational training. This perspective originated with industry trainers and vocational educators in the 1980s. They believed that an important function of school learning is to prepare students for the world of work in which they will use technology. They believed that vocational training can be a practical means of teaching all content areas such as mathematics, science, geography and languages (Ally & Bacon, 2010).

2.2.2.5 Educational technology as it evolved to become a computer system

According to Ally and Bacon (2010), this view began in the 1950’s although the advent of computers gained momentum when they began to be used instructionally in the 1960’s. This implies that as computers began to transform business and industry practices, both trainers and teachers began to see that computers had the potential to aid instruction. From the time computers came into classrooms in the 1960’s until about 1990, this perspective was known as educational computing, and encompassed both instructional

and administrative support applications (Ally & Bacon,2010). According to Epidemoll (2016), Microsoft released the first version of the software in 1990. By the 1990's, educators began to see computers as a combination of technology resources, including media, instructional systems, and computer based supporting systems (Ally & Bacon, 2010). However, computers were initially used in mathematics, science and engineering as a tool for mathematical problem solving (Betcher & Lee, 2016). The next section discusses how learning theories relate to the integration of ICT.

2.3 LEARNING THEORIES IN INTEGRATION OF ICT

Having looked at the four historical perspectives in the preceding section, the researcher now discusses learning theories. This section focuses on three main different theories that are of great importance as they are universal models which justify the use or not the use of ICT as teaching and learning tools. Firstly, the discussion is on behaviourism as a learning theory, secondly critical theory and thirdly, constructivism as a learning theory.

2.3.1 Behaviourism

In behaviourism, human behaviour receives the influence of the external world, which acts as enhancers (Capacho, 2016). Behaviourism believes that the learner is not responsible for his or her learning, but learning is driven by the teacher who delivers a learning content, assesses and reinforces learners' responses (Mukhari, 2016). Seemingly, the view concurs with that of Kundi and Nawaz (2010), who state that learning occurs through the instructor (teacher) presenting the learner with the required stimuli along with the required behavioural responses within an effective reinforcement. This implies that the behaviourism teaching gives complete control of materials to the teacher who manages the lesson and direction of learning. In this sense, learning becomes a sequential process where there is a single reality about which "learners" display understanding through declarative, procedural and conditional knowledge. This means that the process of learning involves a sequence of mechanical stimulation presented to the learner by the teacher. The teacher then waits for a response and gives reinforcement while generating a repetitive cycle of sequence (Capacho, 2016). Therefore, the teacher

occupies a central place. As a result, learners become passive and only learn what is contained and provided by the teacher.

2.3.2 Critical theory

Critical theory is grounded in notions of justice and centres marginalised voices in order to promote emancipation, liberation and equity (Bohman, 2016). In addition, Ciji, Heiser and Leng (2017) view critical theory as the reflective assessment and critique of society and culture by applying knowledge from the social sciences and humanities. The social cultural approach towards the study of ICT in education rejects the view that ICT can be studied in isolation (Lin, Wang & Lin, 2012). Therefore, a more holistic approach of teaching ICT in schools is by adopting a socio-cultural perspective. The school culture is very important in the teaching and learning of ICT.

According to Fo (2013), school culture encompasses the vision, plans, norms and values that are shared by school members. Contrary to behaviourism where learning is driven by the teacher, the social-cultural approach emphasises that effective ICT integration depends on perceptions and vision of school leaders. School culture has a mediating role that influences teachers' actions, beliefs and attitudes. Fo (2013) is supported by Tezci (2011), who says that similar to other external and internal variables, school culture also plays an important role in successful technology integration.

It is a fact that teachers' perceptions of ICT determine the success of the use of ICT in teaching. It is very important that school leaders should support and motivate teachers in the integration of ICT in education. Ward and Parr (2010) state that teachers need to feel confident in their ability to facilitate and integrate technology in their classrooms. This implies that there is a need for professional development, with a focus on increasing teachers' skills on the use of ICT in the classroom. Furthermore, new teaching approaches and technical support should be offered by the school to allow teachers to retain control while facilitating learning. The overall implementation of effective teaching with technology integration requires changes in teachers' knowledge, beliefs and school culture (Ertmer & Otterbrent-Leftwich, 2010). Despite the existence of behaviourism and critical theory, this study will use constructivism as a learning theory because

constructivism impacts on teaching and learning using ICT in Geography learning classrooms (Begg, 2015).

2.3.3 Constructivism as a learning theory

The use of constructivism in Geography teaching refers to the idea that learners construct knowledge for themselves whereby each learner individually constructs meaning as he or she learns (Thermos, 2012). Consequently this would open learners' curiosity in the process, thereby leading them into critical, analytical thinking and knowledge discovery (Kharade &Thakker, 2012). The constructivism theory presumes that prior knowledge and experience play a significant role in learning and form the basis for subsequent activities. This view is in line with Capacho (2016) who says that in constructivism, learning is achieved by establishing relations between new knowledge structures already existing in the mind of the learner. It therefore enables mobile technology to focus on learners' ability to be self-directed and draw conclusions.

Consequently, the merits of the constructivism theory include, amongst others, interaction, meaning attribution and the construction of knowledge by individual learners or groups of learners (Mukhari, 2016). The significance of this theory is that educators cannot provide learners with knowledge, but involve learners in constructing that knowledge. This implies that the design of the learning environment should allow learners to explore preconceptions and interact with the virtual space supported by ICT with the guidance of the teacher (Sampson, 2014). The importance of this theory has been evident in many countries as it emphasises the fact that learners should construct their own knowledge instead of teachers feeding them with information (Mukhari, 2016). Learners are offered the opportunity to explore experiment and generate solutions to problems that they encounter during the learning process with minimal help from their teachers. As a result, the responsibility of learning resides increasingly with the learner (Thermos, 2012). This is in line with learners born from 1980 who are technologically savvy. According to Hlagala (2015), these learners are surrounded by technology, and are familiar with digital tools such as computer games, digital music players and mobile phones. Hence, they are active participants who will be able to construct knowledge in their own minds (Slavin, 2012).

Constructivists encourage learners to constantly use prior knowledge to understand new information. When learners use what they are learning, it sinks and stays with them for a longer period of time. The constructivist learning theory allows the individual to place worth on mobile technology rather than the mobile technology imposing value on the individual. Constructivist theories are based on the belief that children construct their own points of view of the world, philosophy of living, technical expertise and knowledge structures, and emphasise one's learning initiative, and social and situational learning experiences. Learners learn by doing, as noted by Dewey (1859-1952), that practising is the foundation of learning and without learning practice learners would get lost.

In another study by Kamil, Mosenthal, Pearson and Barr (2016), it is argued that the constructivism theory moves the concept of learning beyond the rote memorisation of facts and procedures towards the process of knowledge creation. It moves concepts of school beyond the notion of a place where knowledge is imparted to one of classrooms, organisations, and societies as knowledge building communities. Consequently, this learning theory goes with constructivists' view of ICT as a learning tool that provides a number of activities from tutoring to simulations (Begg, 2015). This implies that the relationship between technology and teaching would be strengthened. It therefore promotes the necessity of learning by doing as learning by doing shall have developed. In support of this view, Woolfolk (2010) found that through this theory, learners would be able to explore and use their abilities to process their acquired information.

The researcher concur with the constructivists s' view of ICT as a learning tool that provides a number of activities, from tutoring to simulations. The relationship between technology and teaching has strengthened when the necessity of learning by doing and experience perception has developed on the basis of an effective learning environment that would address different senses. The next section focuses on the principles of constructivism.

2.4 PRINCIPLES OF CONSTRUCTIVISM

Although this section is not meant to elaborate on discussion on constructivism, it is however, important to highlight those principles that akin to the use of ICT such as Learner control and the capability of the learner to manipulate information actively using what is learned (Ertime & Newby, 2013). In support, Dede (2010) agrees that learners

learn by doing through active participation. By participating in and interacting with the surrounding environment, learners engage in creativity and use thinking skills that enable them to create personal views of the world. Through this level of freedom, knowledge will be constructed and not transmitted and presented in a variety of ways.

In constructivism, learning knowledge is constructed and not transmitted. With the use of constructivist tools, learners engage in personal meaning, making discourse and the application of knowledge that has been collectively constructed with their fellow learners (Mukhari, 2016; Akpan & Beard, 2016). The teacher therefore becomes the facilitator in the learning environment.

Ertime and Newby (2013) argue that constructivism supports the use of problem-solving skills that allow learners to go beyond information given, thereby developing pattern-recognition skills, and presenting alternative ways of representing problems. Learners actively construct their own knowledge by anchoring new information to pre-existing knowledge in terms of their own experiences (Mukhari, 2016). However, teachers should actively involve learners and present challenges during this learning process to enable them to discover themselves and their own meanings.

Learners construct their own understanding by reflecting on their personal experiences, and by relating the new knowledge with what they know. Therefore to be effective, a teacher must encourage, motivate and reward learners for their initiatives. This will promote their leadership (Abbas, 2013) and help them to understand their cultural contexts and learning styles. The researcher is of the view that the use of ICT provides learners with activities, with hands on learning and opportunities to experiment and learn on their own with the teacher as the facilitator. The following section addresses teaching strategies associated with constructivism.

2.4.1 Teaching strategies associated with constructivism

It is acknowledged that ICTs are revolutionising teaching and learning processes in the present century. It is being harnessed even by the constructivists to improve the efficiency, accessibility and quality of the learning process (Moya, Musumba & Akodo, 2011). However, there are various teaching strategies that are applied within the educational sector. Teacher quality is the single most important determinant of learner

performance. This is even more significant when applying the constructivism theory. The teacher's knowledge, beliefs and actions all affect the success of the learner (Abbas, 2013). This study confides itself to the following teaching strategies associated with constructivism. The constructivist teaching technique requires the teacher to act as a facilitator whose main function is to help learners to become active participants in their learning, and to make meaningful contributions between prior knowledge and processes involved in learning (Olesegun, 2015). In addition, constructivist teachers must continuously reassure learners that they are doing things right, that their thinking has power and their errors are correctable (Abbas, 2013).

The technique aims to help learners to become knowledge constructors who will have the ability to identify, analyse and think critically about their own views and those of other learners to be able to solve problems (Mukhari, 2016). Furthermore, the teacher encourages and accepts students' initiatives. The teacher should become one of the many resources that learners may learn from, engage learners in experiences that challenge previous conceptions of their existing knowledge, allow learners' responses to drive the lesson and seek elaboration of learners' initial responses and be willing to let go of classroom control and promote learners' leadership (Abbas, 2013). His or her responsibility is to understand the cultural context and learning styles preferred by learners in order to create environments where learners are encouraged to learn and construct knowledge. The teacher encourages students to engage in dialogue with one another and himself. Furthermore, the teacher's role is to provide a rich stimulating environment that leads to interesting and exciting questions. The teacher begins activities with students from the known to unknown. Having dealt with teaching strategies associated with constructivism, the next section looks at the benefits and challenges of constructivism.

2.4.2 Benefits and challenges of constructivism

The benefits of constructivism in the teaching and learning of Geography include, amongst others, the fact that learners learn and enjoy more when they are actively involved rather than being passive learners (Abbas, 2013). This view is supported by Olesegun (2015), who mentioned that education works best when it concentrates thinking and understanding, rather than on rote memorisation. Furthermore, constructivism

concentrates on learning how to think and understand. Learners are given ownership of what they learn, since learning is based on their questions and explorations. In addition, Mukhari (2016) indicated that constructivism promotes social and communication skills by creating a classroom environment that emphasises collaboration and exchange of ideas.

Contrarily, there are challenges associated with the constructivist teaching style such as a lack of clear guidelines for learners on how to approach learning activities, a lot of information which may confuse learners and the possible disadvantage to below average and shy learners who are more passive and inactive in comparison with smarter learners who take the lead in group activities (Mukhari, 2016). The focus of the next section is on constructivism and the use of ICT in Geography classrooms.

2.4.3 Constructivism and the use of ICT in Geography classrooms

There is a close relationship between ICT and constructivism. According to Abbas (2013), constructivism states that learning takes place in contexts, and learners form much of what they learn and understand as a function of their experience in a situation, while ICT refers to the tool that is used to engage learners in the lesson. The focus of both ICT and constructivism is on the creation of a learning environment. These learning environments are as contexts in which knowledge building tools and the means to create and manipulate artefacts of understanding are provided through which learners work together, support each other as they use a variety of tools and learning resources in their pursuit of learning goals and problem solving activities (Abbas, 2013).

To add, Mukhari (2016) emphasised that the use of ICTs in constructive teaching and learning increases motivation, confidence and captures the attention and interest of the learners. In a constructivist learning environment, computer networks or the computer mediated communication (MC) is used to facilitate interaction between spatially separated learners by means of computer conferencing and online database. Furthermore, networked technology enables teachers and students to build local and global Geography communities that connect them with interested people and expand opportunities for learning. This is a positive step in the right direction towards empowering learners within the technological environment in schools. In addition, Geography teachers and learners, like in other subjects through the use of ICT, groups can work together to solve problems,

argue, negotiate meaning or engage in other pedagogical activities including coaching (Dema & Moller,2012). The following section focuses on the critique of constructivism.

2.4.4 Critique on constructivism

In constructivism the teacher acts as a facilitator or a guide during the learning process. Although the approach seems ideal in the classroom, some teachers in our schools appear not to know what constructivism is and hence find it difficult to apply this approach during the teaching and learning process (Shumba, Ndofirepi & Gwiray, 2012). In a study by Mukhari (2016), it is alleged that constructivism emphasises the value of ITCs in the discovery of information and knowledge construction both in the classroom and elsewhere. However, the theory does not provide theoretical foundations for learning. Furthermore, the above study states that constructivism is a theory of knowledge that emphasises knowledge rather than theory of learning, which explains how the learning process occurs, although collaborative learning is one of the cornerstones of constructivism. This implies that constructivists do not provide a mechanism for learners to create new knowledge.

However, Kara (2018) maintains that the root of the problem and a big challenge in terms of cooperative learning and collaboration is that there is often tension between the individual and collective rationality. A decision that is reasonable and justifiable for the individual can lead to a poorer outcome for all members of the group. Furthermore, a decision of a group may not be appreciated or accepted by the individual. In such settings, it is impossible to predetermine and prescribe a sequence of teaching and learning activities. In addition, learners vary with regard to potential and learning styles. As a result, not all learners will be at ease with constructive models and principles. Other learners

make progress in their learning when they receive guidance and frequent reinforcement from the teacher (Kara, 2018). Therefore, constructivism suffers from flaws that will always restrict its potential and any claims of universality (Shumba, Ndofirepi & Gwiray,2012). The next section focuses on models used to integrate ICT in teaching and learning.

2.5 MODELS USED TO INTEGRATE ICT IN TEACHING AND LEARNING

The most effective teachers are those who have deep knowledge of the subject they teach, as well as a strong understanding of the material being taught. Furthermore, teachers must also understand the way learners think about the content, be able to evaluate the thinking behind their (learners') methods and to identify learners' common misconceptions (Coe, Aloisi, Higgins & Major, 2014).

2.5.1 Pedagogic use of ICT in the classroom

Shulman (1986) stated that teachers possess knowledge about the content area of their discipline. This view was supported by Mishra and Koelher (2006), when they said that the cost of having content knowledge could be prohibitive as students can receive incorrect information and develop misconception in the subject area. Shulman (1986) further added that teachers needed a firm grasp of the analogies and frameworks that can be used to explain these facts and concepts naming it content knowledge (CK). In addition, Shulman (1986) stated that teachers should be guided by procedures that should be used within this particular discipline or subject content. He further revealed that teachers needed knowledge about how to teach known as pedagogical knowledge (PK). Pedagogical knowledge refers to planning and implementation strategies established in the classroom such as grouping students to promote learning from each other, setting up class routines, using discipline techniques and teaching strategies to enhance learning in the classroom environment.

According to Graham (2011), teaching is ineffective in a case where the teacher lacks knowledge related to teaching strategies which involve teaching approaches and classroom management. According to Shulman's (1986) PCK model, it is believed that when a teacher can connect the content knowledge with the pedagogic knowledge that is appropriate for teaching that content, blending them together, it results in pedagogic learning content (PCK). This represents the original domain of the teacher's knowledge (Becker, 2014). Furthermore, the PCK informs the teacher's decisions about the best method to use to teach specific contents standards to their students. Real teaching will only take place when the teacher complements content knowledge with pedagogic knowledge. This will happen when a teacher is a master of the subject matter with a transparent delivery method. Blending this knowledge together enables teachers to make

the connection between the content they wish to teach and the best way to deliver lessons in their daily classroom (Shulman, 1986)

2.5.2 TPACK Model (Technological Pedagogical Content Knowledge)

Within this model, ICT is not a subject of teaching. ICT is viewed as a cultural, meditational tool in the activity system in which students and teachers construct and co-construct new knowledge (Shulman, 1986). As a result, the integration of technology into teaching and learning would have added complexity to the fundamental knowledge of what constitute the teacher's professional knowledge base (Mishra & Koehler (2006). However, an effective pedagogical use of ICT is profoundly influenced by the content domain to which they are situated. They described technological and content knowledge as Technological Content Knowledge (TCK). Furthermore, they added that teachers now need to have knowledge about the technology tools that are part of the discipline content area. For this to happen there must be a relationship between pedagogic knowledge and technology and pedagogic content Knowledge.

In a study conducted by Mua (2016), it was argued that technology needs to be included in addition to the content and pedagogical knowledge in the teaching and learning process to be effective. This is ascribed to a more rapid and technological world in which we now find ourselves. As Graham (2011) and Aguye and Voogt (2012) argue, this model places emphasis on Technological Knowledge (TK) that requires an understanding of the standard technologies such as books and chinks and more advanced technologies. This includes, amongst others, technologies such as ICT operating systems and the ability to use computer hardware and software.

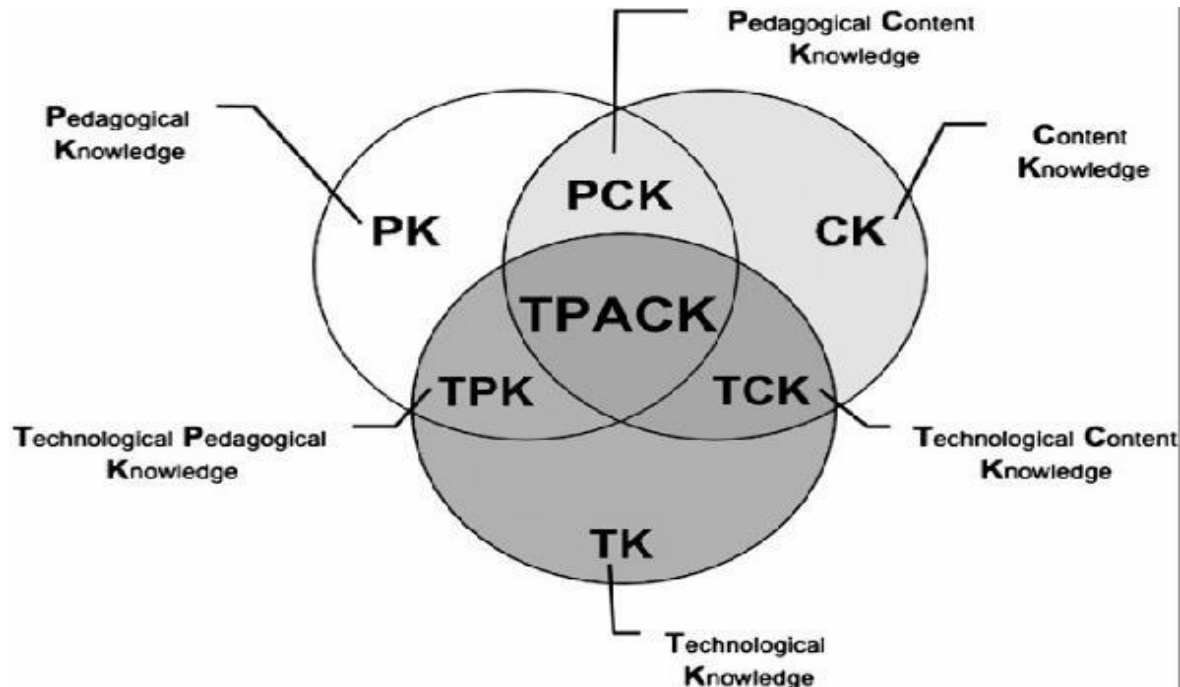


Figure 2.1: Components of Technological Pedagogic Content Knowledge adapted from Mua (2016).

2.5.3 Relationship between Pedagogic Content Knowledge (PCK) and Technological Pedagogical Content Knowledge (TPACK).

Accordingly, effective teaching is influenced by the way teachers use ICT tools in the teaching and learning process and not only how they function (Mishra & Koehler, 2006). The overlap between technological knowledge and pedagogical knowledge is termed Technological Pedagogical Knowledge (TPK), which involves how a teacher uses technological tools in teaching and selecting the best tools to use when working to make their instructional practices more useful. In addition, Graham (2011) added that internet, white boards and computers in the teaching and learning of Geography within TPK, begins to develop when the teacher starts to understand the dynamic relationship between the content and pedagogical knowledge.

Tondeur, Van Braak, Sang, Voogt, Fisser and Ottenbreit (2012) stated clearly that TPK remains the most critical and is for pre-service and novice teachers because they have not participated in many learning experiences that were enriched by technology. Mua (2016) further argued that teachers need knowledge of how to plan lessons whereby they

integrating technology in their classrooms. This view was emphasised by Mishra and Koehler (2006) when they stated that TPK includes strategies and techniques for planning lessons where technical skills are taught. Setting up the equipment correctly influences how teachers use ICT tools in teaching and learning processes. Furthermore, when the teacher is able to blend the selection of appropriate tools (TCK) with appropriate strategies and activities to teach ICT enhanced lessons (TPIC), it results into the Technology Pedagogical Content Knowledge (TPCK or TPACK). This is viewed as teacher knowledge about teaching using ICT (Graham,2011).

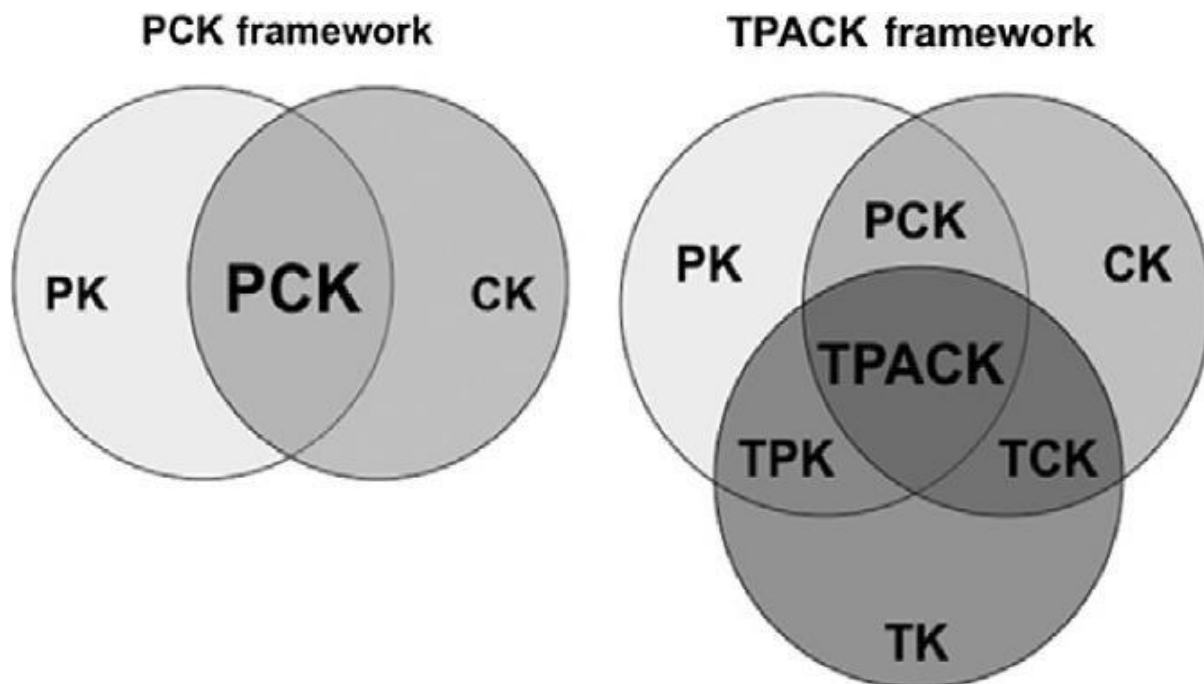


Figure2. 2: Relationship between PCK and TPACK adapted from Mua (2016)

Mishra and Koehler (2006) mentioned that for teachers to develop their TPACK, they have to focus on their learning experiences; not by mastering them, but by getting themselves acquainted with a variety of ICT tools that are appropriate for their teaching. They added that TPACK develops when the teacher begins to understand the dynamic relationship between CK, PK and TK as well as the knowledge between TPK, TCK and PCK. Good educational technology use is built on the principles of good teaching. Mua (2016) argued

that 21st century teachers have to start creating innovative classroom practices where students are stimulated to engage in active knowledge construction.

TPACK is a useful model that has the ability to negotiate the interplay of technology, pedagogy and content, making learning more efficient, effective and more engaging (Mishra & Koelher, 2006). For this model to be effective, it requires that teachers must be flexible enough to develop knowledge about the school, the students and the environment they find themselves in coupled with the infrastructure and tools at their disposal (Tondeur, Van Braak, Sang, Voogt, Fisser & Ottenbrecht, 2012). Furthermore, Mishra and Koelher (2006) added that this call for an open-ended learning environment where teachers are equipped with a combination of Shulman's PCK and TPACK as opposed to learning environments that focus on the mere transmission of knowledge. In addition, the researcher is of the view that computers could be used for presentation, preparation of written exams, selecting topics and emails. It is further alleged that teachers are expected to have various competencies regarding content and pedagogy such as collaboration and networking (Mukhari, 2016). This implies that teachers are capacitated to develop new strategies for mediating ICT supported activities (Hennesy et al, 2010). The next section looks at a variety of viewpoints on the availability and potential utilisation of educational technology in Grade 12 Geography classrooms.

2.6 A VARIETY OF VIEWPOINTS ON THE AVAILABILITY AND POTENTIAL UTILISATION OF EDUCATIONAL TECHNOLOGY IN GRADE 12 GEOGRAPHY CLASSROOMS

Educational technology has been acknowledged as an important tool in education in both developed and developing countries. Over the last few years, there has been a rapid growth in the range and sophistication of new ICTs such as radio, video, television, developed and developing countries (Osodo, Idoshi & Ongati, 2010). In particular computer technology has been used to improve Geography education in schools because of its robust nature in displaying graphics and simulations (Sanle & Pinaar, 2016).

However, Brown (2011) found that the effectiveness of the educational technology largely depends on the way in which technology is integrated into the curriculum, how it is viewed by the teachers and students, the teachers' competency levels with the given technology, the degree to which technology is being utilised in the classroom and the type of

technology used. In support of this view Graham (2011) further argues that the availability of technology, knowledge and competency level of the teachers who will teach learners to use technology, are important factors for its successful integration in the curriculum.

In a study conducted by Hattie (2013) is alleged, however, that diversity of teaching strategies, pre-training in the use of computers as a teaching and learning tool, multiple opportunities for learning and provision of feedback are essentials to optimise the effectiveness of ICT. The author further indicates that the role of the teacher, the need for professionalisation and the need for adapted teaching and learning are additional approaches. This implies that prerequisite to be met for the integration of technology is the teacher's responsibility to facilitate this educational innovation (Montrieux, Vanderlinde, Shellens & De Marez, 2015).

Despite positive factors that promote integration of technology in the teaching of Geography Mikre (2014) and Oladosu (2012) revealed that teachers' attitude play an important role in the teaching and learning process that utilises computer and internet connections. This requires the need for the emergence of a new set of skills, attitudes and pedagogical approaches, especially in the teaching of Geography. As Fallon (2013) have indicated, teachers' beliefs are crucial, as they are related to the actual uses of implemented technology. Their personal willingness to adopt and integrate educational technology into Grade 12 Geography classrooms is a key for successful innovation. Consequently, learners' motivation and confidence would result from having access to ICT equipment and teachers possessing required ICT skills. According to many researchers, technology can enhance learning. As a result, teachers would be able to structure their activities in ways that would challenge and build upon pupils' implicit conceptualisations, while integrating new ideas (Brown, 2011).

In support of this view, Honan (2010) states that key in the proper usage of technology is the proper training of teachers, so that the focus is not on the technology, but rather on what is to be taught and be learned by students. This shows that when properly utilised, technology can increase student achievement levels, increase family involvement in the learning process, and improve teachers' competency and effective utilisation of technology. Therefore, ICT provides interactive media rich and exciting new teaching and

learning tools. Hence, Bester and Brand (2013) concluded that technology such as computers is utilised to promote interactive teaching and learning. Learners do not only receive content in a visual or auditory way but actively react to what is presented to them. Furthermore, Morrison et al (2010) acknowledge that educational technology makes instruction more accessible to learners and easier managed by teachers, unlike teachers' educational technology can perform task without tiring or becoming bored with the process. There is therefore a need for clear and measurable objectives (Graham, 2011). It is therefore imperative that prior to the implementation of any technology, teachers and students should be aware of why the technology is being used and how it will meet the educational goals and objectives. This would maximise the results, rather than to have other accidental purposeful or improper uses. Hence, Honan (2010) stated that the focus is not on the educational technology, but rather on what is to be taught by teachers and learned by students. Therefore, the proper training of teachers is more critical.

Teachers should be able to use the educational technology at near expert level. Mukhari (2016) emphasised that the use of educational technology in a classroom can only be successful if pedagogical principles are taken into account. Before a teacher could decide to use technology, he or she should verify pedagogically which content should be taught in differentiated ways according to students 'needs. Therefore, teachers should know how technology can be used to build on existing understanding in order to master new and more sophisticated content.

Although educational technology could not replace the teacher in the classroom, it can however, be successfully integrated into lessons which could maximise the learning experience since technology has become an integral part of life of today's learners. Many learners are technologically savvy and have become visual learners, and have been brought up with technology through playing games. So without visuals in a presentation, they may not learn effectively (Bester & Brandt, 2013; Brown, 2011).

Today's learners are more used to absorbing information from the screen than from the printed pages. Therefore, they find teachers who use technology to be more reliable and knowledgeable than those who do not. Ahmad (2010) pointed that a country should improve its education system by implementing effective and robust ICT policies. Since

learners are used to ongoing stimulation in order to attract attention outside the school context, the question arises whether schools have access to technology, and whether teachers succeed in utilising ICT in Grade 12 Geography classrooms in Mankweng Circuit of Limpopo Province. According to Sinclair (2012), school administrators should consider the cost of extensive teacher training when evaluating technology costs. Otherwise the technology will be a waste of time as it will most likely be misused or not used to maximise student potential. The next section discusses the potential benefits of ICT in the teaching and learning of Geography.

2.7 POTENTIAL BENEFITS OF ICT IN THE TEACHING AND LEARNING OF GEOGRAPHY

The benefits of ICT especially computers as a tool in teaching and learning have been acknowledged by several researchers in both developing and developed countries. Mdletshe (2013) indicated benefits such as shared learning resources, shared learning space, the promotion of collaborative learning and the move towards autonomous learning. According to Mdletshe (2013), sharing learning space could go a long way in reducing problems such as overcrowding and lack of teachers in Grade 12 Geography classrooms which is said to be at an alarming stage, especially in rural areas of some developing countries such as South Africa. He further stated that in terms of facilitating the move towards autonomous learning, computers and the power they bring to the students to access, manipulate, modify, store and retrieve information will promote greater autonomy in learning.

Likewise, Ahmad (2010) stated clearly that when properly used, technology can increase student achievement levels, family involvement in the learning process, and improve teachers' competency and effectiveness. Networked technology can enable teachers and students to build local and global communities that connect them with interested people and expand opportunities for learning. This is a positive step in the right direction towards empowering learners within the technological environment in schools. In addition, Demirci, Ahmet, (2013) stated that using GIS can significantly enhance Geography teaching and learning environments. Digital photography allows teachers to record pupils' work

undertaken on field trips and other learning outcomes not readily recorded in traditional ways (Joseph, 2012).

Teachers role becomes more and more of a “guide or moderator rather than a director”. ICT becomes an agent for change by significantly enhancing educational reform which enables teachers and learners to move away from traditional to more innovative and effective approaches to teaching and learning (DOE, 2003). ICT can make Geography more authentic and relevant. ICT enables teachers to engage and motivate pupils about geographical concepts to a greater degree. Using GIS software to produce and manipulate maps at a range of scales can save lesson time and give better quality results (Mathevula, 2015). Furthermore, Cumming, Strnadova and Singh (2014) concluded that educational technology enables teachers to provide a wider range of learning activities.

The internet increases access to authentic geographical data and information sources. ICT also gives pupils greater autonomy in their geographical investigations. GIS software can enable teachers to focus more closely on teaching geographical skills, in addition to developing a sense of location and place. ICT enables higher level thinking skills and improve the appearance of work by enhancing presentation (Mathevula, 2015). The connectivity to the outside world beyond the formal school walls and the immediacy of communication tools enable teachers to explore alternative activities such as virtual tours etc. Teachers have the possibilities of world teaching. Similarly, both studies conducted by Telkom (2015) and Clarke and Luckin (2013) suggested that computers and the internet as supported teaching strategies play a crucial role, as they increase active participation, creativity, improve knowledge, skills, increase motivation, increase collaboration, responsibility, self-esteem and interest.

Bester and Brand (2013) established that technology has the potential to increase learners’ motivation and class attendance which is an important aspect, since so many of today’s learners from disadvantaged or advantaged homes and families are not interested in learning or are not motivated to achieve. Educational technology assists learners to make meaning of their own learning material. Kruger (2010) indicated that among the many benefits of using ICT in Grade 12 Geography classrooms are also that they provide variety, compensate for language deficiency, reinforce learning, increase application

possibilities, enhance the applicability of the learning content provided for the learning needs of individual pupils and supplement the spoken word.

To further argue the benefits of educational technology, Aguyo (2010) reported that if fully utilised, ICT can reduce the cost of education and increase efficiency, especially in terms of manpower as one Geography teacher can reach many learners through the internet, interactive white board and video conference technologies. Parents are also spared from buying text books because they will be available online. ICT can play a significant role in providing teachers and learners access into content and up to date teaching aids. The usage of ICT by the teacher can provide learners with skills for future workforce that can help them participate in the networked world. Similarly, Mathevula, and Uwizeyimana (2011) mentioned that if carefully deployed, the use of ICT can go a long way in bridging both the access and standard gaps in Geography classrooms, because ICT could be used to make education accessible to more learners. This could bridge the gaps between the rich and the poor, between the urban and rural areas, and could ensure access to services, especially ICT to utilise existing limited resources, including teachers, more effectively to accomplish the goals of improved secondary education and human resource development.

Literature from educational research supports the claim that using visuals in teaching results in a greater degree of learning, as learners seem to concentrate better and for more sustained period of time. Bester and Brand (2013) stated that learners retain more information with the help of sufficient visual content in their learning materials. Learners have higher comprehension after reading electronic information versus reading printed information. The interactive effects of sound, narration and additional definitions that make up electronic content motivate learners to want to read again, which happens less often with printed information.

Bester and Brand's view is supported by Dzidonou (2010), who further revealed that learners being taught with ICT are motivated even when the learning activities are challenging, authentic, multi-sensorial and multidisciplinary. Learners report higher attendance, motivation and academic accomplishment as a result of ICT programmes. ICT may discourage learners from dropping out of school (Rebecca & Marshall, 2011).

According to Brown (2011), ICT be used in Grade 12 Geography classrooms as a communication tool, an access path to resources, a facilitator of co-operative activities for teachers and learners or a variety of other aids. With the use of ICT, learners do not only receive content in a visual auditory way, but they actively react to what is presented to them (Bester & Brand, 2013). ICT provides access to the worldwide web. In addition, Knight and King (2010) stated that through the use of computer technologies, access is granted to the bulk of information stored electronically, where updating, revision and correction of information can be a continuous process. Similarly, Peeraer and Petergem (2011) identified several benefits of ICT in schools, such as enhancing learning in classrooms and improving management of schools. It helps in time tabling, record storage, secretarial work like typing staff meeting minutes, examinations and letters, improving accountability, efficiency and effectiveness of school activities and use of power presentations and the internet.

In a further study by Keengwe and Onchwari (2011), it is stated that by implementing ICT, schools can present high quality teaching and learning. The study identified different ways that schools can offer quality education supported by ICT, such as real time conversation, learning by doing, directed instruction and delayed time conversation. Higgins and Moseley (2011) revealed that teachers who use ICT in their Grade 12 Geography classrooms for teaching purposes were prepared to continue using it due to its usefulness, such as making teaching more interesting, easier, more diverse, and more fun for them and learners, enjoyable and motivating.

To further argue for the potential benefits of educational technology in Geography teaching, Osodo, Idoshi and Ongati (2010) mentioned that it allows more time for observation, discussion and analysis. ICT further enhances geographical knowledge, improve geographical enquiry skills, and develop geographical, statistical and spatial analysis skills. Furthermore, virtual field trips can offer improved preparation before real trips, or can partially substitute them. An online virtual library offers timeliness and constant updating of information. Online tutorials can produce educational benefits quite different from conventional tutorials for different groups. There is evidence that they benefit less assertive or more reflective learners, facilitate deeper interaction and generate

active participation by learners and groups marginalised by other teaching methods. The following section addresses challenges in the usage of ICT in Geography classrooms.

2.8 CHALLENGES IN THE USAGE OF EDUCATIONAL TECHNOLOGY IN GEOGRAPHY CLASSROOMS

Literature tends to highlight, amongst others that the availability and potential utilisation of educational technology differs from country to country and from region to region. The following barriers to successful ICT integration in Geography classrooms have been identified as common factors: lack of effective teacher training, this refers to the fact that as most schools in developing and developed countries are now equipped with computers, internet access, WiFi etc, teachers that must be able to utilise them to implement an integrated approach in ICT use. Furthermore, lack of teacher confidence, resistance to change, lack of technical support, negative attitude of teachers towards the use of ICT and lack of infrastructure in schools are barriers experienced in most countries (Mathevula & Uwizeyimana, 2011).

According to Bester and Brand (2013), despite their role as innovators, teachers have always had a love-hate relationship with technology. While some teachers are trying to keep up with the latest trends and innovations, some are not bothered, while others do not have any technology to use at all. Rupp (2013) has established that other longer term constraints that may limit access to educational technology include education which is corrupted, mismanaged, underfunded and neglected, and brain drain, which has negative consequences for institutional capacity.

Likewise, Blog (2012) reported that school districts across the country are not created equally. There is so much disparity in educational resources depending on the wealth, or lack thereof on certain areas. Students using educational technology in low income districts gain significant skills and advantages in the learning processes. Using the same technology is an equaliser for disadvantaged students.

There is not yet consensus in the literature as to the impact of ICT on teaching and learning (Mathevula & Uwizeyimana, 2011). Firstly there is still some uncertainty over its educational merits and demerits, as Mikre (2014) argues, that there is a danger that

learners may be confused by a multiplicity of available information. Secondly, the prevalence of undesirable websites poses a real threat as learners tend to spend most of their learning time on websites containing unsolicited contents, such as pornographic materials, as they seek to explore the ICT. The prevalence of undesirable websites is a genuine and critical concern that could affect learning and teaching because the teacher has to spend much time trying to control students from using websites unrelated to the learning content instead of teaching.

Pan African Research Agenda (2008-2011) revealed that the ICT policy is poorly implemented by those whom the government is trying to rescue from economic and social discrimination (in some cases exclusion) caused by the digital divide. Ndlovu and Lawrence (2012) further elaborated that teachers in schools are still in the phase of using ICTs to merely transmit subject content rather than utilise technology to enhance learning. Teachers need competence and innovativeness to maximise the potential of digital devices. The next section focuses on the international perspective of ICT.

2.9 INTERNATIONAL PERSPECTIVE

The fact that there has been a surge in the presence of technology in classrooms in the world is common knowledge. The global adoption of ICT into education has often been due to the potential of new technological tools to revolutionise an outmoded educational system (Kaiser Family Foundation, 2010). This section discusses the use of ICT in the United States of America and Finland.

2.9.1 United States of America

Technology has increasingly become part of the people in the United States of America so much so that it seems preposterous to even think of doing most simple, routine tasks without the use of a cellular phone, laptop computer or personal global positioning system more commonly known as GPS (Kaiser Family Foundation, 2010). In addition, a study by Klein (2010) revealed that the cost of technology and educational platforms in the United States of America has become inexpensive, which has made technology more accessible. The increased accessibility of technology in the United States of America means learners from various socio-economic backgrounds are increasingly exposed to ICT.

Furthermore, a study by Tripp and Herr Stephenson (2011) pointed that nearly 100 percent of public schools in the United States have Internet access, with 97 percent reporting having broadband connection. This view is strongly supported by Brown (2011), who stated that technological advances and a decrease in the cost of technology have resulted in nearly 93 percent of public school classrooms in the United States having access to the internet, and a considerable increase in educational programmes that incorporate technology into the curriculum. The Pew Internet and American Life Project reported that 92% of American teachers state that technology and internet access have a “major impact” on their teaching resources (Purcell, 2013).

More recently, the data show that there is now focus on the United States on one-per-student-technologies primarily tablets. In their budgets for 2013-2014, about 25% of United States school districts expected their hardware budgets with 77% planning to purchase tablets and 85% already reporting the use of tablets at some level (MDR, 2014).

To further outline the availability of educational technology in the United States of America, Boser (2013) mentioned that in the United State alone, the Federal States and Local government spend more than \$3 trillion annually on technology in schools. According to the US Department of Education (2012), 97% of P-12 teachers had one or more computers in their classrooms, and internet access was available for 93% of those classroom computers.

Additionally, P-12 teachers have LCD or DLP projectors, interactive whiteboards, and digital cameras, either in their classrooms or available to them daily (Polanka, 2012). This puts pressure on teachers to acquire technological skills as understanding the impact of ICT, and the best way to integrate educational technology into the classroom is critical.

Osodo, Idoshi and Ongati (2010) reported that in a Geography classroom, the internet can be used by staff to support efficient course administration and to assist in achieving many features of flexible delivery, including learners’ choice in time, place and pace of study. The internet in particular can be used to support a variety of teaching and learning tasks, including distributing information that could be conveyed in other ways. For example, a Geography syllabus available electronically instead of on paper or photos appears on a website instead of being shown around the class. The internet can also be used as an

online library giving access to information sources and databases, providing alternative means of communication (example. email, electronic bulletin boards, chatrooms, desktop, video conferencing) for both administrative and instructional purposes and delivering formative and summative assessment tasks.

A study by Boser (2013) revealed that far too often, school leaders fail to consider how technology might dramatically improve teaching and learning. Schools frequently acquire digital devices without discrete learning goals, and ultimately use these devices in ways that adequately serve learners, schools and tax payers.

To further argue the potential utilisation of technology in Geography classrooms, Bordbar (2010) suggested that teachers should be able to use the technology at near expert level, but many cannot. Instead of formal professional development for teachers, teachers often resort to using practical knowledge and previous experience when incorporating technology in the classroom. This view was supported by Boser (2013), who stated that although the classrooms in the United States have the largest range of technologies, they did not use these technologies the most. The schools may have the funds to spend on technology, but they do not always have funds to hire people to help teachers with technology integration.

Knight and King (2010) and Joseph (2012) identified hindrances in the use of educational technology such as lack of training and incompatibility with school culture, lack of time, lack of funding, attitudes of teachers, institutional subject culture and lack of skills. Clement, Khan and Hasan (2012) noted lack of resources in certain schools in the USA, lack of support for teachers, and beliefs and philosophies of education for some teachers.

Graham (2011) proposed that school administrators should consider the cost of extensive teacher training when evaluating technology costs, otherwise the availability of technology in schools will be a waste, as it will most likely be misused or not used to maximise learners' potential. The American Heritage Science Dictionary (2011) reported that collaboration with technology-savvy teachers, instructional technology specialists, and librarians can help bridge the gap. Knight and King (2010) suggested amongst other strategies to overcome the barriers, having a shared vision and technology integration

plan, conducting professional development and collaboration by teachers in learning, seeking knowledge and constantly acquiring skills alongside their learners.

Likewise, Boser (2013) stated clearly that without technical assistance and proper training of teachers, discrepancies between technology access and integration in developing and developed countries will continue, as will the ineffective educational use of classroom technology worldwide. As teachers develop technical competence, general pedagogical abilities and ability to integrate ICT into the curriculum become very important. As teachers become more competent in the use of technology, they begin to adapt the technology to their own teaching style and curriculum, rather than focusing on the technology, which is beneficial to both teachers and learners (Brown, 2011). According to this study, educational technology is available and accessible to teachers although not mostly used in the teaching and learning of Geography in schools.

2.9.2 Finland

The availability and potential utilisation of ICT in Finland is still at its introductory phase (Kankaanranta & Normena 2010). However, on the 21st June 2007, the Finnish government issued a Resolution on the Objectives of the National Information Society Policy for 2007-2011 (Higgins & Moseley, 2011). According to Higgins and Moseley (2011), one of the objectives was to carry out a pilot project on educational use of information and communication technology (ICT) and to use it as a base to estimate opportunities to increase the use of computers and information technology. However, the purpose of the national plan is to encourage and stimulate all those involved in school communities to make use of opportunities provided by ICT and the media as part of education (Kankaanranta et al, 2010).

The National Plan for Educational Use of Information and Communication Technology developed strategic policies and actions which included, amongst others, national objectives and systematic change, learners' future skills, pedagogical models and practices, e-learning materials and applications, school infrastructure support services, teacher identity, teacher training and pedagogical expertise, operational culture and leadership at school and business and network co-operation.

However, according to Kankaraaranta and Normena (2010), Finland is at around European average and the last of the Nordic countries in terms of educational use of information and communication technology. The view is supported by Higgins and Moseley (2011), who says that ICT tools were not used as effectively and pedagogically as they could have been in Finnish schools. Instead of using ICT during lessons, Finnish teachers use it to some extent when preparing lessons but not during the lesson. This is in contrast with Vahtivuori and Kynaslahti (2012), who mentioned that ICT cannot be simply an additional element in teaching and learning, rather it must be fully integrated with everyday rhythms of schools. This implies that the insufficient use of ICT in Finland schools does have a negative impact on the teaching and learning Geography. This is ascribed to, amongst others, the following barriers:

- Varying and inadequate standards of educational technology.
- Lack of technical and pedagogical support.
- Challenges for schools' operational culture.
- Development of school management practices and change management.
- Partnerships between business and schools in order to organise services.
- Low usage of pedagogical models and practices geared towards supporting learners' active involvement and collaborative learning.
- Availability, quality and dissemination of e-learning materials
- Lack of teacher training.

Finland does very well in international comparisons without using ICT, so it is difficult to convince teachers to abandon current (non-ICT-based methods) and practices. These barriers led to the decline in pedagogical innovative ways of using ICT (Kankaraaranrta & Normena, 2010). It has been further aggravated by the decline in the financial investment for the educational use of ICT. In addition, the study revealed a certain lack of trust in the role played by ICT in the promotion of learning.

The developmental phase of Finnish Schools in the use of ICT is supported by Arje et al (2010), who alleged that differences between regions, schools and stages of schooling have increased in terms of the educational use of ICT. The study shows that Finnish schools were no longer on an equal footing. Some education providers have progressed fast and their schools are leaders in the field of both pedagogical and technical terms, while others have fallen behind. Despite individual schools and teacher groups' attempts to integrate ICT into education in resourceful and creative ways, effective pedagogical practices have failed. This is due to absence of a clear-cut national action programme and financial investment in infrastructure, which have not been enough on their own (Kankaraaranrta & Normena, 2010).

The differences in the advancement of ICT usage has been noted by Niem, Kynasahti, Vahtivuori and Hannnen (2013), who indicated that in Finland there were certainly schools with excellent technological infrastructure and enthusiastic teachers who could use ICT, but there were schools that lagged far behind in their ICT use. Furthermore, Niem et al (2013) show that in Finnish schools, principals and teachers had together created a joint vision of how to use ICT as a future learning tool, and the schools had allocated resources to develop a culture of sharing. The needs and suitable teaching practices of each grade had been taken into account, and the nature of the curriculum is dynamic. An open school culture allows staff to take risks when applying new technology, creates learning environments and empowers learners (Niem et al, 2013). ICT changed the whole school community towards a more communicative ecology of daily practices (Salo, 2011). However, the role played by ICT in promoting teaching and learning remains questionable (Kankaraaranta & Normena, 2010).

2.10 AFRICAN PERSPECTIVE

Africa, like the rest of the world, embraced the innovation of ICT and its use in education. As ICT technology evolved and became more widely used, efforts in Sub-Saharan Africa were also expanded. This section will focus on the use of ICT in countries such as Nigeria, Kenya, Zimbabwe and South Africa.

2.10.1 Nigeria

Educational technology appears to be a 'buzz word' in educational circles in present times. Like most of developed and developing countries, Nigeria also exploited the

potential of ICT to transform their educational landscape in order to face the challenges of the 21st century (Nwazor, 2012). According to a study by Onwuagboke and Ukegbu (2018), ICT holds out the opportunity to revolutionise pedagogical methods, expand access to quality education and improve management of education system. Hence curriculum in the 21st Nigeria urgently demands teachers to be capable of efficiently handling ICT resources. These teachers will help learners to radically obtain and manipulate information for their educational resource development.

Unlike in the USA, teachers in Nigeria were aware of ICT resources but do not utilise them while teaching (Nwazor, 2012). Their reluctance to use it is ascribed to, amongst others, lack of ICT facilities in many schools, lack of funds, erratic power supply and lack of adequate knowledge of the use of internet. However, steps such as workshops, seminars, ICT conferences and other stakeholders in education should join hands to make sure that ICT pedagogical and methodological issues are taken into consideration. This will enhance the integration of ICT in teaching and learning processes, especially in secondary education for quality assurance.

It has been further stated by Okenjom, Orgar and Uchechukwu (2016) that most teachers in Nigerian secondary schools seem to show lack of interest in ICT, concentration and continuity. The study recommended solutions such as the electronic training of teachers. According to the study, electronic training as a form of staff development programme for teachers is a necessary tool for proper the inculcation of techniques and skills for teachers to be able to train learners on the practical usage of electronic devices such as computers and laptops etc.

Furthermore, a study by Nwazor (2012) revealed that when a teacher has equipped himself or herself through the internet, he then has a vast range of knowledge and understanding of the kind of education he will impact to learners to enable them to be able to practically interact and use technologies evoked at their disposal. However, the study revealed that in Nigeria, there is a lack of curriculum context of teacher preparation, and a clear definition and clarification of technology education. Many teachers are not ICT compliant, hence cannot teach what they do not possess. This poses a great challenge in teaching and learning.

Nevertheless, the federal state of Nigeria has made computer studies compulsory in their entire curriculum. But there is still a need for policy, curriculum, pedagogy, technology administration and professional development for teacher competency development (Hooker, Mwiyeria & Verma, 2011). The study was supported by Achibong, Ogbijia and Anijaobi (2010) and Obakhume (2010), who stated explicitly that teachers' competency of utilising ICT for teaching is very low. Similarly, Corbin and Strauss (2010) identified hindrances in the potential use of educational technology such as teachers' reluctance to use ICT, especially computers and the internet, poor software design, skepticism about the effectiveness of computers in improving learning outcomes, lack of administrative support, increased time and effort to learn technology and how to use it for teaching and the fear of losing their authority in the classroom as it becomes more learner centred.

The emphasis by Umeh and Nsofor (2014) is more on modern trends in the use of educational technology in the classrooms in Nigeria. However, they also acknowledged that educational technology is an important discipline in the field of education although it is yet to be rooted in the Nigerian education system. The study made the following recommendations: educational technological materials should be provided in all three tiers of educational level in Nigeria, primary, secondary and tertiary education; there should be enforcement of educational technology usage on both teachers and learners. Geography and all other subjects should be taught using the right technological equipment such as slides, projectors, computers etc. There should be a monitoring team to enforce the use of educational technological materials in schools. There should be training for teachers on the importance, management and utilisation of educational technological materials or equipment. Lastly, government should provide adequate funding for the purchase and maintenance of technological equipment.

2.10.2 Kenya

Like many developing and developed countries, Kenya also embraced educational technology which can be a potential important agent of development. This has been evident in the release of the national ICT policy on education in 2006 (Gok, 2010). Key highlights in the policy for secondary schools were:

- Provide affordable ICT infrastructure to facilitate the dissemination of knowledge and skills through e-learning platform.

- Promote the development of the integrated e-learning curriculum to support ICT in schools.
- Promote the establishment of a National ICT centre of excellence.
- Promote the development of content to address educational needs of secondary schools.
- Create awareness of opportunities offered by ICT as an educational tool in the educational sector.
- Facilitate the sharing of ICT resources between schools.
- Integrate ICT infrastructure with other existing infrastructure in schools.
- Exploit ICT opportunities to offer Kenyan education programmes for export.

However, Kenya's realisation of ICT has been delayed by a number of constraints such as that most schools are not connected to the electricity grid; most schools have no capacity to buy the required infrastructure; and have school leaders and teachers who are either computer illiterate or technology ignorant though the current global technology changes puts emphasis on the digitalisation and modernisation of all sectors, including schools (Manduku et al, 2011). A lack of adequate resources and competency on teachers has greatly compromised the teaching of learners, including those in Grade 12 Geography classrooms.

In addition, a study by Mwencha (2012) revealed that in Kenya learning and teaching in secondary schools is also under increasing pressure to integrate the use of ICT in order to impart knowledge, skills and attitudes needed to survive in the global world. The study pointed that there was a number of secondary schools that were being marginalised due to a lack of accessibility to ICT infrastructure and skilled human resource to facilitate effective teaching and learning. Furthermore, the study indicated that there is a lack of teacher competency. The major problem for the teacher is the complexity of software to use in the teaching and instructional delivery of the curriculum in the school environment to improve their professional effectiveness. This implies that the availability of ICT resources and potential utilisation by teachers' is not yet realised.

However, a study by Laaria (2013) recommended the reduction of infrastructure costs by adopting measures such as locally assembling as well as exploiting alternative technologies to avoid reliance on imported ones. Qualified teachers with ICT skills should be employed and in-service courses designed to train the ones already in the profession. Access to good quality electricity is a primordial provision. Schools should be provided with relevant infrastructure like buildings, purchases of hardware and software, and school leaders should have interest, be committed and champion the implementation. The government has to partner with the private sector and other stakeholders in the process of implementing ICT in schools. The study was supported by Watkins, Tokareva and Turner (2011), who proposed that because teachers are crucial players in the successful use of ICT in education, they should be provided with training in the following areas to make them competent in education and pedagogy using ICT in education and for learners with disabilities and special needs.

The slow pace of the implementation of ICT schools in Kenya is, however, noted by Mingaine (2010), who viewed the implementation of educational technology in Kenya as considerably more recent, of small scale and experimental. The study acknowledged that the implementation of ICT in schools has progressed in nearly the same pattern, from formulation of policies, attainment of basic computer skills, computer aided teaching and learning, communication and research to usage in Geography and other subjects. This observation has been reiterated by Dermici and Ahmet (2013), who stated that the basic problem in Kenya is lack of adequate connectivity and network infrastructure. There is limited penetration of the national physical communication infrastructure in rural and low income areas. Consequently, there is limited access to dedicated phone lines and high speed connectivity for electronic mail and the internet. Even where access to high speed is possible, this is inhibited by high costs. In a few schools where there are computers, they are not used for Geography even though they could have been available for use.

However, the actual availability and potential utilisation of these resources has not been well documented (Osodo, Idoshi & Ongati, 2010). To overcome this problem, a study by Sanget, Valcke, Van Braak and Tondeur (2010) made some recommendations such as rewards and incentives to encourage staff to invest substantial time and effort in initial development, copyright rules, intellectual property, moral rights and the equitable

management of teaching loads, especially when there is unequal involvement in ICT based teaching and greater capital investment in ICT.

2.10.3 Zimbabwe

Over the years, the government of Zimbabwe, through the ministry of primary and secondary education, has been encouraging schools to embrace and utilise ICT in their teaching and learning activities. The ex-president R. Mugabe's office also launched a campaign to provide most schools with computer-related equipment (Musaruwa, 2011). Schools have been investing in different ICTs in order to adhere to the government's call. However, a study conducted by Ndlovu and Lawrence (2012) revealed that most of the ICT resources are not available in schools. This implies that even though teachers are adequately trained and willing to impart the knowledge they have to students, they are hindered from doing so by lack of educational technological resources. The study therefore revealed a low extent of utilisation of ICT in schools. The researcher proposed the following measures: provision of funds for the procurement and maintenance of ICT tools for effective ICT usage. The researcher indicated that lack and insufficient use of educational technology tends to affect the quality of learners produced by schools without ICT.

In another study by Sibanda, Mapendula and Ferusa (2014) about the availability of common educational information communication technologies (ICTs) in secondary schools using a high school in Kwekwe. The following hindrances were identified: power supply, insufficient resources, fear of technology, lack of interest, ICT skills deficiency, ICT costs and poor physical infrastructure. Furthermore, Egomo, Enyi, and Tah (2012) deliberated that the availability of ICT tools for instructional delivery is relatively low in Zimbabwe, except for laptops, multimedia projectors and internet facilities. They recommended that schools should be equipped with ICT tools and teachers should make efforts to acquire tools since they are an integral part of the instructional delivery, appropriate ICT policies and workshop training programmes for teachers at all levels of education.

Similarly, a study conducted by Adedeji (2011) suggested that the government should invest in the provision of ICT resources to schools for teacher training since the

researcher discovered that most of the available ICT in schools was mainly used for administration purposes.

Kuvuli (2013) identifies main factors hindering the development and usage of technology in schools of Zimbabwe as lack of awareness of the importance of educational technology. These include parents, teachers, learners and the community at large. He also revealed lack of professional development of principals and teachers as some of the contributing factors. He recommended that local software developers should work with schools in developing software ideal for training teachers. Teachers need to be encouraged to use ICTs in schools. Lack of time to integrate ICTs into existing curriculum was also cited to be a contributing factor.

Both Mungai (2010) and Mingane (2010) identified the following hindrances in the utilisation of ICTs in Zimbabwe: lack of qualified teachers, since the few they have are overwhelmed; lack of electricity, which is a common problem in most African countries; inadequate computers; higher prices for procurement of ICTs resources; burglary; computer phobia by both administrators and teachers; school leadership; obsolete computers; and increased moral degradation, that is, abuse of facilities such as the internet by people who watch anti-social behaviour.

Similarly, in another study by Langat (2015), the main barriers identified as hindering the development of educational technology usage in Zimbabwean schools included shortage of infrastructure and resources, lack of teachers, lack of clear digital curriculum, political factors, poor timing, poor planning, high cost of implementation, communication barriers, corruption, moral issues, and high crime rate. The recommendations made were that all stakeholders need assessment analysis, the establishment of proper communication channels, the professional development of teachers and technicians, the establishment of digital curricula and the creation of partnership in education.

Furthermore, a study conducted by Manhood, Halm, Rajindra and Ghani (2014) highlighted a lack of exposure and expertise on the part of teachers who are computer illiterate, the forcing of teachers to use educational technology in the classroom without giving them ample time to learn, acquire and apply technology appropriately, and lack of confidence amongst teachers which is caused by lack of training. A study conducted by

Mukhari (2016) revealed that there are manipulative and non-manipulative school and teacher factors that affect the utilisation of ICTs in schools. According to him, manipulative refers to those that can be influenced by schools, such as teachers' attitude towards ICTs, ICT skills and knowledge, school commitment towards the implementation of ICTs and the availability of ICT support. Non-manipulative factors include factors not influenced by the school, such as teachers' age, computer experience, government policy and the availability of external support for the school.

2.11 South Africa

The fact that there has been an increase in the presence of technology in classrooms throughout South Africa and the world is a common knowledge. The introduction of information and communication technology (ICT) in South African schools has been undertaken by various role players. The organisations included in these initiatives range from non-governmental organisations (NGOs), solution providers, research institutions, provincial and national Departments of Education (Ramarola, 2014). There are also evolving models promoting school leadership in the access and use of ICTs in support of teaching and learning. The degree of implementation varies from province to province depending largely on the leadership, skill base and human resource capability available in the Provincial Department of Education (Meyer & Gent, 2016).

Ramarola (2014) conducted a study titled Information and communication technology integration, where to start, infrastructure or capacity building, and revealed that education programmes have addressed the challenge of producing computer literate teachers in various ways and at different rates across the nation. According to Ramarola (2014), the government, the private sector, parastatals and non-government organisations have responded positively to the challenge. School Net SA SCOPE and the South African Institute for Distance Education have developed Educator Development modules of introducing ICTs into schools.

Furthermore, School Net SA provides online, mentor-based in-service training for educators on introducing ICTs into the curriculum, management and the INTEL "Teach to the Future". Educator Development Programme provides educator training in ICT integration into teaching and learning. An educational portal initiated by the Department of Education provides digital content resources (Ramarola, 2014).

However, in their study, Wachira and Keengwe (2010) revealed that despite increase in the number of computers, support for classroom use and the promise of technology in education, it is doubtful whether teachers are prepared to use them for educational purposes as teacher surveys show a consistent decline in the use and integration of computer technology to enhance student learning.

Naicker (2011) stated that a mere 1.4% of the teachers had no experience with computer technologies, while 6, 3% of these teachers had attempted to use them, but still will require help on a regular basis. Only 15, 1% of these teachers were able to perform basic functions in a limited number of computer applications. 49, 6% of these teachers could demonstrate a general competency in a limited number of computer applications. Only 23, 6% of the teachers had acquired the ability to completely use a broad spectrum of computer technologies, and finally 3, 9% of these teachers were extremely proficient in using a wide variety of computer technologies.

In a further study by Mdlongwa (2012), it is revealed that many teachers view the introduction of ICT as a major threat and a challenge. Teachers resist to change from traditional teaching methods to incorporate ICT in their classrooms. Likewise, a study conducted by Mukhari (2016) about teachers 'experience of Information and Communication Technology use for Teaching and Learning in Urban Schools in SA revealed that ICT integration in teaching and learning is endorsed by teachers and principals who understand the benefits of ICT in enabling better methodological strategies, greater collaboration among teachers, improved access to the required information and the ability to cater for learners with different potential and learning styles.

However, Mukhari (2016) identified a number of hindrances in the successful integration in urban schools as inadequate ICT skills, low level of ICT proficiency, inadequate training, negative attitudes and poor teacher confidence. All of these influenced the researcher to investigate the availability and the potential utilisation of educational technology (ICT) in the teaching and learning of Geography in Grade12 classrooms of Mankweng Circuit in Limpopo Province.

It is a fact that the world is still divided between those with access to ICT and those do not. The current study is vital since it would investigate the availability of ICT and how it is

implemented by Geography teachers in Grade 12 classrooms since the South African government has promised that all schools, including those in rural communities, will be equipped with the best infrastructure, equipment and resources (especially ICT infrastructure) to strengthen their role in countering historical disadvantages (DoE, 2007). The study would present some new developments that are propagated by the post-apartheid government. There is a shortage of similar studies previously done in rural areas. Therefore, the study aims at bridging the existing knowledge gap in the availability and potential use of ICTs in the teaching and learning of Geography in Grade 12 classrooms of Mankweng.

2.12 CONCLUSION

This chapter focused on the literature review within which this study is located. The chapter followed this design: firstly, it gave the conceptualisation of the key concepts of the research problem. Secondly, it discussed models that are used to integrate ICT in teaching and learning as well as the theoretical framework. Furthermore, the international perspectives, African perspectives on the availability and potential utilisation of educational technology in schools, and particularly in Geography classrooms were discussed.

CHAPTER 3

RESEARCH DESIGN AND METHODS

3.1 INTRODUCTION

In the preceding chapter, the researcher discussed the review of literature, the models that are used to integrate ICT in teaching and learning classrooms, international perspectives and African perspectives of the availability and potential utilisation of educational technology in Grade 12 classrooms as well as benefits and challenges on the availability and potential utilisation of educational technology in Grade 12 Geography classrooms. In this chapter, the researcher focuses on the chosen qualitative research design and methods deemed appropriate and relevant to the study. Trustworthiness and ethical measures are also dealt with. The next section describes understanding of the research design within which this study operated.

3.2 RESEARCH DESIGN

This section will focus on the research design. A research design is the logic that links the data to be collected and the conclusions to be drawn in the initial questions of the study (Yin, 2014). Furthermore, Maree (2012) explains a research design as a plan or strategy which moves from the underlying philosophical assumptions to specifying the selection of participants, the data gathering techniques to be used and the data analysis to be done. However, Macmillan and Schumacher (2010) describe a research design as a procedure of conducting a study. The aim of the research design is to specify a plan that enables the researcher to generate empirical evidence to be used in answering the research questions. The authors further asserted that quantitative research, qualitative and mixed methods approaches are the three main categories of research designs (Macmillan & Schumacher, 2010). Contrary to the other research designs, the qualitative designs rest on the assumption that knowledge is socially constructed as individuals are inclined to understand and make meaning of the world they live in. Therefore, the design occurs in a natural setting while behaviour is studied as it happens. In support of this view, De Vos, Strydom, Fouche and Delport (2011) argue that the description and explanations of the

participants, natural milieu and the social construction of knowledge enable the researcher to understand the participants' words and to report various social realities.

The case study design was suitable, it provided with an in-depth, multi-faceted understanding of the teachers' experiences in the use of computers for teaching from their life context (classrooms). As Yin (2014), case studies can be used to explain, describe and explore events or phenomenon in everyday contexts in which they occur. Also that the case study approach can offer additional insights into what gaps exist in the delivery or why one implementation strategy might be chosen over another.

In this study the teachers were assumed to be rich in information with regard to the availability and use of ICT facilities. Thus, their experiences, views and opinions are basic for constructing information that will be used to answer the research questions outlined in section 6 of chapter 1. This indicates that without a research design, the researcher is likely to lose focus of the research topic. The next section discusses the research paradigm.

3.3 RESEARCH PARADIGM

In this section, the researcher defines and discusses the research paradigm in which the research is situated and the three important basic categories of paradigms. Maree (2012) describes a paradigm as a lens or organisational principles by which reality is interpreted, and as enabling the researcher to tell a coherent "story" by depicting a world that is meaningful and functional. A research paradigm refers to a typical example or pattern in which research is done. De Vos, Strydom, Fouche and Delport, (2011) argue that a paradigm is a pattern containing a set of legitimised assumptions and a design for collecting and interpreting data. In this study, a research paradigm is seen as a set of basic beliefs that deal with ultimate or first principles that are accepted without questioning (Mukhari, 2016). A paradigm is further seen as a building block of science (De Vos et al, 2011). A paradigmatic perspective refers to a way of viewing the world, and holds that a researcher, when choosing a perspective or paradigm, to make certain assumptions in favour of others (Maree, 2012). This implies that a paradigm has been used to guide and inform the context of this research.

A research paradigm gives a clear picture of the assumptions that are made by researchers on how they view the world based on ontological and epistemological perspectives. Ontological questions are concerned with the nature of existence, of what there is, the general features if there is and reality (Edmondson, 2014). Contrary epistemology poses the questions of how reality can be known, the relationship between the knower and what can be known, the principles that guide the process of knowing and the possibility of the process being shared or repeated by others to assess the quality of research and the reliability of research findings (Mukhari,2016). This implies that epistemology tries to understand what it means to know. Cohen, Marion and Morrison (2011) further argue about researchers' ontological assumptions (assumptions about the nature of reality and nature of things) that give rise to epistemological assumptions (ways of researching and enquiry into nature of reality and nature of things) and axiology (as knowledge and beliefs people hold). The researcher is of the view that the knowledge unveiled through this research approach would benefit all stakeholders in the Department of Education.

The research paradigms are classified into three basic categories of positivism, interpretivism and critical science, all representing ways of seeing the world (Cohen, Manion & Morrison, 2011).

3.3.1 Positivism

According to Macmillan and Schumacher (2010), positivism maintains that humans must be studied in the same way as the study of nature of scientific knowledge, which is regarded as facts and reality and seen as independent of social construction. Mukhari (2016) further states that positivism emphasises the rationalistic view of knowledge, which can be discovered only through scientific methods. The researcher chose positivism because positivism states that humans must be studied in the same way as nature is studied and as such scientific knowledge is seen as a fact.

3.3.2 Critical theory

Critical theory shares characteristics with interpretivism by focusing on studying and understanding society, but puts more emphasis on reasons as the highest potential in people, and through reasoning human beings are enabled to criticise, challenge and

change the nature of society (De Vos et al, 2011). In this study, critical theory reveals schools which still lack ICTs resources, and teachers who still rely on a teacher-centred approach, traditional teaching methods and educational outcomes which focus on producing passive learners. In critical science, people understand how the society functions and the methods by which unsatisfactory aspects can be changed. Irrespective of other paradigms, this study will use the interpretive paradigm.

3.3.3 The interpretive paradigm

The researcher used the interpretive paradigm to guide the study. Interpretivism originated in hermeneutics, which is the study of the theory and practice of interpretation (Maree, 2012). The researcher would use the interpretive paradigm in order to gain a deeper understanding of the phenomenon and its complexity in its unique context instead of trying to generalise the base of understanding for the whole population (Hammersley, 2013). This is in line with Maree (2012), who affirms that the interpretive perspective is based on the assumption that human life can only be understood from within (peoples' experiences); social life is distinctly human product (reality is socially constructed); human life is purposive; human behaviour is affected by knowledge of the social world and the world does not exist independently of human knowledge. The researcher used these philosophical ideas to guide the study. This would enable her to gain insight into the way in which a particular group of people (teachers in this study) makes sense of the availability and potential utilisation of educational technology in Grade 12 Geography classrooms.

Furthermore, the researcher seeks to understand the participants' world and how they develop subjective meanings of their experiences (Maree, 2012). In this way, participants' accounts of meaning, experiences and perceptions would be elicited as maintained by the interpretivist paradigm (De Vos, Strydom, Fouche & Delport, 2011). However, the aim of the researcher is not to describe objects, human or events, but to have an in-depth understanding of the participants' social context (Tuli, 2010). Through the interpretive paradigm, a case study would be used to obtain authentic information related to the object of the research (Hammersley, 2013). As a result, interviewees' thoughts, values, prejudices, perceptions, views, feelings and perspectives regarding the use of ICT in the teaching and learning of Geography were probed (Maree, 2012). From the previous

author's understanding of theory, we learn that the ultimate aim of interpretivist research is to offer a perspective of a situation under study, and to provide insight into the way people or groups make sense of their situations or phenomenon they encounter. Therefore, the valuable data collected would have provided the researcher with better insights for recommendations.

In this research, the paradigm guided the researcher to understand experiences of teachers and curriculum advisors as well as the circuit inspector with regard to the availability and potential utilisation of ICT in Grade 12 Geography classrooms in Mankweng Circuit Office. It was very important for the researcher to interrogate the participants so that they could provide the necessary information regarding the availability and potential use of ICT circuit. The interrogation was successful as the participants provided the required information. The next section focuses on the research approach.

3.4 RESEARCH APPROACH

This research followed a qualitative approach. This is because the qualitative approach assists in comprehending social situations, individuals, events or groups. In this study, it probes teachers' experiences in terms of the availability and potential utilisation of ICTs in Grade 12 Geography classrooms. It would be done through investigation of participants' cultural description, knowledge, subjective understanding and interpretation of their situation (Marshall & Rossman, 2011). It therefore represents a live environment. Since the aim of the study is to discover participants' views and systems in their natural settings, the focus will therefore be on their meanings and interpretations of availability and potential utilisation of ICTs in Grade 12 Geography classrooms. Hence, the nature of situations, settings, processes, relationships and systems will be revealed. Therefore, the researcher will not rely on the collection of numerical data but on non-numerical data such as words and pictures (Castellan, 2010). This is because participants' expressions in terms of their assumptions, intentions, attitudes, beliefs and values would be expressed verbally. This concurs with Castellan's (2010) view that asserted that qualitative research is designed to reveal the audience's range of behaviour and perceptions that drive it with reference to specific topics. This is further supported by Denzin and Lincoln (2011) when they say that qualitative research focuses on an epistemological stance and is a research using methods such as participant observation or case studies, which result in narrative,

descriptive accounts of a setting practice. Therefore, this approach has an exploratory and descriptive focus (Mannay, 2010). From this guidance by these research methodologists, this study applied the qualitative methods of collecting data, which were the interviewing of teachers on an individual face-to-face basis as a focus group. However, the researcher remains an instrument to collect data (Maree, 2012). For this study, the qualitative approach assisted in understanding the position and views of the participants with regard to the use of ICT in the teaching and learning of Geography in Mankweng Circuit. In the next section, the researcher discusses the case study.

3.5 CASE STUDY DESIGN

For an in depth study of a small group of people to be undertaken, a case study design is used. The focus is on a single educational programme that progressed overtime in a natural academic setting, which is a school (Macmillan & Shumacher, 2010). This is in line with Simons' (2011) view, who defines a case study design as the study of the particularity and complexity of a single case in order to understand its activities within particular circumstances. However, Yin (2014) further defines a case study as a research method applied when "how or why" questions are being posed, and pinpoints a contemporary phenomenon with some real life context. The use of ICT in education aims at changing teacher tendencies into learner one, and focuses on transactions, independence and the self-learning of students (Bidarian, Soheila & Dovoudi, 2011). In this study, the case is of schools in Mankweng Circuit.

Other authors view case studies differently. Maree (2012) argues that a case study is a system of enquiry into an event which aims to describe and explain the phenomenon of interest. The author further reiterates that a case study aims at gaining greater insight and understanding of the dynamics of a situation. In a study conducted by Cohen, Marion and Morrison (2011), a case study is viewed as a specific instance that is frequently designed to illustrate a more general principle and a study of an instance action. In this study, teachers, curriculum advisors and circuit inspectors' views and opinions are a basis for constructing information that will be used to answer the research questions. The case study would be done through multiple sources of data collection found in the school environment and the circuit office. This is supported by Macmillan and Schumarch (2010),

who reported that a case study examines a bounded system or a case over time and in depth, employing multiple sources of data found in settings.

In this study, the researcher will use case study as the researcher had close contact with the participants. This enabled the voiceless and powerless to have a say. This method is widely used and enables participants to offer their insights and experiences when in contact with the researcher (Bryman, 2010). The next section justifies the inclusion of a case study in this research.

3.5.1 Justification for the selection of case study design

A case study design prompted the success of the research. The interpretivist paradigm supports the techniques used in collecting data such as interviews and document analysis which were tools used in this case (Maree, 2012). In a study conducted by Yin (2014), a case study is justified by indicating its contribution to our knowledge of individuals, groups, organisational, social, political and related phenomena. The author continues to state that a case study design allows the investigator to retain the holistic and meaningful characteristics of real life situations. To emphasise his point, Yin (2014) further says that a case study's unique strength is the ability to deal with a full variety of evidence documents, interviews and observations. This view is supported by Maree (2012), who confirms that the strength of a case study is its use of multiple sources and techniques in data gathering processes, including interviews and documentation reviews.

For an in-depth study of a small group of people to be undertaken, a case study is one of the most recommended methods (Macmillan & Shumacher, 2010). In addition, the epistemological stance from advocates of case study method has guided me in the use of this method. An important part of the case study design is the fact that instruments are used for data collection. Yin (2014) emphasises the use of interviews, observations and document reviews as instruments of data collection in a qualitative research. Therefore, interviews and document analysis were used by the researcher when conducting this study. One of the most important components of case study design is the validation of data. As the researcher was the investigator, the guidance was provided by the supervisor. The next part discusses the population and sampling of the study.

3.6 POPULATION AND SAMPLING

3.6.1 Population

Any sociological research or scientific research involves the total population that may be targeted as a source of relevant data. (Mukhari,2016). Babbie (2010) and Macmillan Schumacher (2010) describe population as a group of elements or individuals that conform to specified criteria and to which researches intend to generalise the findings of the research. In support, Punch (2011) defines population in research as the total target group that would, in an ideal world, be the subject to the research and about whom the researcher is to say something. Furthermore, Mwencha (2012) describes population as the total collection of elements about which inferences are made.

The population of this research was selected from ten secondary schools in Mankweng Circuit of Limpopo Province. Cohen, Marion and Morrison (2012) stated that it is not possible to interview all the people that relate to the study, who are identified as the total population. The circuit has a population of about 2287 Grade 12 learners with 76 Grade 12 teachers. A total of about 1189 are Geography learners (Capricorn South Data Verification, 2018). All the schools fall under Quintile one-the Department of Basic Education's classification category for no fee paying schools, There are no private or independent high schools that are privately owned,governed and funded in the circuit The secondary schools chosen made a good target population for the study because of the government's commitment to improve the quality of learning and teaching in rural secondary schools by funding ITC infrastructure in schools in order to make secondary education more relevant to the needs of the country.

3.6.2 Sampling Frame

According to Mwencha (2012), a sampling frame refers to the complete list of all cases in the population from which a probability sample is drawn. The sampling frame of this research consists of a total of 11 participants of which 7 were teachers from a population of 6 secondary schools in the Circuit. Four principals from the schools in Mankweng Circuit also participated in the sample as respondents. The information records were also sourced from the schools and Mankweng Circuit Office. The sampling frame was

important since it influenced the population covered and the actual selection process of schools sampled.

3.6.3 The sample size

The samples are where the researcher takes advantage of accessible situation which happens to fit the research contexts and purposes (Punch, 2011). However, Maree (2012) argues that sampling is a method used in special situations for specific purposes in the mind of the researcher, as sometimes it may specify a group of specified age range or a group of specified characteristics. In this study, the research sample consisted of a total of 11 participants who are working for the Department of Education. Together they constituted a case study which, according to the researcher, was appropriate to yield rich and relevant information regarding the availability and potential use of educational technology in Grade 12 Geography classrooms in Mankweng Circuit in order to answer the broad research questions as indicated in subsection 1.6.

3.6.4 Sampling Technique

The researcher used purposive sampling to select the schools and the participants for inclusion in the research project. Babbie (2010) defines purposive sampling as a form of non-probability sampling in which units to be observed are selected on the basis of the researcher's judgment, about which ones are most useful or representative. This view is supported by Yin (2014), who says purposive sampling is a way of getting best information from people who have experience or expertise to provide quality information and insights on the research topic. Purposive sampling is a typical approach chosen with the aim of generating insight and obtaining in depth understanding of the topic of interest (Braun & Clarke, 2013).

The participants were chosen purposively because they could provide rich information about the availability and potential utilisation of educational technology in Grade 12 classrooms. This is in line with Denzin and Lincoln (2011) who says that the whole idea of sampling is to produce accurate findings from subjects or participants selected for inclusion in a study, on the basis of particular characteristics relevant for the study problem under investigation. The participants were directly involved with the teaching and monitoring of Geography in Grade 12 classrooms. A list of schools from Mankweng Circuit was used to identify and select schools for sampling. The participants were also selected

based on their willingness to participate in the study. Furthermore, the selected teachers have been teaching Geography for the past ten years. The following section deals with data collection and instruments.

3.7 DATA COLLECTION AND INSTRUMENTS

Qualitative researches often use information that comes from direct sources by data collection strategies such as observation, interview and document analysis. This view is supported by Punch (2010), who says that qualitative researches use different methods such as interviews, observations and documents to collect data. This implies that any research that contributes to knowledge should have data that is collected in a very systematic and scientific way. In this research data collection involved collecting primary and secondary data using several procedures and instruments. Data collection is a process whereby data is gathered and collected from the participants using suitable and varying tools. McMillan and Schumacher (2010) refer to this as Direct Data Collection. The information was collected directly from the “horse’s mouth”, meaning that the researcher received information directly from the participants. Both verbal and non-verbal data were collected. Verbal data were the responses from the participants and non-verbal data included all written documents found at the site, including equipment registers.

According to Marshall and Rossman (2011), qualitative researchers typically rely on four primary methods of gathering information namely: participating in the setting, observing directly, interviewing in depth and analysing documents. He seems to concur with Punch (2010), who confirms that qualitative researchers study spoken and written representation and records of human experiences using multiple data sources such as observations and interviews. In this research, data was collected directly from the participants to determine the availability and potential utilisation of educational technology in Grade 12 Geography classrooms of Mankweng Circuit in Limpopo Province.

In qualitative research, the investigator usually acts as an observer in the setting that is being studied, either as an interviewer, observer, or the person who studied artifacts and documents (MacMillan & Schurmacher, 2010). Fieldwork is discussed next as the first data collection method that was used in this research.

3.7.1 Pilot study

A pilot study was undertaken before the research could be carried out. Webster (2015) defines pilot study as a method whereby the researcher develops an understanding of the composition of a particular setting or society by taking part in the everyday routines alongside its members. A pilot study was carried out at identified secondary schools in Mankweng Circuit. In deciding for piloting consideration for convenience, access and geographic proximity were undertaken. A pilot study assists in eliminating ambiguities and clarifies issues regarding methods and procedures. Pilot testing is used to determine whether the intervention will work and is implemented in situations that are convenient for researchers (De Vos et al,2011). In this study to ensure credibility and trustworthiness the researcher piloted the provisional interview schedule with one grade 12 teacher and one principal who were not among the selected participants in order to ascertain whether the questions were clear and sequenced in a manner that would elicit the information that would help in answering the main research question and the subsidiary questions. During the pilot interviews it emerged that participants had problems with question 1 which focused on the availability and potential usage of ICT in geography classrooms. As this question was vital for obtaining the required data, the researcher then rephrased the question to make it more understandable. This gave the participants the opportunity to open up and provide their perspectives. During the pilot study the researcher discovered that the time taken was an hour and ten minutes and had to rephrase some questions and probes so that the interview will be within thirty minutes so as to retain the interest of the participants. Through this procedure, the researcher was able to identify elements of the prototype that need amendments (Mukhari, 2016).

3.7.2 Interviews

In depth interviews would be conducted with Grade 12 Geography teachers, curriculum advisors and the circuit inspector. Edmondson (2014) explains an interview as a conversation between two people in which one has the role of the researcher. He further elaborated that interviewing may pose challenges in human interaction between the interviewer and the participants. The interviewer must ensure that his/her questions are not embarrassing and that they must also be clear to avoid ambiguity. The participants must feel free and comfortable to respond to any question. In addition, Marshall and

Rossmann (2011) described qualitative interviews as “a construction site knowledge” where two or more individuals discuss a theme of mutual interest.

The interview was used in order to get more detailed information, since the interviewer could control the process. Each participant was interviewed individually to alleviate fears from other members who could be unwilling to express themselves in front of others. The teacher respondents in this research were referred to as Teacher A to G, the principals were referred to as Principal A up to Principal D and their identity is known to the researcher. In terms of gender, six of the teachers were males and one teacher was a female. All the teachers received varying degrees and diplomas from various institutions of higher learning. The principals who participated in the study consisted of two females and two male principals all heading high schools in Mankweng Circuit. The questions were organised to ensure relevance to the research problem. Since the researcher could communicate directly with the participants, certain aspects of the questions could be clarified, and participants were requested to elaborate on their answers (Mwencha, 2012). The questions were designed as simple as possible and were likewise semi-structured, with ample opportunities for further discussion (appendix A and B).

3.7.3 Observations

Participant observation is a typical qualitative approach to data collection (Macmillan & Schumacher, 2010). In this study, participant observation was also used as a data collection instrument. MacMillan and Schumacher (2010) explain observation as a way for the researcher to see and hear what is occurring naturally in the research site. The nature of the observation is comprehensive in the sense that it is prolonged, continuous and open to any relevant information (Macmillan & Schumacher, 2010). According to Dhurumraj (2013), when a researcher observes facial expressions of the interviewee, the researcher is likely to discover various unspoken emotions, fears, aspirations and hopes. Observation allows for the natural behaviour of the subjects in the study (Macmillan & Schumacher, 2006). According to Thomas (2011), observation involves the systematic viewing of people’s actions and recording, analysis and interpretation of behaviour. Participants’ actions are observed while they are aware or not aware that they are being observed. Thomas (2011) refers to such observation as overt and covert observation. In this study, participants were made aware that they were being observed.

For the purposes of this study, the researcher used the observation sheet to record the available educational technologies and the challenges encountered by teachers when using technology in Grade 12 classes. Observations were done during the educator's normal working hours, from 8h00 to 4h30 in different selected schools. The school's daily timetable was followed for conducting the observations and thus there were no class disruptions. The main focus of the observation was on the ICT availability and usage in grade 12 geography classrooms. An observation schedule was used to collect data refer to (appendix D).

Observations seek to understand the natural context of the participants, including their particular context (Macmillan & Schumacher, 2010). The participants were observed closely during the interview and notes were taken. I spent a considerable amount of time in the participants' natural context. Spending this time with them helped the researcher towards increased understanding of verbal and non-verbal communication. According to Maree (2010), there are four observer roles used in qualitative research, namely complete observer, where the researcher is a non-participant observer who looks at the situation from a distance, observer as participant whereby the researcher gets into the situation, but focuses on his role as observer in the situation, looking for patterns of behaviour, participant as observer which is typically found in action research projects where the researcher becomes part of the research process, and complete participant where the researcher gets completely immersed in the setting to such an extent that those being observed do not know that they are being observed.

The researcher was the observer as participant, focusing only on her role in the situation and trying to understand the assumptions, values and beliefs of the participants. The researcher was flexible to ensure that enough data was collected. Equipment records sheets, circulars and computer training workshop forms were consulted to ensure that enough data were collected. Document analysis is discussed in the next section.

3.8 DOCUMENT ANALYSIS

Document analysis is a systematic procedure of reviewing or evaluating documents both printed and electronic (computer based and internet-transmitted material). Document analysis requires that data be examined and interpreted in order to elicit meaning, gain understanding and develop knowledge (Corbin & Strauss, 2010).

Maree (2010) mentioned different data analyses such as content analysis, which identifies and summarises message content and focuses on things like books, brochures, written documents such as minutes, transcripts, news reports, visual media, conversation analysis which is the study of talk in interaction, discourse analysis which focuses on the meaning of the spoken and written word, and narrative analysis which refers to a variety of procedures for interpreting narratives generated in research in search of narrative strings. In the present study, the researcher used almost all the above modes. In one school permission to access the school equipment register was granted to the researcher. Documents such as the equipment registers were used to get the information that might not be accessible during interviews.

3.9 DATA ANALYSIS

Macmillan and Schumacher (2010) explain qualitative data analysis as an inductive process of organising data into categories and identifying patterns and relationships among the categories. The researcher synthesises and makes meaning from data, starting with the specific data and ending with categories and patterns. According to Maree (2010), qualitative analysis tends to be an ongoing and iterative (non-linear) process, implying that data collection, processing, analysis and reporting are intertwined, and not merely a number of successive steps.

Leedy and Ormrod (2010) comment that in most qualitative research, data analysis and interpretation are closely interwoven, and both are often enmeshed with data collection as well. According to the authors mentioned, the aim of data analysis is to look for trends and patterns that reappear within a single data sheet or among various data sheets. They further state that the sources for analysis can be transcripts, tapes, notes and memory. When analysing data, the researcher needs to be creative and explicit.

MacMillan and Schumacher (2010) highlight that there are mainly three kinds of data in qualitative studies – notes taken during observation and interviewing, audiotape-recorded interviews and visual images. These authors further describe transcription as a process of converting recordings into a format that will facilitate analysis (such as a typed text). Maree (2010), presents the model Seidel 1998 which consists of three essential elements: noticing, collecting and reflecting.

The data gathered from various people and sources was analysed using Thematic Content Analysis, which involves identifying common themes that emerged when applying interviews and observations in the qualitative approach. Creswell (2014) defines data analysis as a spiral that is equally applicable to a variety of qualitative studies. In this study, the researcher analysed data systematically by following the steps mentioned by Braun and Clarke (2013), which are 1. Becoming familiar with the data; 2. Generating initial codes; 3. searching for themes; 4. reviewing themes; 5. Defining themes; and 6. writing up. This research utilises the data analysis spiral of Braun and Clarke (2013). Data processing was done following the steps mentioned below.

- The data was organised mainly using index cards. Large bodies of text were broken down into smaller units, such as sentences or individual words.

- The researcher went through the entire data set several times to get a sense of the whole. In the process, few memos were written to indicate possible categories or interpretations.

- The researcher identified general categories or themes, and some subcategories or subthemes as well, and then classified each piece accordingly. At this stage, the researcher already had a general sense of patterns.

- The researcher summarised and integrated the data.

- The researcher made sure that the data was well organised for analysis. In analysing the data, the researcher considered the words, context, the internal consistency, frequency of comments, extensiveness of comments, specificity of comments and what was not said, as well as finding the “big idea” (Kara, 2018). The researcher should always be flexible in data analysis. Extensive editing of data was done in order to remove mistakes which would influence the final results negatively. Data analysis helped the researcher interpret data, draw conclusions and make decisions. Data editing ensured consistency across respondents and reduced errors in recording, improving legibility and classifying unclear and inappropriate responses (Mwencha, 2012).

3.10 DATA INTERPRETATION

Simons (2011) views interpretation as a highly skilled cognitive and intuitive process, often involving total immersion in the data, re-reading transcripts, field notes, observations and other forms of data in the data set. According to Leedy and Ormrod (2010), the interpretation of data is the essence of research. Without inquiring into the intrinsic meaning of the data, no resolution of the research problem or its sub-problems is possible. They further emphasise that the researcher needs to fully exploit the data by looking at the data set from different angles to make sense of it. The researcher tries to gain a holistic understanding of the data and reflects his/her thoughts about the particular data. The intent of qualitative research is not to generalise findings, but to come to a unique interpretation of events (Creswell, 2014).

According to Maree (2012), creating codes and categories while analysing data represent some level of interpretation, but is intimately related to the kinds of descriptions and interpretations that people use in the milieu, data community or setting investigated. Maree (2012) further indicates that the researcher should search for emerging patterns, associations, concepts and explanations in the data. Simons (2011) is of the opinion that data do not speak for themselves. The researcher makes sense of the gathered data, and the latter reduced accordingly. According to Simons (2011), data reduction is the process of selecting, focusing and abstracting key data from interviews, observations and fields notes. The author further reveals important aspects of interpretation as the instinctive feelings or insights of the researcher that certain issues are crucial, such as metaphors, or puzzles in the gathered data.

In this study the researcher made use of the literature review in accordance with the researcher's research questions to ensure a resolution of the research problem. New understanding and meanings were formed by what emerged from the data. Leedy and Ormrod (2010) state that it is important that the researcher conveys the truth as it is while interpreting the data, because it could happen that the results disapprove the researcher's assumptions. The researcher's ultimate aim of interpreting data was to come to meaningful findings and to draw conclusions.

In addition, Simons (2011) emphasizes that analysis and interpretation are perhaps two aspects of case study research that are written about the least because of three reasons:

firstly, the qualitative study case study depends largely on the interpretive skills of the researcher. These skills differ from one person to the other, as they are personal and intuitive. Secondly, it is difficult to set guidelines for analysis that are replicable or suitable in all situations. Thirdly, it consumes time to formulate ways of analysing case study data that are not simply an attempt to apply analytical tools more or opposite for kinds of inquiry.

3.11 MEASURES FOR TRUSTWORTHINESS

In qualitative research trustworthiness is very crucial, and refers to the way in which the inquirer is able to persuade the audience that the findings in the study are worth paying attention to and that the research is of high quality (Maree, 2012). According to Mukhari (2016), every qualitative researcher is obliged to ensure that research findings are credible and trustworthy so that they can be interpreted, applied in the field and benefit other researchers and interested parties.

Validity in a qualitative research refers to the degree of congruence between the explanation of the phenomenon and the realities of the world (MacMillan, 2010; Mukhari, 2016). Furthermore, Macmillan and Schumacher (2010) refer to validity as the degree to which scientific explanations of the phenomena match reality. The validity of a measuring instrument is the extent to which the instrument measures what it is intended to measure (Leedy & Ormrod, 2010). According to Maree (2012), assessing trustworthiness is the acid of data analysis, findings and conclusions. Rule and John (2011) mention that the concept of trustworthiness promotes values such as scholarly rigour, transparency and professional ethics in the interest of qualitative research gaining levels of trust and fidelity within research community. Maree (2012) proposes that trustworthiness can be enhanced by using the following pointers, namely, using multiple data sources, verifying data, keeping notes of research decision taken, member checking, controlling for bias, greater trustworthiness in coding data, verifying and validating findings, avoiding generalisation, choosing quotes carefully, maintaining confidentiality and anonymity and stating limitations of the study upfront.

According to Mwencha (2012), validity refers to the appropriateness, meaningfulness and usefulness of the inferences on the collected data. In this study, validity was ensured by the use of different instruments in order to record data and the quality of the instruments used. This enabled the researcher to draw correct conclusions. Assessment of the instruments that were used was done so as to provide evidence to support interpretation of the data. In this study, the researcher used the following criteria.

3.11.1 Dependability

Dependability refers to the stability or consistency of the inquiry processes over time. The more consistent the researcher has been in the research process, the more dependable the results are (Horward, 2016). The researcher is held accountable for describing the variations that occurred in the setting and how the variations will influence the manner in which the research will be approached (Mqulwana, 2010). Dependability ensures that the findings of the study are repeatable. In this study, the researcher captured the conditions that appear in the setting of every school during the separate interviews. This will help the researcher to compare data in addition to the findings. The inquiry audit was done by the researcher with relevant supporting documents such as equipment registers from different schools and circuit office, and they were all scrutinised to ensure dependability. The researcher documented all the processes to allow any future researcher to repeat the work and possibly to obtain identical results.

3.11.2 Transferability

Transferability refers to the process of applying the results of research in one situation to other similar situations. If there are enough similarities between the two situations, readers of the research may be able to infer the results of the research to their own situations. In this study, the population was Grade 12 Geography teachers and school principals. However, it was not possible for the researcher to conduct research in all schools in Mankweng Circuit, therefore a sample that was representative of the schools was purposively selected based on the fact that the ICT context of the schools is similar. Consequently, the research findings were transferable to all Grade 12 Geography classrooms in Mankweng Circuit.

3.11.3 Confirmability

Confirmability refers to the degree to which the results of the study could be confirmed or corroborated by others (FHI, 2016). Furthermore, Mukhari (2016) refers to confirmability as the extents to which the characteristics of the data can be confirmed by others who read and review the research results. To ensure confirmability, the researcher actively searched for and described negative instances that contradict prior observations. After the study, the researcher conducted a data audit that examines the data collection and analysis procedures and made judgment about the potential for bias or distortion. In addition, the researcher ensured that the findings emanate from experiences and views of the Grade 12 Geography teachers, curriculum advisors and circuit manager who participated in the study rather than preferences of the researcher.

3.11.4 Credibility

Credibility involves establishing that the results of the qualitative research are credible or believable from the perspective of the participants. The purpose is to describe or understand the phenomena of interest from the participants' point of view; the participants are the only ones who can legitimately judge the credibility of the results (FHI, 2016). According to Mukhari (2016), this criterion refers to the representation of the construction of the social world under study, and is assessed in terms of the process used in eliciting those representations in terms of the credibility of those representations for the community under scrutiny. Furthermore, Yin (2014) stated that credibility demonstrates that the subject has been accurately identified and described, and the research was conducted in a publicly accessible manner (Mukhari, 2016).

The researcher adhered to credibility through the utilisation of well-established research methods, selection of participants to provide relevant information to answer the research questions, preliminary visits, pilot testing, member checking and iterative questioning. This study included the document analysis method as an addition to the usual commonly used individual interviews. Another aspect of concern to arrive at credibility is said to be a tactic to ensure honesty in informants. It is argued by Gall and Borg (2010) that participants must not be forced to take part in the study. This implies that they must freely provide information and may withdraw as they wish if they do not have time. The researcher explained the processes to all the participants. Therefore, in this study the participants

were selected based on their willingness to participate in the research. They all contributed their ideas and experiences voluntarily without fear.

3.11.5 Preliminary visits

The researcher visited each participant twice in order to create a trustful relaxed atmosphere, developed familiarity with the participants and established a relationship of trust. The preliminary visits also served the purpose of briefly explaining to the participants the researcher's intention in regard to the significance of each participant in the study. Furthermore, the participants were also informed of the researcher's intention to record the interviews. It was clarified that the interviews will not be recorded should the participant wishes so. The researcher further emphasised anonymity and voluntary participation. The relationship that was developed made the participants to feel free to voice their experiences regarding the availability and potential use of educational technology in their schools.

3.11.6 Iterative questioning

According to Kekeya (2016), iterative questioning is a reflexive process geared to sparing insight and meaning development. Reflexive iteration enables the researcher to visit and revisit data, connecting the data with emerging insights which eventually lead to refined focus and deeper understanding. In this study, the researcher used iterative questioning to verify the responses which were provided by the participants. The researcher posed the same question several times in order to compare the responses for consistency (appendix A and B).

3.10.7 Member checking

Member checking is also referred to as participants' verification. Harpe and Cole (2012) and Mukhari (2016) refer to member checking as a quality control procedure that a researcher employs to improve accuracy, credibility and validity. In this study, the researcher went back to the teacher participants, and principals to verify the authenticity and confirm with them if the data recorded is a true reflection of the conversation that took place. Participants who were not available were conducted telephonically to confirm or reject the captured data. The participants of the study verified the information as accurate and this served as assurance of validity.

3.12 ETHICAL CONSIDERATIONS

Creswell (2014) indicates that in order to gain the right of entry in any field of research, this right of entry should be authorised by the management office. Thomas (2011) further elaborates that social research and other forms of research, which study people and their relationships to each other and to the world, need to be particularly sensitive about issues of ethics. The present researcher adhered to the University of Limpopo's policy on Ethical Code. A clearance certificate was applied for before the study was carried out and permission was sought from the Department of Education in Mankweng Circuit to conduct the research.

The participants were selected based on their willingness to participate in the study. Geography teachers who have been teaching Geography for the past ten years that is relevant enough to study (Gall & Borg, 2010). A list of schools from Mankweng Circuit was used to identify and select schools for sampling. Purposive sampling is the typical approach chosen with the aim of generating insight and obtaining an in depth understanding of the topic of interest (Braun & Clarke, 2013).

Ethics, which refers to the code of conduct or behaviour of the researcher while conducting a research, was also strictly adhered to. The researcher was conscious of the need for strict ethical guidelines for the research. She ensured that privacy and confidentiality of the information provided was safeguarded and that the ethical behaviour was adhered to each step of the research process. The researcher further upheld the principles of research of using a valid research design and competency in conducting the research as well debriefing the research participants after the research study through explanation of the real purpose and use of the research.

The following ethical factors will be considered before, during and after the study is conducted:

3.12.1 Informed consent

In order to receive informed consent, the researcher's aim of the study, processes, the duration of the participants involved and the pros and cons to which respondents may be exposed to were explained to the participants. The researcher and the participants signed a consent form to pledge confidentiality (appendix C). Arrangements were made prior to visiting the schools so as not to interrupt lessons when conducting the interviews.

3.12.2 Voluntary Participation

Social researchers also maintain that the participants must be legally and psychologically competent to be given consent and must be made aware that they are at liberty to withdraw at any time (Shahnasarian, Hagemann, Aburto & Rose,2013). The participants were informed that their participation in the study was highly valued and that they are to do so voluntarily. In other words, there were no stipends for their participation. If they decide to withdraw from the research, they could do so without any form of penalty or offence. By signing a written consent form, the participants indicated their understanding of the research project and agreed to participate voluntarily.

3.12.3 Research integrity

The researcher strove to maintain integrity when carrying out the research project. Professionalism was observed at all times while dealing with the participants. The data was captured and used raw, making sure that there is no bias or manipulation by the researcher.

3.12.4 Confidentiality and anonymity

Confidentiality (Babbie, 2010) refers to a situation in which the researcher promises to keep information about the respondents private. Any study involving the participation of human beings should respect the participants' rights and privacy. The participants were assured that their information would be treated as confidential and their identity would not be revealed. Information was given anonymously and voluntarily. However, in instances where participants were not at ease with being recorded, the researcher heeded the participant's requests and switched off the recorder. The names of the schools and participants were referred to as School 1 and Teacher 1, respectively although their identities were known to the researcher. Feedback was forwarded to the principals of the participating schools, Geography curriculum advisors and the circuit inspector in the form of a complete written document.

3.13 CONCLUSION

The focus of this chapter was on methodological considerations which consisted mainly of the research design, data collection and data analysis as the main areas. The qualitative

approach was used in this study. The study applied the case study design with methods of interviews and document analysis as key techniques of collection of data. The population of the study is 8 Grade 12 Geography teachers, 2 curriculum advisors and 1 circuit inspector. The study applied purposive sampling. Issues related to ethical considerations were duly observed. The next chapter focuses on data presentation and analysis, the data being the product of the above described procedures of this chapter.

CHAPTER 4

PRESENTATION AND INTERPRETATION OF FINDINGS

4.1 INTRODUCTION

The previous chapter focused on methodological approaches applied in the collection of data. This chapter is divided into sub sections; the first one is about profiles of Grade 12 Geography teachers, followed by profiles of school principals without whom the study would be less credible. The third subsection discusses the data from the interviews. The data from the observations ensued. This is followed by data from document analysis. The forthcoming section deals with the profiles of teachers.

4.2 PROFILES OF TEACHERS

The study targeted the Grade 12 Geography teachers and principals. The sample of this research consisted of seven Grade 12 Geography teachers and four high school principals. In terms of gender, six of the teachers were males and one teacher was a female. All the teachers received varying degrees and diplomas from various institutions of higher learning, but many of them are still uncertain about the use of computers in their teaching for the benefit of their learners. The teacher respondents in this research were referred to as Teacher A to G and their identity is known only by the researcher. The profile of every teacher respondent drawn from the interview information is illustrated in subsequent paragraphs.

4.2.1 Teacher A

Teacher A is a 38-year male who has 14 years teaching experience. He has a BA degree in Geography, BEd honours and computer literacy certificate from the university. When asked if the school is having access to ICT (computers), he responded that his school has a computer laboratory which is always locked and only the school management team has

access to the use of computers. He indicated that computers are mainly used for storage of information and supporting systems, especially for SAMS. When asked if he feels competent with regard to the use of computers, participant A responded by saying he feels partially competent as he never received any training from the Department of Education regarding the use of ICT since he started working.

When asked if he uses computers for teaching for the benefit of learners, Teacher A responded that their computer laboratory is only accessible to the school management team. Therefore, it is not functional as teachers have no access to the facility and the SMT does not understand the significance of computers in teaching and learning. When asked about challenges caused by the situation, Teacher A responded that he finds it difficult to draw diagrams and annexure which could have been easily accessed through the use of computers. The learners who learn more when they view what they are learning about are also highly affected by the situation. He also indicated that he finds it difficult to finish the syllabus unlike if he was using ICT; it could have been easy for him to finish the syllabus. According to him, computers make teaching easier.

4.2.2 Teacher B

Teacher B is a 47-year male who teaches Grade 12 Geography and has 24 years teaching experience. He has Secondary Teachers Diploma (STD) from college. When asked if the school has access to computers, Teacher B responded that his school has a few computers that are accessible only to teachers and the School Management Team (SMT). When asked if he uses computers for teaching and learning for the benefit of learners, Teacher B responded that their computers are used only for administration purposes and recording of learners' marks and the typing of question papers. When asked if he feels competent with regard to the use of computers when teaching, participant B said that he is not competent at all as he was never trained. Therefore he lacks skills regarding the use of computers. He also indicated that nothing is being done presently to ensure accessibility of computers for teaching and learning at their school.

When asked how the situation impacts on his teaching of Geography, Teacher B responded that the situation affects his teaching negatively as he believes that it could have been better if he was using computers in his teaching as learners who learn more, when they see features they would understand better. He also mentioned that computers

would help learners to access more information. He absolutely believes that his learners would understand more if they see what they are learning about and computers could help learners to research more.

4.2.3 Teacher C

Teacher C is also a 55-year male teacher who has 29 years teaching experience. He has a BA degree in Geography and a computer literacy certificate from the university. When asked if his school has access to computers, Teacher C responded that his school has a computer laboratory. When asked if he uses computers for teaching and learning for the benefit of learners, Teacher C responded that computers are used for Geography teaching and learning. When asked if he feels competent with regard to the use of computers when teaching, Participant C responded that he is partially competent as he did computer literacy while at university. When asked if he received any training from the Department of Education in the use of computers, Participant C responded that he was never trained by the Department of Education but he was trained by his colleagues through the recommendation of the circuit inspector. However, he still requires some skills regarding the use of computers.

When asked how the use of computers impacts on his teaching, Teacher C responded that computers helped to improve performance in Geography at his school as learners see most of the geographical features during the lesson. He believes that computers make learners to have interest in the subject and make them not to slumber during the lesson because of the pictures. He also realised that the use of computers in class helped to reduce absenteeism as learners enjoy their lessons and participate more than when he uses traditional teaching methods. When asked about the challenges he encounters during the use of computers in his lesson, Teacher C responded that when electricity (load shedding) goes off during the lesson presentation, the whole lesson is disturbed. When asked how he addresses the problem, Teacher C responded that nothing is being done as the matter could only be resolved by the service provider.

4.2.4 Teacher D

Teacher D is a 55-year male teacher who has 30 years teaching experience. He has a BA in Geography and BEd from the university. When asked if his school has access to

computers, Teacher D responded that his school has a computer laboratory. When asked if he uses computers for teaching and learning for the benefit of learners, Teacher D responded that computers are used for Geography teaching and learning. When asked if he received any training from the Department of Education, Participant D responded that he never received any training from the Department of Education. He only received training from the MTN group, which provided training to the school for a week in 2017.

When asked if he feels competent with regard to the use of computers when teaching, Participant D responded that he is partially feeling competent as he has made his own training. He is using knowledge that he has acquired on his own. Therefore, he is not fully competent as he does not have the required computer skills, and suggested that he still requires training with regard to the thorough use of computers.

When asked how the use of computers impact on his teaching, Teacher D responded that learners enjoy computer teaching as today's learners relate more to ICT, therefore this makes their learning easier. When asked about the challenges he encounters during the use of computers in his lesson, Teacher D responded that he does not encounter any challenge.

4.2.5 Teacher E

Teacher E is a 56-year male teacher who has 32 years teaching experience. He has obtained a BA and BEd degrees in Geography from the university. When asked if his school has access to computers, Teacher E responded that his school has a newly-built computer laboratory. When asked if he uses computers for teaching and learning for the benefit of learners, Teacher E responded that computers are not yet used for Geography teaching and learning as there are still some logistics that are being taken care of. He indicated that the school has just received the computers from the Department of Education and from the Motsepe Foundation. Teacher E further explained that the president of the country has also offered to provide learners with tablets on the ground that he adopted the school.

When asked if he received any training from the Department of Education, Participant E responded that he received training from the Department of Education. When asked if he feels competent with regard to the use of computers when teaching, Participant E

responded that he is partially feeling competent for the personal use of computers but for teaching of learners is not yet competent. Therefore, he still requires training with regard to the thorough use of computers. However, the Department of Education assured the teachers at the school that they will receive training in the use of ICT.

When asked how the use of computers will impact on his teaching, Teacher E responded that it will impact positively as GIS (geographic information technology) section on its own requires the use of computers. He also believes that learners will enjoy computer teaching as today's learners relate more to ICT. Therefore, this makes their learning easy. When asked about the challenges he encounters presently as he is not using computers in his lesson, Teacher E responded that he relies on the use of textbooks.

4.2.6 Teacher F

Teacher F is a 56-year male teacher who has 34 years teaching experience. He has Secondary Teaching Diploma in Geography and a BA degree. When asked if the school has access to computers, Teacher F responded that his school has computers, which are used for teaching and learning. When asked if he feels competent in the use of computers, Teacher F mentioned that he is not competent as he never received any training from the Department of Education but he received peer training from his colleagues at school.

When asked how the use of computers impacts on his teaching of Geography, he responded that the impact is positive as learners can even learn on their own when using computers. However, his challenge is the time allocated for the period of teaching. He believes that computer teaching requires more time for it to be effective. Teacher F also complained about load shedding which happens during school hours as it affects the use of computers in class. When asked how he is addressing the challenges, Teacher F responded that he often teaches after school using computers as this allows him more time with learners. However, with load shedding, he felt this could not be addressed at school level as it is a national crisis.

4.2.7 Teacher G

Teacher G is a 47-year female teacher who has 25 years teaching experience. She has a BA and Bed degrees in Geography from the university. When asked if the school has access to computers, Teacher G responded that her school has a computers laboratory which is accessible only for teachers and School Management Team (SMT). When asked if she uses computers for teaching and learning for the benefit of learners, Teacher G responded that their computers are not yet used for teaching learners but are used only for administration purposes such as the recording of learners' marks and the typing of question papers. When asked if she feels competent with regard to the use of computers for teaching, Participant G said that she is not competent at all as she was never trained, therefore she lacks skills regarding the use of computers. However, she believes that she will soon receive training as the school has received computers from the Department of Education and the Motsepe Foundation as a donation.

When asked how the situation impacts on her teaching of Geography, Teacher G responded that the situation affects her teaching negatively as she presently relies only on the use of textbooks which are sometimes shared between learners. However, Teacher G is confident that the situation at her school will soon be resolved as the school is about to finish the logistics regarding the use of the computers received from the department and the Motsepe Foundation.

4.3 PROFILES OF PRINCIPALS

The principals who participated in the study consisted of two females and two male principals all heading high schools in Mankweng Circuit. All the principals indicated that their schools have ICT infrastructure and internet connectivity. The principals were referred to as Principal A up to Principal D and their identity is known to the researcher. Three principals and six of the seven teachers interviewed came from the same schools, while one teacher and one principal came from different schools. The following section discusses the profiles of the principal respondents.

4.3.1 Principal A

Principal A is female and a high school principal with three years of experience. The school has few computers which are used for capturing and storing information, a projector, a screen, Wi-Fi and several laptops. Principal A indicated that she supports the

use of computers in teaching and learning. When asked if they have computers fitted in classrooms, she responded that their classrooms are not fitted with computers. However, when a teacher goes to class, she or he takes a projector and a screen to there. When asked if she would say the Grade 12 Geography teachers are ready, able and willing to utilise ICT, especially computers in their teaching, Principal A said “not exactly, however, the challenge is that they are not trained, but they ask me to download Geography videos for them to show their learners”.

When asked about the issue of security at the school for ICT materials, Principal A replied that their admin block has been fitted with an alarm system and burglar doors to prevent thieves from breaking in. Furthermore, their school is having security guards on a daily basis. Principal A recommended that all schools could be fitted with computers, and her wish is that each school could be provided with an IT specialist. Furthermore, all teachers should be trained in the use of technology.

To the researcher, Principal A is a very enthusiastic person who goes an extra mile to help Geography teachers by downloading Geography videos for them. The school does not have a computer laboratory, and Geography teachers still lack knowledge regarding the use of computers in their teaching therefore, do not use computers for the benefit of learners. The interview data indicated that lack of computers and lack of ICT skills is a major hindrance in the use ICT at the school.

4.3.2 Principal B

Principal B is a male and a high school principal with 4 years of experience. The school has two computer laboratories. When asked to what extent the SMT supports or hinders teachers’ utilisation of ICT resources in the school, Principal B responded “SGB bought 7 overhead projectors for Grade 12 learners and on top of that the school received a donation of two computer laboratories”. To add on their support to teachers to utilise ICT in their teaching, SMT outsourced a computer specialist who trained teachers in the use of computers. Furthermore, the principal also encouraged teachers to help each other during their lesson presentations using computers.

The principal was asked if he would say the Grade 12 Geography teachers in the school are ready, able and willing to utilise computers in their teaching. This is his response: “The

school has three Geography teachers, but only two teachers are using ICT in their teaching, with the third teacher I don't know if is the issue of age or attitude but I spoke to the head of department to engage him and to encourage him to start utilising ICT in his teaching”.

When asked about the impact of the use of computers in teaching, this was his response: “excellent, because computers stimulate interest of learners in the subject as they see most what they are being taught about and today s’ learners are technologically savvy, they can even learn on their own in the absent of their teacher”.

Principal B indicated that teachers who are non-compliant are struggling to utilise computers in their teaching. When asked how the school addresses the issue of security of ICT materials, this was his response: “the school has an alarm system, two security guards for day and night shift, to add on that their computer laboratories are fitted with three doors, a wooden door, a burglars door and a steel door to make it difficult for thieves to break in”. Furthermore, Principal B indicated that the SGB recommended that the use of computers should be transferred to Grade 11. They also intend to buy projectors for Grade 11 classrooms in 2020 and by 2021 their aspiration is that all the classrooms should be fitted with computers.

To the researcher, the principal’s enthusiasm regarding ICT use in his school indicated how the school use the two computer laboratories to the benefit of the learners. The principal even encourages teachers to teach each other to utilise computers so as not to marginalise themselves and their learners. Furthermore, the principal pinpointed that teachers must change their attitude from using chalkboards and dusters to the use of computers as they are convenient, interesting and make learners to participate in the lesson.

4.3.3 Principal C

Principal C is female and has two years of experience in the school. When asked if the school has access to ITC especially computers, she responded that their school has a few computers which are mainly used for recording and storing information. But in addition, the school has Wi-Fi, a few laptops and projectors. When asked to what extent the SMT supports or hinders teachers’ utilisation of ICT resources in the school, she responded

that they support the use of ICT in teaching and learning because their learners show interest in Geography when taught with computers. However, their school is still faced with a challenge as the teachers are not yet computer literate.

When asked about the security of ICT materials in their school, the principal indicated that they have installed an alarm system and burglar doors in the school's administration block where they keep their ICT equipment. They also have a security guard who works during the day. When asked about her recommendations, this was her response: "I wish the school could do away with chalks and SGB could allocate money for the purchasing of computers".

Therefore the researcher concluded that Geography teachers in the school do not use computers in their teaching for the benefit of learners. The interview data indicated that teachers have no computer skills as the principal pinpointed that teachers still lack ICT skills. The researcher recognised the principal's admission of lack of computers for teaching and a lack of skills as a major hindrance in the usage of computers in the school.

4.3.4 Principal D

Principal D is a male principal with 10 years of experience in the school. When asked if his school has access to computers, he responded that his school has a newly built computer laboratory. When asked if he uses computers for teaching and learning for the benefit of learners, Principal D responded that computers are not yet used for teaching and learning as there are still some logistics that are being taken care of. When asked to what extent the SMT supports or hinders teachers' utilisation of ICT resources in the school, she responded that the SMT supports the use of ICT in teaching and learning because they agreed to the installation of computers in the school. However, their school is still faced with a challenge as teachers are not yet computer literate and logistics are still to be completed.

When asked about the security of ICT materials in their school, the principal indicated that they have installed an alarm system and burglar doors in the school's administration block where they keep their ICT equipment. They also have security guards who work during the day and night. When asked about his recommendations, this was his response: "I wish all schools in the circuit could have computer laboratories to enable teachers and

learners to access information easily and the computers will also help learners to research on their own". The researcher recognised that Geography teachers are not using computers for teaching as there are some logistics to be followed and still need to be trained. The following section presents data from the interviews.

4.4 DATA FROM INTERVIEWS

The aim of the study was to investigate the availability and potential utilisation of ICT (computers) in teaching and learning in schools in Mankweng Circuit. This section presents data based on the utterances of teacher and principal respondents. The study revealed that teacher potential use of computers in Geography teaching is characterised by the following factors that emerged as themes during the interviews. The presentation of the research results is thus structured along the following areas:

Inadequate access of ICT (computers) in schools, Lack of computer access, Teacher's level of access to ICT facilities in schools, Utilisation capacity of computers, Lack of ICT skills, Lack of training, Lack of training by Department of Education, Teacher's ICT proficiency level and lack of management, Technologically advanced learners. Power interruptions and limited time for teaching using computers. This findings impact negatively to the teaching of geography especially on content such as Geographic Information systems.

4.4.1 Themes emerging from Teachers

The availability and utilisation of ICT in schools is not without problems. In Mankweng Circuit, challenges include both contextual and personnel-related challenges. The most striking challenge within contextual factors is inadequate classrooms suitable for the installation of ICT resources. This, as respondents have alleged, leads to a lack of ICT policy in schools. The implication here is that there is no sufficient support for ICT infrastructure in the sampled schools from the management side.

In view of the existing challenges, the respondents indicate that there is a lack of professional development. This deprives them of an opportunity to gain knowledge and skills that would enable them to be competent in computer utilisation. As Geography respondents, they have limited skills that are not adequate to service the Geography subject in their respective schools.

During the interview session with regard to challenges, the respondents had the following list of challenges that they identified:

4.4.2 Lack of computer access

The study revealed that out of the seven participant teachers interviewed, only three teachers are using ICT (computers) in their teaching. Most of them cited a lack of availability of computers in their schools as a reason why they are not using computers in their teaching for the benefit of learners. This was clearly indicated by Teacher B, who stated that “the available computers are only used by teachers and the SMT for administration purposes and setting of question papers.” Teacher D also reiterated that “the Department of Education should supply more computers and materials necessary for ICT”. This implies that teachers have the desire to have access to computers to enable them to become efficient in their teaching strategies which will benefit learners and ensure the achievement of educational objectives.

4.4.3 Teacher’s level of access to ICT facilities in schools

The interview highlighted the fact that most respondents could only access ICT in the staffrooms for typing and administration (recording of marks). In some schools, computers are said to be accessed by the SMT for administration purposes as they are not enough to cater for all learners. Therefore, they are not used for teaching and learning. This is revealed by respondent A, who says: “Computers are mainly used for storage of information and supporting systems especially for (SAMS)”. This view is supported by respondent G, who states: “Our computers are not yet used for teaching learners but are used only for administration purposes example recording of learner’s marks and typing question papers”. This unveiled the fact that in many schools computers are still used as storage and supporting systems and not as communication tools for teaching and learning.

4.4.4 Utilisation capacity of computers

To study the capacity of ICT facilities for teaching and learning, teachers were asked to state if they were using computers in their teaching for the benefit of learners. Five of the eight teachers interviewed indicated that they are not using computers in their Geography teaching. Three teachers responded that they are using computers in their teaching of Geography. These responses indicate the disparity of ICT usage in Geography

classrooms. It was the researcher's impression that few teachers integrate ICT (computers) in their teaching of Geography.

4.4.5 Lack of ICT skills

To study the level of ICT competencies and skills, participants were asked if they are competent in their use of computers. All the seven teachers responded that they are not yet competent when teaching using computers in their classroom. When asked if he feels competent with regard to the use of computers when teaching, participant B said that he is not competent at all as he was never trained therefore he lacks skills regarding the use of computers. Similar views were uttered by participant E, who responded that he is partially feeling competent for the personal use of computers, but in terms of teaching of learners, he is not yet competent. In addition, participant D responded that he is partially feeling competent regarding the use of computers in the teaching. Due to these comments, it is clear to the researcher that there is a low competency level of using computers in Geography classrooms and other schools in Mankweng Circuit.

4.4.6 Lack of training

The participants were asked if they have been trained in the use of computers in teaching. Two of the teachers indicated that they acquired training while still at university. "I got trained while still at university fourteen years ago. I studied computer literacy at first and second level as a compulsory course" (Teacher A). In addition, Teacher C said that he did computer literacy while at university. By having studied computer literacy at University level, the researcher assumes that the teachers have mastery of technological level which is one of TPACK aspects and an enabler of teachers to implement technology in teaching and learning. They therefore have an acceptable level of ICT competency, which they can integrate in their teaching methods. However, Teacher F mentioned that he received peer training from his colleagues at school. This peer training has contributed a great deal in equipping him with the necessary skills to teach using computers. To indicate his commitment to integrating ICT, Teacher F said that "computers are being used for teaching learners more in Geography." From what Teacher F said, the researcher assumes that he relied on ICT to perform his pedagogical responsibilities, and uses it frequently.

4.4.7 Lack of training by Department of Education at schools

When asked if ever the participants have received any training from the DPE, all the participants indicated that they have never received training from the Department of Education. This was emphasised by “I never received training from the Department of Education therefore I don’t have skills regarding the use of computers” (Teacher, B). In support of Teacher B, participant D responded that he never received any training from the Department of Education. In this study lack of training for teachers in the selected schools proved to be a major challenge, with seven participants indicating that they have never received any training from the Department of Education. Most of the teachers only did self or peer education when it comes to the use of computers for personal use. Only two of the respondents acquired computer literacy at university. From the above mentioned facts, the researcher is of the view that lack of appropriate training among the respondents led to insufficient use of ICT in the Grade 12 Geography classrooms. This shows that computers are rarely used in teaching for the benefit of learners.

4.4.8 Teacher’s ICT proficiency level and lack of management

The availability of ICT infrastructure together with ICT proficient teachers is a necessity in the effective use of ICT in teaching and learning. This is supported by GDE (2011), which stated that “education requires that teachers, managers and administrators in the public schools have knowledge, skills and the support necessary to integrate ICTs into teaching and learning”. Teacher A stated that at his school ICT is not functional as teachers have no access to the facility, and that computers are only used for administration and recording purposes not for teaching and learning. The researcher is of the assumption that lack of support from the management discourages teachers who are competent to use ICT in their teaching.

4.4.9 Technologically advanced learners

Many participants indicated that learners today are technologically-orientated. This compels the teacher today to use ICT integrated methods of teaching. This is emphasized by Teacher E, who said that learners will enjoy computer teaching as today’s learners relate more to ICT; therefore this makes their learning easy. The view is supported by Teacher C, who said that computers make learners to have interest in the subject and make them not to slumber during the lesson because of the pictures. He also realised that the use of computers in his class helped to reduce absenteeism as learners enjoy their

lessons and participate more than when he uses traditional teaching methods. The researcher is of the view that as we are living in the times of technology, learners can easily adapt to computer classrooms.

4.4.10 Power interruptions

Participants in the study also complained about load shedding which were experienced and affected schools by interrupting the use of computers. When asked about the challenges he encounters during the use of computers in his lesson, Teacher C responded that electricity (load shedding) goes off during lesson presentations, and the whole lesson is disturbed. When asked how he addresses the problem, Teacher C responded that nothing is being done as the matter could not be resolved by the service provider. This is also mentioned by Teacher F, who complained about load shedding which happens during school hours as it affects the use of computers in class. Due to these circumstances, it is clear to the researcher that there is a low level use of computers in selected schools and other schools in Mankweng. The researcher's view is that many enthusiastic teachers may lose interest in adopting and accepting ICT as part of their pedagogic teaching, and resort to traditional teaching methods.

4.4.11 Limited time for teaching using computers

Teacher F indicated that time devoted to the teaching of ICT is very minimal. ICT needs more time to use when teaching as he also enjoys using computers in his Geography teaching. However, his challenge is the time allocated for the period of teaching. He believes that computer teaching requires more time for it to be effective. This, to the researcher, indicates that Teacher F is a devoted teacher to ICT and is prepared to extend his teaching to afternoon to ensure achievement of his teaching objectives. The forthcoming section deals with the data from principal respondents.

4.5 THEMES EMERGING FROM THE PRINCIPALS

An analysis of the data obtained from the principals' interviews elicited categories of themes, some of which are similar to those which emerged from teacher participants. The section below discusses the themes which emerged from the principals.

4.5.1 Support of the use of (ICT) computers in teaching and learning of Geography

All the principal participants acknowledged the role played by computers in teaching and learning. They all pointed out the shortcomings of traditional teaching methods. The theme is captured in various responses from the three principals illustrated as follows:

“I wish that all the classrooms could be fitted with computers and all schools should have an ICT specialist. When you teach using computers learners understand more as what they see is not easily forgotten than when using traditional teaching methods“. (Principal A)

Principal B has this to say: “the use of computers is an excellent move, because they stimulate interest, are convenient and makes learners to participate in the lesson. Teachers must change their attitudes from using chalkboards and dusters.”

“I wish money could be allocated for purchasing of computers and the school can do away with chalks as learners need to be exposed to geographical phenomenon such as tropical cyclones and GIS” (Principal C).

4.5.2 Ineffective use of computers in teaching and learning

In their responses, all principal participants indicated the ineffective use of computers in teaching and learning due to time allocation for periods, lack of computers and lack of computer training and attitudes of teachers. The following utterances were made by the principals.

4.5.3 Time

“The school does not have classrooms fitted with computers, if I want to use ICT I have to carry the projector and screen to the classroom and take time connecting the equipment. Therefore a lot of time allocated for teaching purposes is lost during the process.” (Principal A)

4.5.4 Lack of computers

“The school does not have enough computers for teaching purposes; I wish SGB could allocate money for purchasing of computers for teaching and learning”. (Principal C)
Principal A has this to say: “I wish that the school could be provided with a computer laboratory”.

4.5.5 Lack of computer skills

When asked if Geography teachers in Grade 12 are ready, able and willing to utilise ICT in their teaching and learning, the researcher got the following responses:

Principal A: “not exactly, the teachers are not yet there, maybe is because of their lack of training and my wish is that each school could be provided with an IT specialist”.

“Teachers who are ICT non-compliant are struggling to utilise it. Their challenge is to know how to use ICT.” (Principal B)

Principal C has this to say: “Some teachers are not computer literate”. The statement was also repeated by Principal D, who said that teachers are not yet computer literate.

4.5.6 Attitude of teachers

Teachers are portrayed as partners without whom ICT cannot be effectively utilised in the classrooms. However, as uttered by Principal B, in some instances, the attitude of the teacher towards the use of ICT makes it difficult.

“Teachers must change their attitudes from using chalk and dusters to the use of computers because they are convenient and learners become interested in the lesson”.

4.5.7 Technologically advanced learners

Today’s learners are technologically savvy and teachers cannot avoid the use of ICT in their teaching anymore to make them understand what they learn. The statement below supports the digital nature of today’s learners.

“Today’s learners are very technologically advanced; even if the teacher is not there they are able to research on their own”. (Principal B)

Teacher A has this to say; “learners’ today must be hands on as they are more technologically advanced; I wish the school can have a computer laboratory where they can research on their own”.

4.5.8 Security measures

It is a fact that we are living in times in which crime in South Africa is a thorn in the flesh. When asked about measures to avoid burglary and theft of ICT (computers). These are responses from the principal participants. The administration block where ICT materials

are kept has been fitted with an alarm system and burglar doors. In addition there is also a security guard who works during the day”. (Principal A)

“The school computer laboratories have been fitted with three doors, wooden door, burglar door and steel door to prevent breaking into the computer laboratories. There is an alarm system in the school. To add on those, there are two security guards for the day shift and night shift”. (Principal B)

Principal C has this to say: “our school has an alarm system, burgled windows and doors together with a daily security guard”.

To add, Principal D has this to say: “we have installed an alarm system and burglars doors in the school and have a security guards who works during the day and night”.

To add on the interviews as a data acquiring method, the researcher also engaged an observation sheet and document analysis. Observation allows for the natural behaviour of subjects in the study (Mc Millan &Schumacher, 2006). The forthcoming section deals with data obtained through the use of the observation form.

4.6 DATA FROM OBSERVATION

The researcher used the observation form below in 4.6.1 to identify ICT resources available in the participating schools.

4.6.1 Availability of ICT in Mankweng Circuit

Data collected from sampled schools in the circuit shows an example of the availability of ICT resources in schools. This is indicated in Table 4.1.

Table 4.1: Type of ICT resources available in Mankweng Circuit

Types of ICT resources	School number 1	School number 2	School number 3	School number 4
Computers	Yes	Yes	No	Yes
Whiteboards	Yes	Yes	No	Yes
Projectors	Yes	Yes	Yes	Yes
TV set	Yes	No	No	No
Laptops	Yes	Yes	Yes	Yes

Digital Photocopier	Yes	Yes	Yes	Yes
VHS	Yes	No	No	Yes
DVDs	Yes	No	No	Yes
Wi-fi	Yes	Yes	Yes	Yes

Table 4.1 shows that all four sampled schools in Mankweng Circuit have laptops.

This indicates that the SMTs of these sampled schools are pro-technological advanced. With this level of readiness within the technological age, they can therefore embrace and lead their schools into the fourth technological revolution.

It is also evident from the table that they have digital photocopiers, projectors and have access to Wi-Fi. However, out of the four schools, only one of them has a TV set and three other schools have whiteboards and one does not. The data further shows that two out of four schools have VHS and DVDs while three schools have access to computers.

This level of preparedness augers well in the teaching and learning of Geography in the circuit. The focus now turns to the utilisation of ICT in the circuit's schools. The forthcoming section focuses on the data from document analysis from the participating schools.

4.6.2 Geography teacher potential utilisation of ICT (computers) in sampled schools

The utilisation of ICT enhances quality teaching and learning in the classroom. To ascertain this view, seven teacher respondents were invited to respond. They all confirmed that ICT is essential in the teaching and learning process not only in Geography but also in other subjects as well. However, the utilisation ICT in the circuit differs from one school to the other. It is gratifying to note that all sampled schools in Mankweng utilise computers. This level of accessibility and usage of computers in schools pave the way for technological empowerment in the circuit. In addition, according to the respondents, computer used are by the management as well as SAMS personnel.

However, three respondents out of seven utilise computers in the teaching and learning of Geography in Grade 12. It is evident from this data that a challenge does exist in schools with regard to the utilisation of computers for teaching and learning process. This could be

result of numerous factors as availability of resources differ from one school to the other, hence their differences in utilisation. It is however, hoped that the few exceptions that have contextual factor will have some opportunity to address them in due course.

During the interview, five respondents had the following to say in Table 4.2 concerning their utilisation of computers in the teaching and learning of Geography in Grade 12:

Table 4.2: Interview responses concerning ICT utilisation in teaching

Responde	Responses
A	“Our computer laboratory is only accessible for school management team and therefore is not functional as teachers have no access to the facility”
B	“Computers are used only for administration purposes and recording of learners marks and typing question papers”.
C	“Computers are used for Geography teaching and learning”.
D	“Computers are used for Geography teaching and learning”.
F	“The school has computers which are used for teaching and learning”.

Table 4.2 above emphasises the differences in the utilisation of computers as a result of their differences in resource endowment. This is not a unique situation as it does prevail in other departments due to financial constraints. However, their overall competency in the usage of computer is interpreted below based on their level of training. The next section focuses on document analysis about respondents’ competency in ICT utilisation.

4.7 DATA FROM DOCUMENT ANALYSIS

Document analysis is a systematic procedure of reviewing or evaluating documents both printed and electronic (computer based and internet-transmitted material). It requires that data be examined and interpreted in order to elicit meaning, gain understanding and develop knowledge (Corbin & Strauss, 2010). In the present study, analysis of equipment register was not accessible. Therefore, the researcher used the following analysing forms to obtain data.

4.7.1 Respondents' competency in ICT utilisation

The respondents were asked to complete the form analysing their competency in computer utilisation. The results are shown in Table 4.3.

Table 4.3: Respondents' qualifications and competency in ICT

Respondents	Qualifications	C	P/C	N/C
A	Computer literacy Certificate			
B	N/A			✓
C	Computer literacy certificate			
D	Attended MTN computer session			
E	Attended DoE computer training session			✓
F	N/A			✓
G	N/A			✓

N/A- Not Available; C- Competent; P/C- Partially Competent; N/C- Not Competent

Table 4.3 shows that the respondents' level of computer literacy and competency is not satisfactory. Although there are three respondents with a bit of exposure to computer training, the remaining four portray a dark picture in the utilisation of technological devices. Even if they could be allowed to utilise computers with or without training, their efforts are likely to be counter-productive. It is, however, surprising to note that these Geography respondents are adequately qualified for their careers from different institutions. Regrettably, they did not have any interest in computer literacy, especially for Geography related duties.

In terms of training, Table 4.3 further shows that the DoE has taken some initiatives in providing some form of training, but still self-development remains core for the betterment of oneself. It is also noted from Table 4.4 that gradually, the partnership between public and private institutions to support the advancement of ICT in schools as MTN has shown is beginning to emerge. With these interventions in place, respondents could follow suit and qualify for the betterment of their teaching and learning processes. The few respondents with certificates can therefore intensify their efforts and achieve higher heights. The forthcoming section focuses on the utilisation of schools' computers for other activities.

4.7.2 Utilisation of schools' computers for other activities

Apart from utilising computers for teaching and learning, the respondents were asked about other functions that their computers are used for. The results are indicated in Table 4.4 below.

Table 4.4: Respondents use of computer other than for teaching

Purpose	School 1	School 2	School 3	School 4	Principal
1. Remedial learning.		✓			
2. Finding /accessing information and researching through internet.	✓	✓			
3. Communicating with others.	✓	✓	✓	✓	

4. As teaching/learning tool for teaching Geography.		✓			
5. Development of ability to use basic applications.	✓	✓			
6. Using in test administration, scoring and analysis.	✓	✓	✓	✓	
7. Tracking of students' performance level.	✓	✓		✓	

It is evident from Table 4.4 that computers in those sampled schools are used for different activities. From the four sampled schools, the computer is used mainly for test administration, scoring and analysis. In addition to these, it is used largely for communication, tracking of students' performance level and research for additional teaching materials. It is rare except in some schools used as a teaching and learning tool. These different activities for which the computer is used for shows its importance and relevance in the teaching and learning of Geography. Teachers need to team up and popularise the significance of ICT in schools. The next section deals with the conclusion of the chapter.

4.8 CONCLUSION

This chapter 4 presented the finding of the results of the data gathered from four schools in Mankweng Circuit. The focus was on the sampled teachers and principals whose data were collected by using instruments such as an interviews, observation and document analysis.

A visit to the four schools was done to get an inventory of ICT resources. The captured data shows that disparities within the schools exist in terms of ICT resource provision and utilisation. The respondents' answers revealed that in some schools resources are available but not fully utilised. This has been ascribed to lack knowledge and logistical issues in some schools. The responses from teachers and principals of sampled schools correlated in some issues although there are some differences. They are, however, both confident that if existing obstacles could be overcome, teaching and learning of a qualitative nature would be pursued. As result, the aim of this chapter has been achieved through this presentation and interpretation.

CHAPTER FIVE

DISCUSSIONS OF FINDINGS

5.1 INTRODUCTION

This research focused on the availability and potential utilisation of computers in Grade 12 Geography classrooms in Mankweng Circuit, Limpopo Province. Chapter one focused on the background to the study. This was followed by the literature review in Chapter two. Chapter three dealt with the research methodology. Chapter four focused on the presentation of findings. This chapter deals with the summary of findings, implications of findings, conclusion, areas for further research and contribution to knowledge. The next section discusses the summary of findings of study.

5.2 SUMMARY OF FINDINGS

The study sought to investigate the availability and potential utilisation of technology (computers) in Grade 12 Geography classes. The study followed a qualitative research approach, and a multiple case study design was adopted. A total of 7 teachers and 4 principals were sampled through a purposive sampling strategy. Data was collected through interviews, observation and document review. The overall findings are: (a) in the six schools sampled there is inadequate supply of and access to computers and lack of

security. (b) lack of skill on the use of computers by teachers. (c) Intermittent power interruptions at the schools affected the utilisation of computers for teaching purposes. The findings are discussed in full detail in the following paragraphs.

5.2.1 Lack of computers

The study found that of the six schools sampled; only three had computers which were used for teaching and learning purposes. This revealed that computers were unavailable in these schools. This finding is stated by Participant B who said: “the few available computers are only used by teachers and SMT for administration purposes”. Similarly, Teacher D reiterated his wish that the Department of Education could supply more computers to the school. This indicates that the inadequate number of computers discouraged teachers from integrating technology in their teaching.

In addition, similar statements were uttered by Teacher A, who said that the few computers available were used for storage of information, and Principal C, when she said that the school does not have computers. This finding is in contrast with a study conducted by Knight and King (2010), who stated that the availability of computer technologies in schools ensures that access is granted to the bulk of information stored electronically, where updating, revision and correction of information can be a continuous process. This shows that teachers still use the traditional teaching method of chalk and talk, which makes them lag behind in the world of ICT. However, this agrees with a study by Clement (2012), who stated that inadequate resources are a hindrance in schools.

Furthermore, the findings showed that there are two methods of computer provision in Mankweng schools. As a result, few computers were made available to selected schools through donations by the private sector. This was revealed by Teacher E, who indicated that their school had just received computers from the Motsepe Foundation. Another method of computer provision is made by the DoE through Norms and Standards. This finding was stated by Principal B, who said that SGB bought 7 overhead projectors for Grade 12 learners. Based on these two methods, it was found that some schools had more computers than others. It was further found that these methods were not properly coordinated and monitored.

The study found that this caused an uneven distribution of computers. This finding is in line with a study by Pan African Research Agenda (2011), which revealed that the ICT policy is poorly implemented by those the government is trying to rescue from economic and social discrimination. Contrarily, the situation is in contradiction with the study by Brown (2011), who stated that technological advances and a decrease in the cost of technology have resulted in nearly 93 percent of public school classrooms in the United States having access to the internet, and a considerable increase in educational programmes that incorporate technology into the curriculum.

Literature reviewed in Chapter 2 showed that policy guidelines in some countries regulated the availability of computers and set target to ensure equity. This was revealed by large sums of money being spent on ICT to ensure support and commitment in America as mentioned in a study by Honan (2010), who said that American Congress passed the improving America School Act and pledged an amount of 49 million dollars to enhance the usage of education technology in American education. From the data, it was found that schools that took part in the study had no specific policy guidelines, and targets were not set to ensure adequate provision. Even if teachers are willing to use computers in their Geography classes, the inadequacy of facilities will be a hindrance. The finding was stated by teacher G who said that computers were used only for administration purposes, for example, the recording of learners' marks and the typing of question papers. His view was supported by Principal A when she said the school does not have computers. However, a study by Manduku et al (2011) stated that despite government policy, many schools are not implementing computer usage, thereby depriving teachers, learners and school community from accessing the potential use of ICT.

It was further found that limited funds were earmarked for making computers available in schools. This was revealed by principal B who indicated that the SGB recommended that the use of computers should be transferred to Grade 11. They also intend to buy projectors for Grade 11 classrooms in 2020, and by 2021, their aspiration is that all the classrooms should be fitted with computers. The statement is assumed to be indicating that the funds for 2019 were not sufficient to cater for all the grades. This is supported by a study conducted by Rupp (2013), who established that amongst other longer constraints that may limit availability of educational technology such as computers in schools is

education that is underfunded. This led to few computers being procured. It can be argued therefore that investment in communication and technology in the sampled schools in the circuit is not high on the department's priority list.

In addition, another finding is that there seems to be no monitoring mechanisms to ensure compliance in meeting targets for computer, internet and security alarms procurement. However, this is contrary to both studies conducted by Telkom (2015) and Clarke and Luckin (2013) when they suggested that the availability of computers and the internet in schools as supported teaching strategies plays a crucial role, as they increase active participation, creativity, improve knowledge, skills, increase motivation, increase collaboration, responsibility, self- esteem and interest. The availability and insufficient use of computers tend to affect the quality of learners produced by the sampled schools. The next section deals with the accessibility of computers.

5.2.2 Lack of computer access

The study found that computer accessibility in the six sampled schools remained a problem that constrains their utilisation for teaching. Furthermore, the findings revealed that only one of the six schools had computers that were accessible to teachers and learners. This made the school better than the counterparts. This was revealed by Teachers C and D, when they mentioned that their school has computers that were used for teaching and learning purposes. This finding agrees with a study conducted by Knight and King (2010), who stated that through the use of computer technologies, access is granted to the bulk of information stored electronically, where updating, revision and correction of information can be a continuous process. Contrary to the above statement, lack of computer accessibility was cited as the main barrier in the utilisation in other schools. This was stated by teacher E and Principal D that in their school, computers were not yet used for Geography teaching and learning as there were still some logistics that were being taken care of. This is seen as a hindrance in the accessibility of computers in the school.

Furthermore, this was also a challenge for Teacher A, who said that computers were mainly used for the storage of information and as supporting systems, especially for SAMS not for teaching and learning. However, this was in contrast with a study conducted by Keengwe and Onchuru (2011), who stated that by implementing ICT, computers in

teaching can present high quality teaching and learning in schools. The study also found from the teachers that one of the reasons for the inaccessibility is insufficient time allocated for periods when using computers in their teaching. This was revealed by teacher F, who lamented that computer teaching requires more time for it to be effective. In addition, teachers complained that the time allocated for a period in an overcrowded class was another obstacle. A 30-minute period for the number of learners in a class was considered insufficient time when teachers use computers in their teaching for the benefit of their learners. It was further found that due to lack of enough classrooms, teachers' movement from their classrooms to computer rooms takes time. This finding was also noted by Sanget et al (2010), who recommended rewards and incentives to encourage teachers to invest substantial time and effort in ICT-based teaching. Therefore, the study concluded that computers are not effectively used in the six sampled schools.

As a result, accessibility of computers in the sampled schools remain an unresolved challenge. It can therefore be concluded that computers are not accessible in schools. This is against (Mua,2010)who stated that teachers now need to have knowledge about the technology tools that are part of the discipline content area. For this to happen there must be a relationship between pedagogic knowledge, technology and pedagogic content knowledge (TCK). However, as data shown in Chapter 4, the situation differs from one school to the other. The forthcoming section deals with the use of computers for teaching purposes.

5.2.3 Lack of skills

On the question of the potential use of computers for teaching purposes, the study found that out of seven teachers, five lacked essential skills and knowledge needed for the effective use of computers for teaching purposes. It is a fact that computers require teachers that are conversant in utilising them for teaching purposes. However, only three teachers indicated that they utilise computers mainly for tests, as revealed by Teacher B, who clearly mentioned that he lacks computer skills, and Teacher E, who stated that he partially feels competent in the personal use of computers, but for teaching purposes he was not yet confident. This was, however, in contrast with a study by Bodbar (2010), who elaborated that teachers should be able to use the technology such as computers at near expect level for teaching purposes for the benefit of learners.

A major finding, however, was that the utilisation of computers was mainly limited to administrative staff. This finding agrees with a study by Ndlovu and Lawrance (2012), who stated that teachers in schools are still in the phase of using computers to merely transmit subject content rather than to enhance their teaching for the benefit of learners. This led to computer utilisation being confined mainly to office work. Consequently, their being utilisation is skewed towards management. This was reported by principal A when she said that the school has few computers which are used for capturing and storing information. This finding was in agreement with a study by Boser (2013), who revealed that far too often school leaders fail to consider how technology might dramatically improve teaching and learning; schools frequently acquire digital devices without discrete learning goals and ultimately use these devices in ways that do not adequately serve learners.

Furthermore, the view agrees with the study by FNBE (2011) when saying ICT tools such as computers were not used effectively and pedagogically as they could have been in Finnish schools due to lack of skills. However, this is contrary to a study by Graham (2011), who indicated that the DoE should consider extensive teacher training when evaluating technology costs in schools.

This lack of computer literacy by the teaching staff makes it difficult for them to utilise computers. This finding is in agreement with a study by Mwiyeria and Verma (2011) when they stated that there is still a need for professional development for teacher competency in the use of computers. This is in contradiction with Mathevula and Uwizeyimana (2014), who indicated that technology in teaching compels the emergence of a new set of skills and pedagogical approaches. In addition, Watkins, Tokareva and Turner (2011) proposed that because teachers are crucial players in the successful use of ICT in education, they should be provided with training in the following areas to make them competent, education and pedagogy. Hence lack of competency may be one of the strong barriers in the six sampled schools in Mankweng Circuit.

Brown (2011) acknowledged that one of the most telling factors of whether technology will be successful if it is incorporated in the curriculum is the knowledge and competency level of the teacher who will use it for teaching learners. However, the study further found that

teachers ascribed their incompetency in the utilisation of computers to a lack of sufficient training by the Department of Education. This finding was revealed by Teacher G, who said that she is not competent at all as she was never trained for the use of computers. In addition, Principal C indicated that the school is still faced with a challenge as teachers are not yet computer literate. This lack of teacher training in the use of computers hinders their use in teaching for the benefit of learners. However, this is contrary to a study by Graham (2011), who indicated that the DoE should consider extensive teacher training when evaluating technology costs in schools.

Furthermore, is a disadvantage to the technologically savvy learners who are able to research on their own in the absence of their teacher. The little training that was offered by DoE and the private sector did not equip them with the necessary knowledge and skills required. Findings suggested that teachers need to undergo basic courses in using computers in teaching to improve their skills. This view is supported by Boser (2013), who stated that clearly without technical assistance and proper training, discrepancies between technology access and integration in developing and developed countries will continue as will ineffective use of classroom technology worldwide.

In addition, a study by King (2017) also identified that one of the hindrances in the use of technology in schools is lack of training. To overcome this barrier, the Department of Education needs to conduct professional development of teachers. Schools need to provide training courses for teachers to gain experience in the usage of computers. From the research findings, training is needed for teachers to develop appropriate skills and knowledge regarding the effective use of computers to support their teaching. This view was reiterated by Principal A, who indicated that teachers at her school are not trained. However, this seems to be a problem in many countries as mentioned by Mwencha (2012), who stated that there were a number of secondary schools which were being marginalised due to lack of skilled human resources to facilitate effective teaching and learning. The schools may have the funds to spend on technology, but they do not always have funds to hire people to help teachers with technology integration. This is contrary to Honan (2010), who stated that the proper usage of technology is training of teachers.

Poor or lack of computer skills and lack of confidence translate into low proficiency. These two factors inhibit teachers from using computers for teaching learners who are very comfortable with technological tools. Exposing teachers to well thought-out and appropriate training is the first step that will lead all teachers to adopt and appreciate the use of computers for Geography delivery. However, the findings of this study indicate that even teachers who were using computers were not proficient. This was indicated by Teacher C, who said that he was never trained by the Department of Education but he was trained by his colleagues. This finding is in agreement with Borbar (2010), who found that instead of formal professional development, teachers often resort to practical knowledge and previous experience when incorporating technology in their classrooms. The little training that was offered by colleagues and the private sector did not equip them with the necessary knowledge and skills required.

This study further indicated that teacher training on computer application and operation can improve their use and professional effectiveness. Furthermore, the findings revealed that teachers are pointing their fingers at the DoE and school management for not conducting workshops to ensure that teachers mastered their computer skills and utilise them in their teaching. The study found that lack of ICT coordinators is an issue that must be given serious attention in the sampled schools in Mankweng Circuit. This finding is in contrast with Hattie (2013), who stated that computers are effectively used where there is pre-training in the use of computers as teaching and learning tools. The DoE should consider providing workshops for all teachers in schools. The next section focuses on power interruption.

5.2.4 Power interruption

From the data, it was found that power interruption is cited by some teachers as one of the factors that make it difficult for them to utilise computers. This finding was indicated by Teacher C, who responded that electricity (load shedding) is sometimes a hindrance as it goes off during lesson presentations, and the whole lesson is disturbed. This finding agrees with a study conducted by Sibanda, Mapendula and Ferusa (2014), who identified power supply as one of the major hindrances in the use of computers in schools. According to Laaria (2013), one of the hindrances hampering the implementation of

educational technology in Kenya is electricity. However, this is a problem experienced in different countries.

The study found that the utilisation of computers by teachers, especially Geography teachers still remain a serious concern in the sampled schools. This impacts negatively on learners and deprives them of the information that can be easily understood when using computers. According to Graham (2011), teaching is ineffective in a case where the teacher lacks knowledge related to teaching strategies which involve teaching approaches and classroom management. PCK model emphasises that when a teacher can connect the content knowledge with the pedagogic knowledge that is appropriate for teaching that content, blending them together, it results in pedagogic learning content. Real teaching will only take place when the teacher complements content knowledge with pedagogic knowledge. It is, however, important to note that these challenges are not unique to schools in Mankweng Circuit. As reviewed literature in Chapter 2 indicated, the same challenges are being experienced by other teachers elsewhere in the world. As a result, it can therefore be concluded that like computer availability, the utilisation of computers by Geography teachers varies from one school to the other. The next section focuses on the interpretation of the findings.

5.3 IMPLICATION OF THE FINDINGS

On the question of the availability of computers in Mankweng Circuit, findings revealed that inadequate computer facilities were a major problem faced by the circuit. This was attributed to limited financial support that is earmarked for computer availability in schools, which compromises the teaching process. It is also shown that specific policies for computer procurement have not been clearly articulated. This has been evident during discussion with the sampled teachers. As a result, teachers find it difficult to access computers, especially for teaching purposes. The implication of this finding is that the Department of Education should allocate more funds for the purchase of computers if teachers are to use ICT for teaching purposes.

On the question of potential utilisation of computers by teachers, the findings revealed that factors such as training and monitoring of advancement was ignored in Mankweng Circuit and therefore needs attention as well. This also implies that principals should attend training workshops to learn about their responsibility as ICT leaders at school. This is in

agreement with Mwencha (2012), who reported that a lack of skilled manpower to manage available system facilities for ICT hinders the use of ICT in schools in Nigeria. In this research, it was noted that most schools lacked computer literate teachers and ICT experts that would support and manage the application of ICT in the teaching process for the benefit of learners. It is against this background that the research becomes relevant and important. It shows gaps that exist and need to be narrowed to improve the literacy of learners in communication technology and the utilisation of computers in the classroom. Policy makers can learn good practices from other countries to improve their educational system as it is lagging behind. This is in agreement with a study conducted by Gray (2011), which stated that one of the most telling factors of whether technology will be successfully incorporated in the curriculum is the availability of computers in schools. The implication of this finding is that the Department of Education should engage in a rigorous effort or campaign to train all teachers in order to equip them for the Fourth Industrial Revolution. Without thorough training, the use of ICT for teaching purposes will remain a pipe dream. The electrical power supply at the schools is often unstable. While uninterruptible power supplies devices could mitigate the problem, schools should go a further step and find means of acquiring a constant power supply like the purchase of stand by generators and solar panels.

This would agree with (Graham,2011) when he stated that setting up the equipment correctly influences how teachers use ICT tools in teaching and learning processes. Furthermore, when the teacher is able to blend the selection of appropriate tools (TCK) with appropriate strategies and activities to teach ICT enhanced lessons (TPIC), it results into the Technology Pedagogical Content Knowledge (TPCK or TPACK). This is viewed as teacher knowledge about teaching using ICT. The next section focuses on the limitations to the study.

5.4 LIMITATIONS OF STUDY

The intention of the research was not necessarily to generalise the findings but rather to understand and make meaning of the availability and potential utilisation of educational technology by grade 12 geography teachers and principals as the managers of the process of using computers in teaching and learning in Mankweng Circuit. Being aware of this fact, the researcher attempted to provide detailed descriptions of her activities in the

research process so that the phenomenon can be fully understood. Although the study was specific to Mankweng Circuit there are a few learning points that other circuits comparable to Mankweng may draw from. The following section is about the recommendations to the study.

5.5 Recommendations

Based on the findings of the study, the following recommendations could be implemented in an attempt to increase the use of ICT in teaching and learning in the participating schools, and possibly the whole province and the whole South Africa. The national Department of Basic Education should include ICT skills in the curriculum. Access to basic ICT equipment, including computers and internet should be ensured at schools. Whenever possible it should be made compulsory for every teacher to have a laptop or computer to use in teaching. This could be coupled with a literacy programme for teachers together with provision of software required in teaching and learning. Furthermore measures to protect ICT infrastructure should be implemented. The next section deals with the conclusion.

5.6 CONCLUSION

All teachers and principal participants in the sampled schools acknowledged the importance of the use of computers in teaching and learning. It is a fact that interest by government to integrate educational technology in teaching and learning puts pressure on teachers to find valid and effective ways of using computers in the classrooms. To add, the use of ICTs in constructive teaching and learning increases motivation, confidence and captures the attention and interest of the learners. In a constructivist learning environment, computer networks or the computer mediated communication (MC) is used to facilitate interaction between spatially separated learners by means of computer conferencing and online database. Furthermore, networked technology enables teachers and students to build local and global Geography communities that connect them with interested people and expand opportunities for learning. This is a positive step in the right direction towards empowering learners within the technological environment in schools. In addition, Geography teachers and learners, like in other subjects through the use of ICT, groups can work together to solve problems, argue, negotiate meaning or engage in other pedagogical activities including coaching

Furthermore, the nature of the 21st century learners demands that teachers integrate computers into their pedagogic activities in order to prepare them for the future workforce. On this basis, the researcher investigated the availability and potential utilisation of educational technology in Grade 12 Geography classrooms of Mankweng Circuit in Limpopo Province.

The reviewed literature endorses the use of computers in education by various nations of the world to the benefit of both teachers and learners. In line with the literature, the study revealed that in spite of the positive side associated with the use of computers in teaching and learning, there are various conditions that hinder successful implementation of computers in the sampled schools in Mankweng Circuit. Amongst the mentioned factors are the unavailability of computers in schools, lack of accessibility, lack of skills and power cuts. To improve on the current situation in the sampled schools, a number of recommendations were cited based on the findings of the study directed to the DoE, school principals in their roles as ICTs leaders and teachers as pedagogical practitioners.

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APPENDIX A

Interview schedule for Semi-structured interviews with Teachers

1. Does your school have access to Information Communication Technology (computers)?
2. If yes, do you utilize ICT in your teaching for the benefit of learners?
3. If no, what measures are being taken to ensure access to ICT?
4. Have you been trained for the use of computers? If not, why?
5. If yes are you competent in the use of computers?
6. How does the use of ICT impact in the teaching of Geography?
7. Which challenges are you faced with when using or not using ICT in your Geography classroom?
8. How do you address these challenges?
9. As a geography teacher in grade 12, do you recommend the use of ICT in Geography classroom? If so why?
10. Do you have anything else to share regarding the use of ICT in Geography lessons

APPENDIX B:

Interview schedule for Semi-structured interviews with principals

1. Do your schools use ICT (computers) in teaching and learning?
2. What evidence do you have about the reliability of this information? Can I have access to that information?
3. To what extent does the School Management Team (SMT) support/hinder teachers' utilization of ICT resources in Schools? Explain.
4. Would you say Geography teachers in the school are ready, able and willing to utilise ICT in the teaching and learning situation? Explain.
5. What is the impact of the use of computers in Grade 12 Geography classrooms?
6. Comment on the challenges experienced by teachers in their utilization of ICT and possible solutions.
7. We are aware that there are a number of challenges facing security at schools especially security for ICT resources. How would you address such challenges?
8. From your experiences, what are your recommendations regarding the use of ICT in a Grade12 Geography classrooms?
9. Do you have anything else to share regarding the use of ICT in Geography classroom?

Appendix C

Consent to participate in the study (adapted from Unisa template) CONSENT TO

PARTICIPATE IN THE STUDY

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

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

I have had sufficient opportunity to ask questions and I am prepared to participate in the study.

I understand that my participation is voluntary, and I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but my participation will be kept confidential unless otherwise specified.

I agree to the recordings of in-depth interviews.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname (Please print). Participant signature.....Date.....

Researcher's Name & Surname..... (Please print) Date.....

APPENDIX D:

OBSERVATION FORM

ICT resources available in the school

Use Yes or No to answer the questions below:

Types of ICT	School number1	School number2	School number3	School number4
1.Computers	Yes	Yes	No	Yes
2.Whiteboards	Yes	Yes	No	Yes
3.Projectors	Yes	Yes	Yes	Yes
4.TVs	Yes	No	No	No
5.Laptops	Yes	Yes	Yes	Yes
6.DigitalPhotocopier	Yes	Yes	Yes	Yes
7.VHS	No	No	No	No
8.DVDs	Yes	No	No	No
9.Internet	Yes	No	No	No
10.Wi-fi	Yes	No	No	No

APPENDIX E



University of Limpopo
Department of Research Administration and Development
Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 3935, Fax: (015) 268 2306, Email: anastasia.ngobe@ul.ac.za

TURFLOOP RESEARCH ETHICS COMMITTEE
ETHICS CLEARANCE CERTIFICATE

MEETING: 06 March 2019

PROJECT NUMBER: TREC/65/2019: PG

PROJECT:

Title: Analysing the Availability and Potential Utilisation of Technology In Grade 12 Geography Classes in Mankweng, Circuit Limpopo Province.

Researcher: MN Phalane

Supervisor: Prof MJ Themane

Co-Supervisor/s: N/A

School: Education

Degree: MEd (Curriculum studies)

PROF P MASOKO
CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: REC-0310111-031

Note:

- i) This Ethics Clearance Certificate will be valid for one (1) year, as from the abovementioned date. Application for annual renewal (or annual review) need to be received by TREC one month before lapse of this period.
- ii) Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee, together with the Application for Amendment form.
- iii) PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

Finding solutions for Africa



LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA
DEPARTMENT OF
EDUCATION
CAPRICORN SOUTH DISTRICT

CONFIDENTIAL

Ref: 84/2/1 Enq: ThebeaneMM Contact: 015 633 9901 Email:thebeane.m@edu.limpopo.gov.za


To: Mrs. Phalane M.N

From: District Director
Capricorn South District

SUBJECT: APPROVAL TO CONDUCT RESEARCH-MASTER'S DEGREE

1. Your letter dated 18/10/2018 refers.
2. It is with great pleasure to inform you that approval to conduct research as per subject above is hereby granted.
3. The research must be conducted in accordance with the department's policies and conditions such as but not limit to:
 - No disruption of Learning and Teaching
 - No publishing of research outcomes with privilege information before HOD's approval
4. We wish you best of luck in your studies. We believe this will add value to the education system in our province especially in Capricorn South District.

Kind regards.


District Director

01/04/2019
Date

APPENDIX: G



LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

PRIVATE BAG X 1108
SOKKONGA
0737

TEL: 015 267 5641
FAX: 015 367 5240

**DEPARTMENT OF EDUCATION
MANKWENG CIRCUIT**

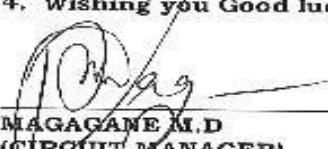
Enq: KEKANA M.J
Tel No: 015 27 5641

2019.04.08

UNIVERSITY OF LIMPOPO
PHALANE M.N
PRIVATE BAG X9489
POLOKWANE
0700

**PERMISSION TO CONDUCT A RESEARCH BASED ON THE TITLE:
"ANALYSING AVAILABILITY AND POTENTIAL UTILISATION OF
EDUCATIONAL TECHNOLOGY IN GRADE 12 GEOGRAPHY
CLASSROOMS IN MANKWENG CIRCUIT".**

1. The above matter refers.
2. We acknowledged the receipt of your letter. Requesting to conduct Research Titled: "Analysing availability and potential utilisation of educational technology in Grade 12 Geography classrooms in Mankweng Circuit" High schools.
3. Permission is hereby granted for the above mentioned request.
4. Wishing you Good luck in your studies.


MAGAGANE M.D
(CIRCUIT MANAGER)

08/04/19
(DATE)

APPENDIX: H

Appendix D: Consent to participate in the study (adapted from Unisa template)

CONSENT TO PARTICIPATE IN THE STUDY

Ramses MR......confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

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

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and /or conference proceedings, but my participation will be kept confidential unless otherwise specified.

I agree to the recordings of in-depth interviews.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname RAMESSES MR. (Please print) Participant signature [Signature] Date 7/5/19

Researcher's Name & Surname.....(Please print) Date

APPENDIX: I

PHALANE M.N

University of Limpopo

Private Bag x1106

Sovenga

0727

27 March 2019

The Principal

Makgongoana High School

Box 13

Sovenga

0727

Dear Sir/Madam

REF: REF: REQUEST TO CONDUCT RESEARCH INTERVIEWS

I am Nancy Phalane, a master student in curriculum studies at the University of Limpopo. I am kindly asking you to participate in a study that I am conducting as the respondent. The title of the study is: **ANALYSING THE AVAILABILITY AND POTENTIAL UTILISATION OF EDUCATIONAL TECHNOLOGY IN GRADE 12 GEOGRAPHY CLASSROOMS IN MANKWENG CIRCUIT.**

The purpose of the study is to explore and understand the availability and potential utilisation of educational technology in Mankweng Circuit. You will be asked questions relating to your experiences as a grade 12 geography teacher or principal of a school managing the process of using computers in teaching and learning.

One interview will be conducted which will be semi-structured and will take 30 minutes and it shall be voice recorded. Responses shall be confidential and pseudonyms will be used for both teachers, principals and their schools.

For further information concerning the study fee free to contact my supervisor or me on the following details:

Prof Themane

Tel 015 267 5641

Thank you in advance.

Yours Sincerely

Phalane M.N 0152364456

APPENDIX: J
Researcher
Phalane M.N

University of Limpopo
Private Bag x1106
Sovenga
0727

27 March 2019

Head of the Department

Department of Basic Education

Private Bag x 9489

Polokwane

0700

Dear Sir/ Madam

**REF: REQUEST TO CONDUCT RESEARCH: LEBOWAKGOMO DISTRICT,
MANKWENG CIRCUIT.**

I am hereby asking for permission to conduct a research study at four of the schools which falls under the jurisdiction of your department. I am currently registered with University of Limpopo for a master's degree in curriculum studies. My research topic is: **ANALYSING THE AVAILABILITY AND POTENTIAL UTILISATION OF EDUCATIONAL TECHNOLOGY IN GRADE 12 GEOGRAPHY CLASSROOMS IN MANKWENG CIRCUIT.** All the information gathered will be treated as confidential. The interaction with possible participants will take place after school. The research results will be made available if requested after completion of the study and its publication in the form of a thesis.

Please find the attached ethical clearance from the University of Limpopo. In the event of additional enquiry, you may contact me on 0152364456 or at the following address: Phalane @ gmail.com or my supervisor Professor Themane at Mahlapahlapana. Themane @ul.ac.za 0152675641.

Yours faithfully

Phalane M.N (Mrs)

APPENDIX: K
Phalane M.N

University of Limpopo
Private Bag x1106
Sovenga
0727

27 March 2019

The Circuit Inspector
Department of Basic Education
Private Bag x 948
Mankweng
0700

Dear Sir/ Madam

REF: REQUEST TO CONDUCT RESEARCH: LEBOWAKGOMO DISTRICT, MANKWENG CIRCUIT.

I am hereby asking for permission to conduct a research study at four schools which fall under your jurisdiction. I am currently registered with the University of Limpopo for a master's degree in Curriculum Studies. My research topic is: **ANALYSING THE AVAILABILITY AND POTENTIAL UTILISATION OF EDUCATIONAL TECHNOLOGY IN GRADE 12 GEOGRAPHY CLASSROOMS IN MANKWENG CIRCUIT.** All the information gathered will be treated as confidential. The interaction with possible participants will take place after school. The research results will be made available if requested after completion of the study and its publication in the form of a thesis.

Please find the attached ethical clearance from the University of Limpopo. In the event of additional enquiry, you may contact me on 0152364456 or at the following address: Phalane @ gmail.com or my supervisor Professor Themane at Mahlapahlapana. Themane @ul.ac.za 015 2675641.

Yours faithfully

Phalane M.N (Mrs)