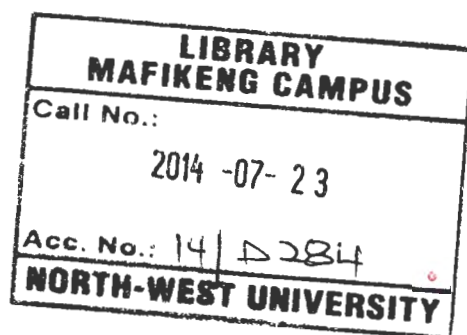


The Role of Networked Computers in The Enhancement of Teaching and Learning

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Dissertation submitted in partial fulfilment of the requirements for the degree of
Master of Business Administration (Human Resource) at the Mafikeng Campus of the
North-West University



Supervisor: Prof N. Mavetera

May 2013

North-West University
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DECLARATION

I, **Lucky Karel William Tholo**, declare that this dissertation titled, "The role of networked computers in the enhancement of teaching and learning", hereby submitted for the degree of Master of Business Administration (Human Resource), at the Mafikeng Campus of North-West University, has never been submitted at any institution for any qualification. The content is my own work in design and execution. All references have been duly acknowledged.

L.K.W Tholo

Date

ACKNOWLEDGEMENTS

- Firstly, I would like to send my special thanks to my supervisor, Professor Nehemiah Mavetera, of the North West University (Mafikeng Campus), for his untiring support and patience during the extended period of doing this mini-dissertation.
- Secondly, I would like to thank my colleagues, Mr M.C Kgadiete and Mr T.G Seleke, for lending a helping hand in collecting data for this study.
- Thirdly, I would like to thank all participants in the study, teachers from participating schools who helped in facilitating the data collection process and school principals who permitted me to use their schools for this study.
- Fourthly, I would like to thank my school manager, Mr M.B Mokone, for allowing me the time to focus on this study, for encouraging and motivating me into pursuing my studies.
- Fifthly, I would like to thank my fiancée Mmoniemang and our daughter Reitumetse for their time which I stole while conducting this study.

ABSTRACT

Computers are widely used for educational purposes with a belief that they have the ability to improve learner performance and how teachers teach. Most commonly, computers in schools that embrace such technologies are being used to develop and present neat and legible documents amongst teachers, learners and the administration staff. The professional interaction between the administration staff, teachers and learners is inevitable in a school environment. A professional interaction in this context means using these technologies for communication, information sharing, and accessing of centralised information. Since the introduction of Outcomes-Based Education, the Department of Basic Education and business entities have supplied computers to schools in an effort to improve the standard of education in the country. This paper examines the role of networked computers in the enhancement of teaching and learning in schools. The study was of a quantitative nature and used a questionnaire as a data gathering instrument. The reason behind the study was to draw a line between the benefits of networked computers and stand alone computers used in schools. The study was conducted in three schools in the Ditsobotla district in North West province, South Africa. The results gave the impression that networked computers benefited users more than stand alone computers.

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CHAPTER 1

INTRODUCTORY NOTE

It is becoming increasingly difficult to ignore the importance of networked computers in a teaching and learning environment. The changes in the curriculum, teaching methods and the processes of learning show the need of technological intervention in order to reach the set objectives of producing learners envisaged in the curriculum. On the web page Buzzle.com (Charlie, 2011), it is stated that:

Computers, over the years have changed the way the world works. They have proved to be an asset not only for the corporate sector but also in other sectors such as medicine and education.

Almost every school today has computers to be used by teachers, learners, and the administration staff. Although there is easy accessibility to these computers, there is no direct link used to send and receive information stored on other computers. The use of printers cannot be shared amongst all. Networked computers in this context refer to computers that are connected in a network to communicate to each other by means of a cable through a server, and also computers with internet access.

Rudestine (1997) and Rusten (2003) agree that the use of computers and networks for collaborative learning, research, and communication, is rapidly becoming one of the most potent means for applying computer technologies to improve education. Presented by the two authors is the ideal situation which challenges one to investigate the role networked computers are playing in the effectiveness of teaching, learning and administration in schools.

1.1 BACKGROUND AND CONTEXT

The invention of computers has provided a remarkable improvement in the spheres of work in general. One of the first generations of computers during the 1940's in USA was used to perform complicated mathematical calculations. Since then, computers have been improving at an alarming pace. It is due to these improvements that today computers can do almost everything that simplifies the life of a human being.

As one can think, the improvement of computers and technology is dependent on the economic state of the country. Developed and economically strong countries enjoy more recent inventions of technology than less developed countries. "The stronger the economy and the better the infrastructure, the greater the density of internet users" (Chivhanga, 2000). However, the importance of the services provided by these machines prompts everybody to seek their intervention in their duties regardless of whether their generation is current or not.

As in any sector, computers are being used in education. As it is the case, developed countries have pioneered in using computers in schools for instructional purposes. During 1998, K-12 schools in USA had 8.6 million instructional computers (Anderson & Ronnkvist, 1999) whereas none of the African countries makes part of the top ten countries with more computers.

The need for information sharing in a learning environment remains a crucial issue. Computers operating as silos cannot fully benefit education in today's world where there is information globalisation, cloud computing, online forums, and many others.

"By the fall of 2000, almost all public schools in the United States had access to the internet and 98 % were connected" (Cattagni & Westat, 2001).

Africa is a little behind in the advancement of technology as compared to the western countries, but is welcoming technological improvements as any country in the world. Burnheim (n.d) states that 'the number of African countries with full internet access in the capital cities has nearly tripled from 16 to 46 in 1998. Only 3 of the continent's 54 countries still have no internet connection- Eritrea, Libya and Somalia- and the first two are expected to obtain full internet access soon'.

Recent research (Anon., 2012) has shown that in South Africa, at the end of 2008, roughly 10.5% of South Africans had access to internet: a total of 4.9 million local web users in a population of 43.7 million, then. This represented a growth of 12.55% since 2001. Another study conducted by World Wide Worx (Goldstuck, 2012) revealed that there were 5 million computers in South Africa in 2006. Looking at the rate at which computers are becoming more accessible to the public, one can assume that the figures have increased since 2006 till today.

Of all these computers, a portion has been allocated to schools. Despite some extreme variations, schools in Gauteng, Northern Cape and Western Cape have, on average, a better ICT infrastructure than schools in Eastern Cape and Limpopo. Schools in Free State, KwaZulu Natal, Mpumalanga and Northwest hold a middle position (Anon., 2004).

The department of education together with business entities and the international institutions of learning have donated a number of computers to several schools in

the country. Almost every school in South Africa today has a computer. Although schools have computers and computer labs, most schools have computers effectively used only for administrative work.

The provincial department of education encourages schools to implement the use of computers as instructional tools. The question then arises, 'does the department give enough support to schools in effectively using these computers'? The answer is that the department does give support in the implementation of this, but partly. The Department has now started distributing compact discs containing policies and administrative documents to teachers at schools.

Partners in education such as SABC Education, are distributing DVD-Rom's that contain subject content useful to learners. The Shuttleworth Foundation, a non-profit organisation aimed at helping learners do well in Mathematics and Science has also uploaded videos and a lot of learning material on their web site so that learners can visit the site and learn further the two subjects.

The National Department of Education has a portal named Thutong where teachers can refer on subject content and also download assessment material, departmental policies and administrative documents.

The process of schools recapitalization is in its second phase and the last phase is expected to end in the 2013-2014 financial year (Anon., 2010). The aim of the recapitalization grant is to equip schools and address the imbalances between the historically resourced and the historically disadvantaged schools.

In this study schools are classified in two categories, Category A represents schools with more resources and Category B represents schools with limited resources.

1.2 PROBLEM STATEMENT

The Ditsobotla district has both Category A schools and Category B schools. Category A schools are located in Lichtenburg town and Category B schools are located in Itsoseng and Boikhutso townships.

The status quo in Category B schools in Itsoseng is that most schools have computers and computer labs. One out of four high schools in the area offers Computer Applications Technology as an examinable subject. Computers in other schools are only used by teachers to type their question papers, class administration documents and to play SABC Education DVD's as a means of helping learners to understand the content better.

Almost all subjects have tasks that require learners to research or do an investigation as a component of their Continuous Assessment Mark (CASS), but there is no measure on how well these learners use the provided technology to investigate and research. Engineering Graphics and Design (E.G.D) is a subject offered in Technical Schools. It is compulsory in E.G.D that learners do some drawings using the computer (Computer Aided Drawing). This forms part of their CASS. This is only compulsory for learners in grade 10 this year (2012) and will advance to grades 11 and 12 in the next two years respectively.

It remains an issue of concern how computers in schools help teachers and learners in effectively teaching and learning. Although almost every school has computers

today, it is not clear if these computers are being used to enhance communication between users. Also, it is not clear if such computers help users to easily access information and important documents from scattered workstations.

1.2.1 Learners

There is a considerable concern that the majority of adolescents do not develop the competence in writing which they need to be successful in school, the workplace, or their personal lives (Graham & Perin, 2007). Universities in recent years have reported that first year students they admit cannot read and write properly. This points out to the type of education these students have received at school level.

Recent researches related to technology and student achievement by Sivin-Kachala and Bialo (2000) reported positive and significant gains for students who were engaged in technology-rich environments (Sivin-Kachala & Bialo, 2000). Similarly, a related study by Keengwe, Onchwari and Watchire (2008), reports that students showed significant gains and achievement in all subjects, increased achievement and improved attitude toward their own learning, and increased self esteem (Keengwe, et al., 2008).

Learners at Category B schools are technologically disadvantaged. The implication is that they are not the group that Sivin-Kachala and Bialo are referring to. Without proper infrastructure such learners in Category B are facing a challenge of meeting the curriculum requirements. An example is those E.G.D learners with computers but without a data projector. Another issue of major concern is that of school and community libraries. Libraries today are not used as before. They are just buildings without material relevant to today's curriculum; some are just buildings without

books. The situation leaves learners in these environments with no place to do research and further study or information finding.

Smart phones and social networks such as Facebook have introduced most learners to communication networks and online information sharing. It is a common practice that these users search for songs, download and upload on the net. Therefore one cannot doubt if they are able to search and access learning material and also discuss and share these materials over the net. The challenge to achieving this is still the infrastructure.

There are learners who right from home are able to use a computer. These learners only need to be provided with proper computer systems at schools to improve their learning. In the same class as the computer literate learners, there are learners who have not had a chance to operate a Smart Phone and do not have a computer at home or have not had an opportunity to use a computer before. It is in fact for these learners that there should be schooling and schools should be resourced.

1.2.2 Teachers

Teachers from time to time find themselves in a situation of not feeling comfortable with their work. There have been a lot of curriculum changes since the birth of democratic South Africa. Even presently there is curriculum change taking place. Teachers are expected to honour these changes and implement them. Teachers have complained that the training they receive prior to the implementation of the new curriculum is minimal. Therefore, teachers always need support in order to follow the expected steps of the curriculum implementation.

There are subject advisors who are subject specialists hired to offer professional support and help to teachers at schools. However, one subject advisor per district results in subject advisors visiting a school twice a year on average. This means that professional help and support is not on time when teachers need it.

The technological infrastructure at schools deprives teachers of sharing information with teachers of the same subject in other schools without compromising contact time with learners. Teachers have to go from one school to another hand delivering correspondence or going to discuss either content issues or professional issues. This also applies to school-based union leaders, teacher cluster leaders, sports organizers and many others.

Schools' information systems are always at a risk of being hit by virus from the use of flash disks that users use to transfer information from one computer to the other. Schools are also bound to experience high paper usage due to unnecessary print-outs made when sharing information. Important documents cannot be retrieved once lost or shredded and thrown away by mistake. Important information cannot be archived for future reference.

1.2.3 Administration

In this context, administration refers to the principal, school clerk, School Governing Body (SGB), School Management Team (SMT) and all committees in the school such as committees for exams, sports and others.

1.2.3.1 Principal

If the school is not able to electronically receive and send correspondence to the upper offices of the department, it is then required of the principals that they should go to these offices for such correspondence. Transport claims for these trips makes a huge difference in the school's budget. Every document has to be filed as an effort to keep the office organized, but a lot of files also take-up a lot of office space. There can be no recovery of documents in case of theft or fire.

Forwarding notices, invitations to meetings and announcements require that they should be delivered to every teacher in school. This takes us back to the issue of unnecessary print-outs stated above. There is no clear record of what has been given to the staff and what has not, also what has been received and what has not.

1.2.3.2 School Clerk

The school clerk has to receive and send correspondence to the department on behalf of the principal. Also, there is continuous contact between the school clerk and the entities doing business with the school. Hand delivered invoices can also be costly to the school.

1.3 RESEARCH OBJECTIVES

The aim of this research is to determine

- The benefits of networked computers over stand alone computers
- The availability of networked computers in schools
- How computers in schools (networked and stand alone) are used for teaching and learning
- How helpful to users are computers in schools?

1.4 BRIEF LITERATURE SURVEY

Prior studies have noted the importance of computers in a teaching and learning environment. This chapter attempts to show the reasons why networked computers should be used in schools. In a study conducted on the role of computer technology in restructuring schools, Collins (n.d) argues that:

When a technological innovation - be it a book, the automobile, or television becomes widely available, its ramifications spread throughout the society, and that includes education. For example, the invention of printing press and with the advent of affordable books - had profound effects on education.

It made the ideas of universal literacy and public schooling possible and led to a de-emphasis on teaching the art of memory. The automobile and the bus led to the consolidation of rural schools, the dispersion of people to the suburbs, the split between urban and suburban education, and the practice of busing to achieve racial integration.

The impact of television and video technology on education is already evident in the decline of the print culture and a rise of a visual culture in shorter attention spans, and in a loss of innocence among children. Similarly, the computer and the electronic network are likely to have significant effects on education, and it behooves us to consider what those effects might be as we think about the issue of restructuring schools.

The government acknowledges the importance of education to its citizens, hence education is amongst the nation's top priorities in every national budget speech. Education must help to build higher-order cognitive abilities, strengthen processes of inquiry, people to compete in global markets and become productive members of democracies ...New approaches and strategies for change are needed, and computers, mediated communication, and related educational technologies are an important part of these approaches and strategies (Rusten, 2003; Rudestine, 1997).

The White Paper on e-Education (DoE, 2004) stresses the need for making every effort to ensure that all the South Africans participate in the knowledge economy to prevent social exclusion. It is hoped that all learners in this country will have access to computers by the year 2013 and will thus be equally empowered to participate effectively in this new information society.

Chapman (1998) and Prince (2007) both agree that computers are transforming communication and the economy, and every child should be exposed to this technology to understand the significance of this technology. Every high school graduate should know how to use a computer and the internet, understand how a computer works, have some grasp of how to find information on the internet, and generally know how computers are used by the business, the government, educational institutions and people in their homes. At a bare minimum, students should know how to type and how to use word processor, how to drive the operating system and how to navigate the internet.

Although extensive research has been carried out on ICTs, not enough attention has been paid to schools in the disadvantaged communities where there are no telephone lines, electricity or schools which have not received computers yet. Bytheway et al. (2010) advocate that in developing countries where repercussions of poverty, unemployment and lacking resources are widespread, the large-scale and sustainable integration of ICTs in schools is yet to be realized.

Lack of any communication's backbone is especially evident in previously disadvantaged schools which do not have the means to establish this symbiotic

communications' platform which has the potential to reduce operating costs and increase the level of education delivered (Du Preez, 2011).

The use of computers by teachers is also an area to be explored. Scrimshaw (2004), van Braak, Tondeur and Valcke (2004) and Tondeur et al. (2008) provide that even though the conditions for successful ICT integration finally appear to be in place, such as access to infrastructure, increased computer skills and sufficient computer training, the implementation of educational computer use has not yet reached a critical level. One study has shown, for example, that where ICTs are used for learning, they are chiefly used to present and disseminate information rather than change the way that children are taught (Anon., n.d.).

1.5 RESEARCH QUESTIONS

This study is driven by three questions:

- *What is the role of networked computers in the teaching and learning process?*
- *Do teachers and learners use computers to search for information?*
- *Do the school teaching staff and admin staff use computers as a central storage place for work documents?*

1.6 IMPORTANCE OF THE STUDY

This study is crucial as it contributes to the body of knowledge on the role networked computers play in schools. Another aspect of the importance of this study is that it will bring to the table the shortfalls in the successful implementation of policies in place. The insights and recommendations will hint the policy makers and

those supposed to implement remedial steps to take note of where problems are identified and also to hint on the infrastructural improvements needed if computers in schools are to be used in the enhancement of teaching and learning.

1.7 BRIEF RESEARCH DESIGN AND METHODOLOGY

Data was gathered through the use of questionnaires. Questionnaires were administered to a minimum of three schools in Ngaka Modiri Molema District, schools in both Category A and Category B. About 400 questionnaires were administered to those schools. A minimum of 113 respondents constituted the target from each school. The respondents included the principal, school clerk, teachers and a minimum of 100 learners. The questionnaire consisted of 3 sections whereby section 1 was compulsory to all respondents, section 2 was aimed at teachers and section 3 was aimed at principals and administration assistants.

1.8 ETHICAL REQUIREMENTS

An official letter (Appendix B) from the university requesting permission to distribute questionnaires and to access information which would be useful for this study was obtained and presented to departmental officials and school principals. Also, an official letter (Appendix C) granting permission to conduct the research in schools was obtained from the Regional office of Ngaka Modiri Molema and presented to school principals as proof of the granted permission by the higher office.

1.9 BRIEF LIMITATIONS TO THE STUDY

Schools are not equally resourced, therefore, the outcomes of the study might differ from school to school. To address this, schools with equal or similar resources were grouped. Secondly, access to teachers and learners who are obliged to respect the

non-negotiables as stipulated by the state president during school time was not easy because they had to be in class and lessons running uninterrupted.

1.10 CHAPTER LAYOUT

The first chapter is an introductory note to this study and a discussion of the problem leading to the need of conducting this study. Chapter two is a review of related literature provided by studies conducted before. The third chapter discusses the research methodology, how the research was conducted. In the fourth chapter data is discussed and analysed. In conclusion, the fifth chapter states experienced limitations of the study, key findings, recommendations and identifies the problem for future research.

1.11 CHAPTER SUMMARY

This chapter presented the problem highlighting the current status in schools and proceeded to giving the background with consideration of the international trends and zeroed into the district, next the problem statement, research objectives, literature review, research questions, importance of the study, research design, and methodology, ethical requirements, sampling, data analysis and, lastly, limitations of the study. This chapter also paved the way for review of literature.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Computers continue to play an important role in most, if not all, spheres of society. The use of computers is widespread among government departments, business entities and industrial environments. Computers are used to increase efficiency and minimise human error, amongst other uses. Governments and education departments around the world have also considered the integration of computers in the teaching and learning process. It is therefore important to look at the role of computers in teaching and learning.

2.1.1 Networked computers

Educationists around the world have embraced the use of different media in an effort to better impart, receive and comprehend knowledge in a classroom set-up. Media such as radio, television and video tapes have been brought into the classroom to help in the enhancement of understanding of the content taught in class. Such media has lost its popularity in use for educational purposes and is superseded by the use of computers.

Computers are embedded with programmes which can be used in educational tasks. Such programmes are word processors for developing documents, Excel for performing mathematical operations, Power Point for developing presentation slides, Paint for developing artistic images, and many more. Computers also have capabilities of accepting additional software developed for increasing the functions of

a computer to suit the needs of the user. Amongst other basic necessities of a computer, is its ability to centrally store information, also share hardware and information if connected to a network.

Spam Laws (2012) defines a computer network as a set of two or more articles that are linked so that the computers can share resources, such as printers, software, and internet connections. Networked computers can also share files without having to transfer data using a disc or a data key (Anon., 2012). Computers are usually connected through LAN (Local Area Network), MAN (Metropolitan Area Network), and WAN (Wide Area Network). Schools are better suited when connected through LAN because it is a network confined to a smaller radius of distance as compared to MAN and WAN.

The core importance of these technologies is to enable the sharing of information and hardware and also to enable communication between users. It is due to these functions that these technologies are called Information Communication Technologies (ICTs). Networked computers have an important function of communication and therefore can be considered as forming part of ICTs, and therefore, for the sake of this work networked computers are referred to as ICTs henceforth in this chapter.

According to Tinio (2003): *ICTs greatly facilitate the acquisition and absorption of knowledge, offering developing countries unprecedented opportunities to enhance educational systems, improve policy formulation and execution, and widen the range of opportunities for business and the poor. One of the greatest hardships endured by the poor, and by many other who live in the poorest countries, is their sense of*

isolation. The new technologies promise to reduce that sense of isolation and to open access to knowledge in ways unimaginable not long ago (Tino, 2003: 6).

Similarly, Barrera-Osorio and Linden (2009) believe that, *the use of Information and Communication Technologies (ICT) in education is becoming a major consideration as developing countries focus on improving quality of education. Investment in ICT use in education has grown steadily over the past decade in developing countries, even in some of the most challenging environments in some of the least-developed countries (Barrera-Osorio & Linden, 2009: 2).*

2.1.2 Stand-alone computers

Opposite to networked computers there are stand-alone computers. A stand-alone computer is defined as a "computer that is used on its own without requiring a connection to a local area network (LAN) or wide area network (WAN)" (Anon., 2012). According to PC Mag (2012), "when the computer is running local applications without internet access, the machine is technically a stand-alone PC" (Anon: 2012). Stand-alone computers are mostly found in category B schools whereas networked computers are mostly used in category A schools.

2.2 USE OF NETWORKED COMPUTERS IN TEACHING

The second research question of this study asks if teachers and learners use computers to search for information. According to Collins (n.d), Computer technology can be used in the classroom in three ways: 1) as tools such as word processors, spreadsheets, programming languages, and electronic network systems; 2) as integrated learning systems that present exercises for students to work on individually and that keep records of student progress for reporting to the teacher;

and 3) as simulations and games that engage students in computer-based activities designed to be motivating and educational(Collins, 1991).

Realities in schools are that computers are being used, if available, but not for instructional purposes in most cases. A study conducted by Bhukuvhani, Zezekwa and Sunzuma (2011) revealed that "instead of using CAI (Computer Assisted Instruction) and other educational packages, research findings show that word processing is the most used resource" (Bhukuvhani, et al., 2011: 34).

A study that has explored how the use of computers has evolved from 1995 to 2005 has revealed that by the beginning of this decade, the most important use of computers was to teach the basics and then changed to the use of application programmes such as word processors and spread sheets. However, this was for doing teachers' personal affairs and student tasks such as typing examination question papers, getting information about their salary and job related information. By the end of this decade, very low percentages of teachers had started using email to communicate with students' parents and internet to search academic papers (Zamani, 2010).

Gulbahar and Guven (2008) in a study on ICT usage have found that 98.2% of teachers in participating schools in Turkey had computers at work and 88.7% of these computers were connected to the internet. However, a greater number of these teachers spent less than one hour using those computers. Also, a greater number of teachers were confident with their skills of using word processors, spreadsheets, presentation software, computer aided instructional software, web browsers, search engines, electronic mail, chat / forum, electronic encyclopaedias

and instructional films. It has also been found in this study that the teachers' preferred instructional tools were board, printed materials, overhead projectors, television / video, radio cassette recorder, multimedia computer and slide projector. This is according to the usage rate (Gulbahar & Guven, 2008).

According to a study conducted by O'Dwyer, Russell and Bebell (2004), although a small positive effect, teachers use ICTs for preparing for lessons, and delivering instruction. However, this is limited to teachers with positive beliefs about technology. There was also a positive effect on teacher-directed student use of ICT during class time, teachers also directed students on creating products using ICTs (O'Dwyer et al., 2004: 2-4).

Penuel (2006) in a study that examined how One-to-One laptops are used in classrooms cites many researchers that have found that students primarily use these laptops for writing, taking notes, doing homework, keeping organised, communicating with fellow students and teachers, and for researching on the internet. It was also found that students mostly use word processing software, email clients, chat programmes and web browsers (Penuel, 2006).

2.2.1 Global trends

According to Beebe (2004), the global trends of the use of ICT for education are:

- 1). ICTs are becoming an integrative part of national education policies and plans.
- 2). The convergence of technologies has become a driving force for educational reform, enabling teachers, learners and related professionals to connect better to information, ideas and each other via effective combinations of pedagogy and new technologies.

3). ICTs for teaching and learning undergo at least three phases which are: *a substitution phase* in which traditional teaching occurs with the use of new technologies, *a transition phase* in which new teaching and learning practices begin to appear as established practices and start to be questioned, and *a transformation phase* in which the new technologies enable new practices.

4). With ICTs, teachers can easily connect with teachers and learners from other countries and help each other with sources of teaching material.

5). Learners' critical thinking skills are sharpened due to focusing on analysing information which is readily available and learners are no longer depending on teachers and librarians for information.

6). ICTs enable cross border education and trade in education (Beebe, 2004).

2.2.2 Local trends: Africa

Beebe (2004) lists the trends of ICT use in Africa as:

1). ICTs are being reflected on strategic planning for educational institutions,

2). such institutions are using ICTs for managing financial, personnel and educational resources,

3). both traditional distance learning and campus-based institutions are embracing the use of ICTs for teaching and learning (Beebe, 2004).

2.3 CHALLENGES TO ICT IMPLEMENTATION

2.3.1 Infrastructure

Dzidonu (2010) argues that a key challenge to the implementation of ICTs in education is the 'rural versus urban disparities in infrastructure'. The author states that "although a number of the major African cities have made some advances in expanding and modernizing their telecommunication infrastructure and internet connectivity in the last decade, the continent's rural areas where over 70% of the population live continue to be isolated under-served in terms of ICT infrastructure. The largest cities and towns which account for about 12% - 22% of the total population have access to more than 75% of the total main telephone lines in most of the regions of the continent" (Dzidonu, 2010).

2.3.2 Time delays

The South African Department of Education has developed a strategy which will guide in the integrating of ICTs in the curriculum. The first phase of the strategy by the Department of Education on ICT's advocated that institutions are connected, have access to internet, and communicate electronically. The DoE also identifies the following learning outcomes in its National Curriculum Statements Grade 10-12:

1. Hardware and System Software: The learner is able to demonstrate an understanding of and competently operate computer-based technologies.
2. e-Communication: The learner is able to apply creative uses of different computer technologies to facilitate electronic communication.

3. Social and Ethical Issues: The learner is able to critically analyse the impact of computer technologies on socio-economic, environmental, political and ethical issues.

4. Programming and Software Development: The learner is able to design, implement, test and deliver efficient and effective solutions to problem situations (Anon., n.d.).

These are the learning outcomes which the Department of Education has set to be achieved in 2013. From what has been said by Bovée, Voogt and Mellissen (2007), if schools in poor communities are still not fully resourced, it is evident that these outcomes will not be achieved in the anticipated time (Bovée et al., 2007). This suggests that there has been a delay in the implementation of the process of equipping schools with the necessary ICT resources by the department and that time poses another challenge to the successful implementation of ICTs in all South African schools by the year 2013 hence the current imbalances.

The learning outcomes provided by the National Curriculum Statement show that the department envisages the use of networked computers by teachers and learners in order to facilitate electronic communication. The imbalances referred to in the previous paragraph are the situations in category B schools where there are only stand-alone computers to be used by both teachers and learners for teaching and learning.

Another perspective to time as a challenge as provided by Bingimlas (2009) is that, teachers are competent and confident in using computers in classrooms but they do

not have enough time to do it. The reasons attributed to this are lack of time to plan for lessons, locate internet advice, practice using ICTs before lessons, address technical problems and busy teacher schedules (Bingimlas, 2009).

2.4 ADVANTAGES OF NETWORKED COMPUTERS

2.4.1 Advantages of networked computers to learners

In line with the first research question of this study (*What is the role of networked computers in the teaching and learning process?*), many researchers around the world have studied extensively the effects of ICT's in education and most studies have shown similar benefits of using these technologies in schools. A corporate writer for "About.com website" perceives the benefits of using ICT's in schools as follows: Students can share files faster and more reliably than they can when using floppy disks (Compact Discs and Flash Drives in today's technology). Central printers can be made accessible to students more conveniently. Students can more easily collaborate on group project using network software applications (Mitchelle, 2012). The author however does not focus on the cognitive skills that can or cannot be developed from using these technologies.

In terms of stand-alone computers, in order to share files, users have to use discs which are a malware risk to computers. Also, every computer should have its own printer connected to it. This can be a very costly situation if a class has about 40 computers, therefore printers should also be 40 so that learners can perform their duties at the same time.

In a study conducted in Vadodara, India, Wagner, James, Kozma and co-writers (2005) examined the impact of computers on learning of school subjects. Their

findings were that the potential impacts that ICT can have when applied to education are:

(a) Student outcomes such as increased knowledge of school subjects, improved attitudes about learning, and the acquisition of new skills needed for a developing economy. Beyond learning outcomes, ICT may help close the gender gap, and help students with special needs.

(b) Teacher and classroom outcomes such as development of teachers' technology skills and knowledge of new pedagogical approaches, as well as improved mastery of content and attitudes towards teaching.

(c) Other outcomes such as increased innovativeness in schools and increased access in schools and increased access of community members to adult education and literacy (Wagner et al., 2005).

These researchers further provide that the above outcomes imply that governments and N.G.Os have provided computers and internet connection to schools, simulations and multimedia tutorials to students, training to teachers, and management and productivity tool to schools (Wagner et al., 2005). The findings of the study conducted by these researchers have shown that firstly, students who used computer tutorials in mathematics, natural science, and social sciences scored significantly higher on tests in these subjects. Students who used simulation software in science also scored higher. Secondly, primary school students who used tutorial software in reading scored significantly higher on reading scores. Very young students who used computers to write their own stories scored significantly higher

on measures of reading skills. Lastly, students who used word processors or otherwise used the computer for writing scored higher on measures of writing skills (Wagner et al., 2005).

A study by Osin (1998) examined the benefits of computers in education and found that for Computer-Assisted Learning (CAL), the benefit is that each student may learn according to his or her own cognitive level and learning speed, independently of his or her classmates. Each student receives individual guidance, with explanations tailored to perceiving problems, and opportunities for in-depth learning according to individual interests (Osin, 1998). In addition, another benefit of CAL is that learners are able to learn independently with minimised assistance by the teacher. Also, learners need not be only in a classroom set-up to learn, they can still learn at their convenient time on their own. This cannot be effectively achieved when learners are using stand-alone computers.

For the aspect of communication networks, the benefit, as compared to stand-alone computers, is that instead of isolated classes, students can communicate with people and gather information from around the world, thereby increasing their motivation to use higher-level analytical skills in their school work. In addition, communication among people from different countries helps to break down stereotypes and expand intellectual horizons (Osin, 1998). Stand alone computers in schools on the other hand deprive learners of such benefits of communicating with others to seek help or to search for information on content matter that they find challenging.

The use of computers in education is inevitable in today's schooling era. Al Sharaideh (2011) investigated the effect of using computer assisted programmes on

tenth grade students' achievement in National Education in Jordanian schools and the results yielded that "students' participation in computer-based instruction helped them to acquire meaningful learning in National Education. They utilised different representations that they found in the interactive computer-assisted programmes. This helped them in facilitating their understanding and also encouraged students to use interactive and virtual representations. This helped them not only to strengthen their academic knowledge of Phonetics, but also to practice using the phonological rules accurately" (Al Sharaideh, 2011: 872).

Protheroe cites Stratham and Torell (1996) where 10 meta-analyses on the effectiveness of technology were reviewed and their findings indicated that: When properly implemented, computer technology had a significant effect on student achievement, as measured by test scores across subject areas and with students at all levels. When used appropriately, computer technology stimulated teacher-student interaction and encouraged cooperative learning, collaboration, problem-solving, and student inquiry skills. Students from computer-rich classrooms demonstrated better behaviour and had absentee and drop-out rates lower than students from classrooms lacking computers. Computer based teaching was especially effective among populations of at-risk students (Protheroe, 2005).

In contrast, stand alone computers are less entertaining and not able to draw user interest, instead they increase the fear of using computers because they might not be user friendly to a lesser skilled user. Also, a stand-alone computer requires that the user should be well conversant with programmes installed in order to be able to have a reason of spending time on them, working.

In the quest for successfully implementing ICT's in schools, governments, educational institutions and business entities have collaborated in equipping schools with the necessary infrastructure and ICT resources and also trained teachers in different ICT programmes. These programmes in the end also served as tools for examining the effects of ICT's in education.

When evaluating the Maine Learning Technology Initiative in which grade 7 and 8 students and their teachers were provided with laptop computers, technical assistance and professional development for integrating laptop technology into their curriculum and instruction, the evidence collected and analysed indicated that, for students: Students use laptops for finding information, organising information, and taking class notes. Students' usage of the laptops for completing class work is higher for students who may take the laptop home. Students are more engaged in their learning, more actively involved in their own learning, and produce better quality work. Students are better organised. Students' attendance, behaviour, and achievement have improved (Silvernail & Lane, 2004). These outcomes could not have not being met in a situation where stand-alone computers are used because these learners would have not been able to find information which they used for doing their tasks and also, they could not have not had the interest of doing their school work. Interest in this regard is attributable to the confidence they gain through being able to access information which assists them in providing solutions to their tasks at hand.

The ACOT research programme has been referred to by many researchers interested in studying the effects of computers in education. This ten year-long Apple

Classrooms of Tomorrow programme demonstrated that, in addition to performing well on standardised tests, ACOT students developed a variety of competencies such as: Students learned to explore and represent information dynamically and in different forms. Students become more socially aware and confident. Students were able to communicate effectively about complex processes. Students used computers routinely and appropriately. Students became self-motivated and independent learners and mastered content quickly and shared their understanding spontaneously as well as gained the ability to work collaboratively, and developed a positive orientation toward the future (Rusten, 2003).

Through the acknowledgement of the fact that problem-solving abilities are an important aspect in education, Kuo, Hwang and Lee (2011) have conducted a study in which a hybrid approach that integrates the cognitive apprenticeship model with the collaborative learning strategy has been implemented to examine how web-based problem-solving can improve the students' problem solving abilities. The findings of this study have shown that web-based searching and analyzing systems have a positive impact on students' problem-solving abilities (Kuo et al., 2011). This can only be attributable to a networked computer environment. On the other hand, the implication of this is that learners confined to stand-alone computer environment are disadvantaged in terms of this benefit of the development of problem-solving abilities gained through networked computers.

In a research which investigated the creative impact of ICT in rural primary school in South-west England, a model developed by Wheeler, Waite and Bramfield (2002) was used and it demonstrated that social interaction, problem solving, and creative

cognition are the modes that meet at the nexus (transformation) and produce creative action as a result. The authors provide examples of creativity in problem solving as those that may be observed in a variety of online activities including expert manipulation of text and graphics, creative use of colour, animation and effects to convey particular messages, and economic navigation through complex web-based resources. The authors provide an example of creativity in online social interaction as creation and use of alternative personae (avatars) in chat rooms and the examples of creativity in creative cognition include the creation and management of a personal website, creative writing using word processor, and discovering and adapting to new ways of working and studying using electronic environments (Wheeler et al., 2002).

A study commissioned by the Department for Education and Skills in England to examine the impact of ICT on learner motivation, learning outcomes, behaviour, and school attendance has yielded the findings that: Overall the motivational impact was positive. The forms of motivation which arose as a result of ICT use were concerned with a commitment to learn, more than a mere completion of tasks or to gain a competitive edge. ICT enhanced learning processes such as: *engagement* (through visual, kinaesthetic and auditory means), *research* (access to a wide range of resources from which to search and select), *writing and editing* (through offering pupils ways to commit ideas more readily and edit to far greater extents than before), *presentation* (through enabling them to present work neatly and professionally). The types of ICT that pupils found particularly useful were the internet, interactive white boards, writing and publishing software, and presentational software. ICT impacted positively on pupils' attitudes towards and

engagement with their school work and also on their behaviour. Through improving motivation, ICT impacted on the quality of pupils' work (Passey et al., 2004).

2.4.2 Advantages of networked computers to teachers

Teachers can carry out their day-to-day communications with each other more efficiently through email and messaging. News and class project information can be easily disseminated to students (Mitchelle, 2012).

Teachers who work in relatively isolated environments are able to exchange information with their peers, receive advice from experts around the world, and download an increasingly broad array of teaching and learning materials available on the internet (Osin, 1998).

A quasi-experimental research conducted by Shieh (2012) to examine the impact of Technology-Enabled Active Learning (TEAL) has revealed that in addition to the students' test results, there are non-test score gains such as increased interest in class attendance, participation in extracurricular subject activities. Teachers gained more confidence in helping learners on subject concepts (Shieh, 2012).

Protheroe (2005) is of the view that teachers use laptops for developing instructional materials, to conduct instruction related research and to communicate with colleagues. He further states that teachers who participated in the study have reported that laptops helped them to meet their curriculum goals more efficiently and they were also able to meet individual learner needs by individualizing their curriculum (Protheroe, 2005).

A meta-analysis of 174 studies conducted to investigate how world-wide classrooms are using technology to change the practices of teachers and students has also

revealed for *student collaborative research*: students were most likely to acquire new ICT, problem-solving, and collaborative skills. Teachers acquired new pedagogical skills. The curriculum and class day was more likely to be reorganised. *Information management*: communication skills, and information handling skills. *Teacher collaboration*: teachers acquired new collaborative skills (Kozma, 2003).

2.4.3 Disadvantages of networked computers

While looking also at the draw backs of using ICTs in classrooms, Rubio and Conesa (2011) discover that in order for ICT to be integrated in classrooms, IT skills are a prerequisite; familiarity to software; ability to solve technical problems; proficiency of language. In terms of content, the content might not be appropriate for the level of students or will not apply to the contents to be covered in the study unit (Rubio & Conesa, 2011).

Based on the findings of a study conducted, Ward (2003) states that the main disadvantage of ICT is the unpredictability of computers. This is because of low teachers' self efficacy to deal with operational problems that might arise while conducting a class. Other potential disadvantages were that computers are hard to use, the teacher might tend to give up to much instructional responsibility and also that students get too wound up (Ward, 2003).

A study conducted to examine the integration of ICT into computer based classroom learning environments in Thailand has shown that the disadvantages of the use of ICT are:

Anxiety about using computers: The respondents lamented about the complexity of the programme they used, they could not finish their assignments in class, it was

difficult to follow content on PowerPoint slides prepared by the teacher, they were not confident about their skills of using computers, and teachers also have the desire to use computers in teaching but are not sure on how to go about doing it.

Time consumption: Teachers asserted that lesson planning required more time as specificity is necessary, it takes time to set up equipment and organise the classroom, there's a constraint of time when there should be experimentation with ICTs during curriculum time and at the same time coverage of subject content should be completed.

Lack of class attention during studying time: "Most students do not follow the teacher's assignment because they are playing games and surfing the internet, not attending to teachers' instructions", and lastly, there's lack of student-teacher interaction (Rumpagaporn, 2007).

The aspect, 'lack of class attention during study time' shows the need for networked computers since they provide the teacher with the ability to check what learners are doing on their computers from his/her computer which can be used as the administrator computer.

Collins and Halverson (2009) report that there is a commercial push to sell educational products such as educational programmes in America. According to these authors, education was once viewed as a public good with equal access for all, but it is now up for sale to those who can afford specialised service and computer programmes (Collins & Halverson, 2009).

Lovell and Phillips (2009) have evaluated the suitability of commercially available authorised software programmes against the claims made by the manufacturers. These software are intended to help in teaching reading and writing in the primary grades in Canada. The authors argue that "some of the evaluated programs do not support skill development in a natural context. Desktop publishing software claimed to support the writing process, yet if teachers do not use computers for all aspects of writing process, such as researching and organising ideas, preparing first drafts, or editing and revising multiple drafts, it follows that the software is not being used to support all aspects of the writing process". Furthermore, the authors state that the programmes are not recent and therefore not able to perform at a level consistent with modern programmes. In addition, "the majority of the programs are non-instructional, they do not track student progress, provide feedback, or adapt to suit student needs, thereby limiting their usefulness as educational tools" (Lovell & Phillips, 2009).

Charlie (2011) alludes to the fact that computers have the potential of making learners lazy and reliance on them renders a learner to be poorly prepared for examination. The author provides an example of learners doing all calculations with the help of a computer, such learners' mathematical ability can be affected and such learners have problems performing those calculations by themselves in an examination which is not computer based (Charlie, 2011).

2.5 AVAILABILITY OF ICTs FOR EDUCATION

Ajayi and Ekunayo (2009) have investigated the level of the availability of ICT facilities in Nigerian secondary schools and the findings were that there is a high

level of unavailability of ICT resources such as computers, data projectors, electronic notice boards and internet filmstrips (Ajayi & Ekundayo, 2009). Bhukuvhani *et al.* (2011) also state that computer use in Zimbabwe is only 20-30% which is a fraction of what it should be. Similarly, the Harvard University Guide study has revealed that the level of e-readiness in Zimbabwe is still low (Bhukuvhani *et al.*, 2011). Muchena is cited as saying that the situation in Zimbabwe "was attributed to lack of availability, cost and quality of ICT services and equipment and lack of networked learning which addresses how well the education system integrates ICTs into its process to improve learning among other reasons for low rating (Bhukuvhani, *et al.*, 2011).

In a study conducted in Turkey, Gulbahar and Guven (2008) identified accessibility as one of the variables which affect the successful implementation of ICT. The results have shown that teachers are willing to use ICT but face a challenge of non-accessibility of such resources. Teachers who participated in this study pointed out "problems about accessibility to existing hardware (computer, overhead projector, etc.), inefficiency of institutions' computer laboratory, inefficiency of institutions' technical infrastructure about instructional technology, inefficient number of media (printer, scanner, etc.) for effective use of computers, shortage of computers used by teachers, absence of reward systems for encouraging technology use and poor technical and physical infrastructure of learning environments" amongst others (Gulbahar & Guven, 2008).

Of all the countries that participated in the Second International Technology in Education Study (SITES 2006), South African schools are listed the lowest as

compared to other developing countries. Also, South Africa has a student-computer ratio of more than 40 while other developing countries have a ratio of more than 10. Blignaut, Els and Howie (2010) provide that for internet access, South Africa is listed second to the last. (Blignaut et al., 2010) further state that "South Africa trails in terms of ICT equipment, tutorial software, general software, multimedia production tools, simulations, communication software, digital resources and e-mail accounts" (Blignaut et al., 2010).

UNESCO 2002 report uses a four stage continuum to measure ICT integration in schools: *The emerging stage*: where schools are still at a stage of purchasing, or receiving donations of computer hardware and software. This is an initial phase in which teachers and school administrators are starting to explore the use of ICTs for managing the school and also for adding ICTs to the curriculum.

The applying stage: The contribution of ICTs to learning is starting to be better understood in the school, teachers and administrators use ICT for curriculum and management tasks.

Infusion stage: ICT is well integrated in the curriculum and employed in laboratories, classrooms and administrative offices.

Transforming stage: "Schools that use ICT to rethink and renew school organisation in creative ways are at transforming approach. ICT becomes an integral though invisible part of daily personal productivity and professional practice. ICT is taught as a separate subject at a professional level and is incorporated in all vocational areas" (UNESCO, 2002).

According to Wilson-Strydom and Thomson (2005) the majority of schools in South Africa are in the 'Applying stage' or the 'Infusion stage' and in terms of learner access, schools are moving beyond the 'Emerging stage'. For internet access, 63% of schools that participated in the study had internet access while 37 % did not. Although many South African schools have been provided with computers lately, the study by Wilson-Strydom and Thomson (2005) can be argued against by considering the fact that there is evidence of the imbalances and uneven distribution of resources in South African schools. Most schools that might be referred to in this study are those historically advantaged schools in the economically stable communities such as schools in towns and the former Model C schools (category A schools), therefore, it should not be considered to be a general state around the country.

According to Bovée, Voogt and Mellissen (2007), the availability of computers for teaching and learning has increased by 3.6% between 1996 and 2000 (Bovée, et al., 2007). By 2002, the White Paper on e-Education reported that the total number of computers in schools have increased to 26.5%. However, the White Paper on e-Education also provides that a large number of schools are still without computers, especially in the poor provinces (Prince, 2007).

2.6 TEACHERS' SKILLS OF USING NETWORKED COMPUTERS

From the studies referred to above, it can be confidently said that there is evidence that Information Communication Technologies do have a positive impact in education. However, most researchers attribute teacher training as being the root of ICT's successful implementation.

Ward (2003) argues that providing infrastructure and professional development is not enough to ensure ICT integration in classrooms. The professional development that the author discourages is that of teacher training limited only to the operations of ICTs. The author claims that a teacher can be an expert in operating the computer but not being able to use the computer in conducting a lesson. The author makes a recommendation that teachers should be trained on how to use ICTs for conducting their lessons (Ward, 2003). Similarly, Chigona, Bladergroen, Bytheway and co-writers (2011) state that "one of the barriers to the meaningful integration of ICTs in education in developing countries is the lack of alignment between what funders and project implementers intend (on the one hand) and social meanings educators assign to the technology (on the other)" (Chigona et al., 2011). The authors further provide that among other teacher discourses, teachers lamented that they needed to be trained on integrating ICTs, they also stated that they were not receiving necessary support and had to learn through their own discovery (Chigona et al., 2011).

Networked computers are able to address these discourses by teachers. Teachers using networked computers are able to search for information on how to use these technologies and receive solutions which they can try immediately. With a plethora of information on the net, and through communicating with peers and experts, teachers are assured of improvement in their computer skills.

The latter makes sense if one has to consider the fact that internet is a new aspect in most parts of the world which was not easily accessible to many in the recent past. This suggests that teachers who were trained on using computers were only

trained on using stand alone computers without internet access. This is the basis of teachers' limited knowledge of using computers for communicating and information searching. Wang (2006) states that the IT training model in teacher training which was designed in the early 1980s was primarily aimed at improving technology proficiency among pre-service teachers (Wang, 2006). "Research later determined that student teachers and recent graduates continued to have difficulty relating technology to instructional activities and lacked strategies to integrate computers in the curriculum. The results prompted severe criticism of the stand-alone computer course" (Wang, 2006: 8).

According to the International Society for Technology in Education, "Teachers must be comfortable with technology, able to apply it appropriately, and conversant with new technological tools, resources, and approaches." "If all the pieces are put into place, teachers should find that they are empowered to advance their own professional skills" (Keengwe et al., 2008: 79). In a study that summarises the extant research on training administrators to use information systems, Fulmer advocates for training administrators in the use of information technology. In her study, Fulmer categorises the rationale for administrator training into three themes. The first theme is that administrators as leaders of schools were in position to be change agents in the transformation of their roles and work environments in those schools. Fulmer further states that it has become imperative for administrators to ensure that opportunities to acquire these technological skills are provided not only for students but also for teachers (Fulmer, 1996). Bosh (in Fulmer, 1996) states the three reasons why technology is important as (a) administrators are leaders in the

school, (b) improvements begin with principals, and (c) with the appropriate training and support for change, administrators can be analysts for technological innovation.

The second theme is that technology has the potential to transform the work and operations of schools, and the third theme is that, as information systems were developed the issue of administrator training became more crucial (Fulmer, 1996).

Fulmer also provides models of teacher training in her research. According to Fulmer (1996), the first typical way of handling administrator training is to have students acquire computer skills before admitting them to programmes of study. The second required students to take a programme related to computer competency course either before taking regular course work or during their formal professional preparation. The third was for the professors to infuse technology and computer applications into the course work of existing programmes (Fulmer, 1996).

It should be noted that in the three models referred to above students who are still training to become teachers and school principals in future. Although these models provide an excellent solution to ensure computer literacy among school administrators, there is a grey area which has been overlooked by the researcher. The grey area is that the expectation of the use of ICT's is current and points to principals and teachers who are working at schools currently. These are the people faced with the challenges of implementation.

Similarly, Russell, Bebell, O'Dwyer and O'Connor (2003) also advocate for the idea of preparing tomorrow's teachers to use technology. Although these authors consider the in-service teachers, not much attention is paid on the long-serving teachers who

have always taught the traditional way. The in-service teachers that these authors are focussing on are only the new teachers in the system.

According to Farrell and Isaacs (2007), factors constraining the implementation of ICT in Africa are:

Policy framework and implementation plans: "the predominant focus is more on development of ICT operational skills than on the integration of ICT in pedagogical practice".

Advocacy leadership: should not raise expectations beyond what is possible in the near term".

Infrastructure and access: "inconsistent or unavailable supply of electricity, lack of ICT equipment, overcrowding of computer labs, and lack of affordable access to connectivity with acceptable bandwidth".

Collaborating mechanisms: "the notion of international collaboration on matters of content development, training support services should be aggressively explored".

Human resource capacity: "the shortage of skills limits the implementation process.

Fiscal resources: "there is a general dependence on donors for the implementation of policy.

Learning content: there is lack of local digital content such as indigenous languages, also, substantial reliance on content from the private sector.

Procurement regulations: import duties on ICT equipment should be eliminated in all countries.

Attitudes: "government can encounter inter-ministerial jurisdiction issues regarding the control and management of ICT applications".

Sustainability: "meeting the ongoing costs of maintaining equipment, staff training, connectivity, content materials acquisition, and development of consumables is a major challenge"(Farrell & Isaacs, 2007: 31).

In another study, Dzidonu (2010) states that there is still lack of expertise in developing, administering and delivering courseware and developing and maintaining e-learning network in most of African countries, and that although the majority of teachers may be computer literate, they are yet to be trained to deliver their courses using ICT tools and resources (Dzidonu, 2010).

According to Dzidonu (2010), funding conventional education also poses as a challenge because African countries face difficulties in allocating enough budgets to the implementation of ICTs since they still have to build new schools, buy text books, feed school children, pay teachers' salaries and also train teachers. In addition to that, Dzidonu provides other challenges as 'apathy and resistance to change'. The author states that the African educational institutions are still battling with resistance to change by teachers who still deliver their courses in the traditional mode using chalk and blackboard (Dzidonu, 2010).

2.7 ATTITUDE

"Computer attitude has been defined as a person's general evaluation or feeling of favour or antipathy towards computer technologies and specific computer related activities" (Kubiakto & Haláková, 2009: 744). Ajzen and Fishbein (in Kubiakto and

Haláková, 2009:744), define attitude as "a positive or negative sentiment, or mental state, that is learned and organized through experience and that exercises a discrete influence on the affective and conative responses of an individual toward some other individual, object or event. Attitude is usually provoked by prior experience, such experiences determine the level of confidence. The lower the confidence of the user, the negative the attitude, and the higher the confidence, the more positive the attitude will be. Computer users with a negative attitude are those with inferior training or familiarity with regard to computer use.

Many researchers have studied attitude toward ICTs with comparison of gender and age of users. Kubiakto and Haláková (2009) cite a number of studies that yielded different results in terms of attitude: Hakkarainen et al. (2000) and Papastergiou and Solomonidou (2005) agree with Shashaani (1997) that boys have a more positive attitude toward computers than girls. On the other hand, a study by Ray, Sormunen and Harris (1999) found that females have a more positive attitude toward computers than males. Fancovicova and Prokop (2008) state that there is no difference between males and females' attitudes towards ICT. Ogilvie, Trusk, and Blue (1999) concluded that the attitudes of pupils towards computer exercises were positive regardless of their gender. Palaigeorgion, Siozos, Konstantakis, and Tsoukalas (2005) also agree with Fancovicova and Prokop (2008) but further state that women are more anxious about the use of hardware and that they had a less positive judgement towards the use of computers in social and personal life. Kirpatrick and Cuban (1998) believe that "when female and male students had the same amount and types of experiences of computer, females' achievement scores

and attitudes are similar to that of male's at all education levels Kirkpatrick and Cuban cited in(Yusuf & Balogun, 2011).

In terms of age, Brosnan found that 6-11 year old boys had a positive attitude toward computers than girls (Kubiakto & Haláková, 2009). On the other hand, Comber, Colley, Hargreaves and Dorn and Laguna and Babcock (in Kubikto and Haláková 2009) state that "younger pupils boys and girls have more positive attitudes toward computers than the older whereas Bozionelos (in Kubikto and Haláková 2009) state that "older students have more positive attitudes to computers than the younger" (Kubiakto & Haláková, 2009).

Although most of the studies consider males as those with a positive attitude towards ICTs, it is still a two way stream which creates some form of confusion. A point of interest for this study is the attitudes of teachers and learners in the usage of ICTs in teaching and learning disregarding age and gender.

2.7.1 Teachers' attitude toward ICTs

A good number of teachers do agree with the fact that ICTs are a useful tool in enhancing teaching and learning today. The popularity and ability of computers to improve the standard of teaching and learning cannot be ignored. However, not every teacher who has access to these technologies uses them for teaching. Teachers may not be categorised into one group in this regard. There are teachers who do use computers for teaching and there are those who have problems in using computers for teaching. According to Irvine and Williams (2002), a greater percentage of teachers do believe that the internet is an essential skill for education and also teachers who are non-users agree that children should know how to use

the internet. However, non-user teachers who would like to include it in the curriculum face challenges of lack of facilities and inadequate training (Irvine & Williams, 2002).

Teacher attitudes toward computer can act as a barrier to the usage of computers or can act as a key to the use of computers. Kluever, Lam, Hoffman, Green and Sweringes (in Albirini, 2006) state that "attitudes towards computers affect teachers' use of computers in the classroom". Teachers with a negative attitude towards computers tend to use them less than teachers with a positive attitude. Fransis-Pelton and Pelton (in Abirini, 2006) state that teachers' lack of knowledge and experience result to lack of confidence to attempt to introduce computers in their instruction.

Many researchers have outlined a number of variables that influence teacher attitude toward computers, some of these variables are computer experience, ownership, availability, and duration of usage. Dupagne and Krendel, Woodrow and others (in Cavas, Cavas, Karoglan and Kisla, 2009) state that computer experience is widely considered as correlated to positive attitudes (Cavas et al., 2009). Similarly, Chou (in Cavas et al., 2009) believes that computer experience has an influence on teacher attitude toward computers. From the quoted studies, it can be deduced that computer experience leads to high levels of confidence, and confidence leads to a more often usage of computers and this signals a positive attitude.

Ropp (in Cavas et al., 2009) has found that there is a relationship between access to computers & hours spent on computer usage in a week and computer attitude. This means, if teachers have easy access to computers and also have enough time to

work on computers, they tend to have a positive attitude toward the use of computers. Enough time to work on computers allows teachers to figure out solutions to what they intend doing on computers and also to prepare well in advance for their lessons rather than being embarrassed by these technologies in a class setup.

Computer ownership at home is another important variable in this subject because it suggests that teachers who own computers at home have easy access and ample time to familiarise themselves with computers and improve their literacy. Cavas et al., (2009) agrees with Ghrist and Riddle (2003); Russos (2007); Sadik (2006) and others that "computer ownership has been consistently correlated to attitudes toward computers and positive effects for preparing teaching and learning materials" (Cavas et al., 2009, p. 22). Also, in this regard, there was no difference in the gender variable although it was shown that there was a sign of anxiety among women. On the other hand, Cavas et al. (2009) have found that there was a more positive attitude among teachers within the 20 - 35 age-group than those in the 36 - 49 and 50 and more.

A greater number of researchers around the world have shown interest in studying the attitudes of student teachers toward computers and most of the studies arrived at the same results. Yusuf and Balogun (2011) have found that student teachers have a positive attitude toward ICT and that they have shown competence in using ICT tools. Annraja and Joseph (2006) found that trainee teachers have high level of attitude toward ICT both males and females. In another similar study, the data revealed that undergraduate teacher education students had a strong belief that

interaction with ICTs was helpful, pleasant and easy (Dixon & Siragusa, 2008). In general, the literature provides enough evidence that teachers have a positive attitude toward ICTs regardless of their confidence and use.

2.7.2 Learner attitude toward ICTs

Fancovicová and Prokop (2008) found that learners' attitudes toward computers were positive among Slovak schools. Actually, just like for teachers, a higher number of researchers have found that learners have a positive attitude toward ICTs. However, in the case of learners, there were the effects of behavioural dimension of attitudes and lack of resources such as internet connection (Fancovicová & Prokop, 2008).

From what has been provided, it is clear that the negative attitude towards computers is a result of anxiety and leads to low skills of user and prior experiences of not being able to manipulate or command the computer to perform tasks desired by the user, also, not having an option of finding a solution to the problem faced by the user. This situation takes away the interest of learning further the operations and manipulation of computers. Networked computers have been shown to be more interactive to users than stand alone computers. This is because of having the capabilities of helping the user find solutions through direct communication with experts and the availability of information. Based on this, it can be concluded that networked computer users should have a more positive attitude toward the use of computers than stand-alone computer users.

2.8 CHAPTER SUMMARY

A plethora of research has been conducted to study ICTs in education around the world. However, the literature reveals that most of the studies have based their focus on the availability and challenges to ICT implementation. There is evidence that although not at a desired level of functionality in the general sphere, most schools do have computers for learner use. However, many studies have argued that these computers are not fully serving their purpose. On the other hand, it can be deduced from the literature consulted that schools that effectively use computers are those that have been historically known to be well resourced. Although much of the literature is not very clear on networked computers or stand-alone computers, the literature has shown that networked computers have an impact in the process of teaching and learning.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

The literature reviewed has shown that schools are indeed equipped with computers which have the purpose of helping in the process of teaching and learning. However, as outlined in the literature review, most researchers have based their focus on how computers are being used in schools, how they have impacted learner performance, and the attitudes of computer users in schools. Keeping all these in mind, not enough work has been focused on the impact made by computers in schools in comparison with networked computers and stand alone computers.

The purpose of this research is to study the role of networked computers in the enhancement of teaching and learning. In order to achieve this, a quantitative research method was used. This chapter describes the research design that was followed. The demographics and location where the research was conducted are discussed first. The goals of the research are described second, research questions are then listed. A description of data collection methods is then made. The research instrument is explored next, and the research instrument is described. Next, the process of data collection is discussed. Penultimately is the description of the method used for data analysis. I then conclude this chapter by discussing the ethical issues and limitations to the study.

3.2 DEMOGRAPHICS

This study was conducted in schools situated in Itsoseng Township and Lichtenburg town. These schools are all in the Ditsobotla area which falls under Ngaka Modiri Molema district, in the North West Province (RSA). The selected schools in Itsoseng Township serve the Itsoseng community and the surrounding rural areas while on the other hand schools in Lichtenburg town serve the community of Lichtenburg town and the financially affording from the surrounding townships.

The reason behind the choice of these schools is that they form part of the Category A and Category B schools. They are all public schools which are under the North West Department of Education. All these schools have computer technologies to be used by learners, teachers and the administration staff. Although not totally, the curriculum offered at these schools is the same, the majority of subjects taught at these schools are common.

3.3 GOALS OF THE RESEARCH

The goal of this research is to determine what benefits of networked computers in schools are there as compared to stand alone computers which are also being used in schools. The study confirmed the availability of computers in schools under both Category A and Category B and also examined how computers in these schools are being used for teaching and learning. This study also examined the benefits users enjoy from these computers.

Two out of three schools where the questionnaire was distributed are township schools in which there are computers to be used to meet the requirements of the curriculum, however, computers in these schools are not networked. The other

school in comparison is situated in town and better resourced, this is a school in which computers are networked. Computers in this school also have a purpose of being used to meet the requirements of the curriculum.

3.4 RESEARCH QUESTIONS REVISITED

The main research question was:

- What is the role of networked computers in the enhancement of teaching and learning?

The three subsidiary questions were:

- Do teachers, learners and administration staff use computers to share information?
- Do teachers and learners use computers to search for information?
- What benefits do networked computers provide for users in schools?

3.5 PARTICIPANTS IN THE STUDY

As this research is aimed at studying the role of networked computers in the enhancement of teaching and learning, it became imperative to consider both well resourced and less resourced schools in the Ditsobotla area. To briefly describe participating schools: they are schools located in a Township, resourced in the same way and have the same computer infrastructure. On the other hand, there are well resourced schools located in town which are also resourced in the same way and have the same computer infrastructure. These schools cannot be classified in the same category as those schools in the Township. Comparatively looking at these schools, Township located schools are less resourced.

Table 3.1: Computer infrastructure in participating schools

| Aspect: | Category A (per School) | Category B (per School) |
|------------------------|-----------------------------------|-----------------------------------|
| Computer labs | 4 | 2 |
| Access internet | All | All |
| Networked | All | 1 |
| Computers working well | All | All |

Table 3.1 above is a checklist of the infrastructure in participating schools. It is shown in the Table that Category A schools are more resourced than Category B schools in terms of equipped computer labs and networked computers.

Further, it should be noted that Township located schools outnumber those located in town. There are a total of four High schools in the Township and only one high school in town. It is because of this that a representative sample had to be two schools from the Township and the one school located in town. All the participating schools are high schools.

My choice of participants was influenced by which schools had computers and computer laboratories available for teaching and learning. One out of two Category B schools offers Computer Applications Technology (C.A.T) as an examinable subject. The other school in Category B offers Engineering Graphics and Design (E.G.D) of which the Practical Assessment Task is not examinable but forms part of the Continuous Assessment (CASS) component. On the other hand, the Category A

school also has computer laboratories and offers both C.A.T and E.G.D as subjects in the curriculum. The participants in this study were teachers, learners, school principals and administration staff from both Category A and Category B schools. A total of 333 respondents participated in the study. A total of 107 participants were from the Category A school and 226 participants were from Category B schools.

3.6 DATA COLLECTION

3.6.1 Data collection instrument

A questionnaire was developed and administered in order to gather information from teachers, learners, school principals and administration staff about how they used computers to enhance teaching and learning, and also how they used computers to share information.

3.6.1.1 Part A - Gathering demographic information

Part A established the title of the respondent, whether the respondent is a learner, teacher, principal or administration assistant. Further, this part required the name of the school the respondent is attached to, school type, whether it is a public school or private school. This part also establishes the location of the school whether it is in a township, town or a rural area. Lastly this part requires learners to provide their level of grade at school.

3.6.1.2 Part B - Examining availability and accessibility

Part B examines the availability and accessibility of computers to the respondents. This part also establishes the connectivity of computers that these respondents were asked to rate through statements on a four-point scale ranging from 'strongly agree' to 'strongly disagree'.

3.6.1.3 Part C - Use

Part C examines how the respondents use computers in their schools. This part investigated the activities that users carry out on computers, whether most of the activities are carried out when a computer is used as a stand-alone computer or carried out on the network.

3.6.1.4 Benefits

Part D investigates what benefits of networked computers respondents enjoyed and what they use networked computers for. Respondents were also asked to rate the statements on a scale of one (1) to four (4) ranging from "Strongly disagree" to "Strongly agree".

3.6.2 Data collection process

A self developed questionnaire was personally distributed by the researcher to all participating schools. The data was collected over a period of a month. The questionnaire was given and explained to respondents during their free time after the examination session of the day. Respondents were given the space of a week to complete the questionnaire. The researcher made several rounds to participating schools to collect the completed questionnaire.

3.7 DATA ANALYSIS METHOD REVISITED

The questionnaire administered consisted of close-ended questions only, therefore data was analysed through the use of Statistical Package for Social Sciences (SPSS) software. Data was analysed by an independent statistician and interpreted by the researcher.

3.8 ETHICAL CONSIDERATIONS REVISITED

To render this study ethical, the following rights of respondents were observed:

- The right to confidentiality,
- the right to anonymity,
- voluntary participation, and
- Ample time to complete the questionnaire.

Prior to administering the questionnaire to respondents, I obtained a permission seeking letter (Appendix B) from the North-West University Graduate School of Business Leadership Research Office. I then obtained a written permission from the North-West Department of Education Regional Office (Appendix C) to conduct the research in schools. The two letters were used to seek permission from principals and school management teams and also to serve as proof that protocol has been observed. However, the permission given at this level was verbal but agreed upon by all affected in the school.

Respondents' consent was obtained before they completed the questionnaires. This was done by requesting willing respondents to raise their hands so that they could be given the questionnaire. The respondents were also made to understand the issues of anonymity and confidentiality attached to their voluntary participation. Respondents were also assured that there were no risks of penalties or victimisation that would come as a result of their participation in this study.

As an endeavour to observe scientific honesty, no data manipulation was done in either completing the questionnaire or capturing of data for statistical analysis on the computer.

To avoid bias and subjective collaboration, the statistician produced the results independently of the researcher.

3.9 CHAPTER SUMMARY

This chapter examined the method used in conducting this research. It is introduced by linking to what is deduced from the literature reviewed. The demographics of where the study was conducted are explained. Secondly, the goal of the research was discussed. Research questions were then listed and then a discussion of participants in the study. A discussion of data collection methods used and how data was analysed followed and, lastly, the ethical considerations made were discussed. All these steps paved the way to data analysis which constitutes the content of the next chapter.

CHAPTER 4

DISCUSSION OF FINDINGS

4.1 INTRODUCTION

In this chapter the data collected is statistically analysed. The data was collected through the use of questionnaire. A total of 400 copies of the questionnaire were distributed to schools, broken down as 150 copies to each Category B school and 100 to the Category A school. A total of 333 copies of the questionnaire were returned. This is a satisfactory number since the researcher anticipated at least 113 from each school in order for the sample to be representative. The returned copies constitute 83% of the total questionnaire distributed.

4.2 RESEARCH STUDY RESULTS

4.2.1 Demographics

The first section of the instrument prompted the respondents to give information about their status at school. A greater number of respondents (87.9%) were learners followed by 9.8% of teachers and 1.3% of respondents being school principals. This percentage includes deputy principals. The lowest respondent percentage was school administration staff at 1%.

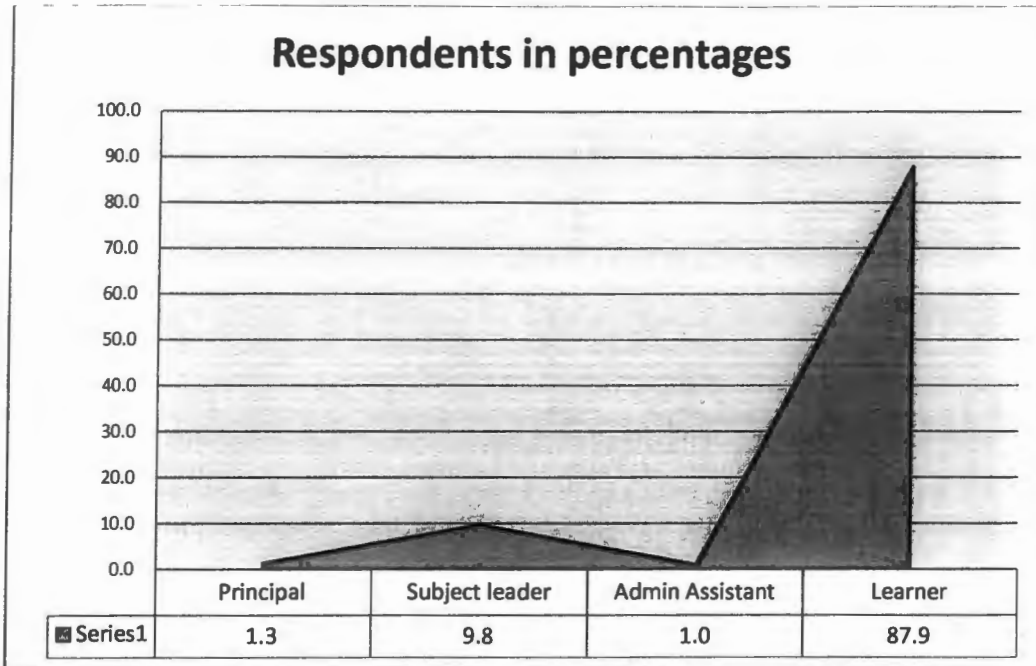


Figure 4.1: Total percentages of respondents

The information in **Figure 4.1** gives a true reflection of the situation at schools where learners are many times more than teachers. According to the preliminary report by School Realities 2012, the average learner educator ratio in South African schools is 30.4:1 (Anon., 2012). The second large number in a school set-up is that of teachers. In schools with high number of learners, the post establishment allows for a principal and a maximum of two deputy principals, but mostly only one administration assistant, hence the 1%.

4.2.2 Availability and accessibility

Before it could be established whether computers in schools were networked or not, it was important to firstly test the availability and accessibility of computers to learners, teachers and administration staff.

4.2.2.1 Learners and teachers

TABLE 4.1(a): Responses from teachers and learners on accessibility and availability.

| Question | SD | D | A | SA | UNSURE |
|--|------|------|------|------|--------|
| Do you have computer laboratories in your school? | 2.0 | 1.6 | 62.9 | 32.6 | 1.0 |
| Are computer laboratories in your school sufficient for use by all learners? | 14.3 | 32.2 | 36.5 | 16.6 | 0.3 |
| Are computer laboratories in your school equipped with computers? | 1.0 | 5.5 | 65.8 | 23.5 | 4.2 |
| Are most computers in your school in a working order? | 3.3 | 12.1 | 58.6 | 25.7 | 0.3 |
| Is the number of computers enough for the whole class to use at once? | 14.7 | 21.8 | 46.3 | 15.6 | 1.6 |
| Are computers in your school only used by teachers and administrative staff? | 29.0 | 55.4 | 9.4 | 5.2 | 1.0 |
| Are learners allowed to use computers? | 4.6 | 7.2 | 60.6 | 26.4 | 1.3 |
| Do learners only use computers when the teacher requires them to do so? | 9.8 | 22.8 | 44.6 | 22.5 | 0.3 |
| Are learners allowed to use computers when they need to during their free time? | 22.5 | 25.1 | 30.6 | 21.2 | 0.7 |
| Are your computers enabled to access internet? | 10.1 | 17.6 | 41.0 | 28.3 | 2.9 |
| Do your computers share a printer? | 6.5 | 20.2 | 50.5 | 19.9 | 2.9 |
| Can you sit on any computer and still be able to access files you saved on another computer? | 16.0 | 26.7 | 31.3 | 24.1 | 2.0 |

According to what is shown in **Table 4.1(a)** in terms of accessibility, a total of 95.5% of respondents indicated that they have computer laboratories in their schools while 53.1% of the total number of respondents agreed that these computer laboratories are sufficient for use by all learners. About 89.3% of respondents indicated that their computer laboratories are equipped with computers. A total of 84.3% agree that these computers are in working condition to be used for teaching and learning purposes. Again, 61.9% of the respondents indicated that they had a sufficient number of computers to be used by the whole class of learners at once. This situation suggests that the participating schools do not face the challenge of lack of computer infrastructure.

Table 4.1(b) below differentiates between Category A and Category B schools in terms of the availability of computers in these schools. This was in response to the question: *Are computer laboratories in your school equipped with computers?*

TABLE 4.1(b): Differentiating between Category A and Category B in terms of Availability

| Category | SD | D | A | SA |
|----------|-----|-----|------|------|
| A | 0 | | 64.9 | 35.1 |
| B | 1.9 | 6.4 | 74.5 | 17.2 |

According to what is shown in **Table 4.1(b)**, all respondents from Category A school agree that their schools have computers while 91.7% of respondents in Category B also agree that their schools have computers. The small margin between the two percentages shows that undoubtedly schools from both categories do have computers to be used for educational purposes.

About 84.4% of respondents have also indicated that computers in their schools are not only meant to be used only by teachers and administration staff while 87% of respondents agree that learners are also allowed to use these computers. About 67.1% of the sample indicated that learners only gain access to these computers when the teacher requires them to do so, meaning that most learners only use computers when following teacher instructions. About 51.8% as opposed to 47.6% agree that learners are allowed to use computers any time including their free time while 0.7% of the respondents were unsure with regards to this aspect.

In response to the question, "Are your computers enabled to access internet?", 69.3% of the total sample indicated that their computers at school are enabled to access the internet. When responding to another question, "Do your computers share a printer?," 70.4% indicated that their computers are able to share a printer and 55.4% also indicated that their computers enable them to access information

they saved on other computers. This is in response to a question intended to test if computers being used in the schools are networked.

TABLE 4.1(c): Differentiating between Category A and Category B in terms of Internet connectivity

| Category | SD | D | A | SA |
|----------|------|------|------|------|
| A | 1.1 | 0 | 46.8 | 52.1 |
| B | 13.8 | 25.2 | 43.4 | 17.6 |

According to **Table 4.1(c)** only 1.1% of the respondents from Category A have indicated that they use computers without internet connection while 98.9% have access to internet at school. In Category B schools, only 61% of the respondents indicated that they have internet access and 13.8% of the respondents strongly disagree to the question.

TABLE 4.1(d): Differentiating between Category A and Category B in terms of sharing a printer

| Category | SD | D | A | SA |
|----------|-----|------|------|------|
| A | 2.1 | 1.1 | 60.6 | 36.2 |
| B | 9.4 | 29.4 | 48.1 | 13.1 |

When responding to the question investigating if computers in Category A are networked, almost all respondents (96.8%) have indicated that computers in Category A schools are able to share a printer. This suggests that these computers are connected in a network. On the other hand, a total of 38.8% of the respondents from Category B schools disagreed that the computers they use are networked while only 61.2% in Category B as compared to 96.8% in Category A have indicated that

their computers are able to share a printer. This is according to what is shown by **Table 4.1(d)**.

TABLE 4.1(e): Differentiating between Category A and Category B in terms of local network connectivity

| Category | SD | D | A | SA |
|----------|------|------|------|------|
| A | 0 | 1.1 | 41.5 | 57.4 |
| B | 23.6 | 42.2 | 26.1 | 8.1 |

Similar to what is shown in **Table 4.1(d)**, **Table 4.1(e)** indicates that a greater number of respondents from Category A (98.9%) stated that they can sit on any computer and still be able to access files they saved on another computer. A total of 65.8% as opposed to 34.2% of the respondents in Category B schools have indicated that they are not able to sit on any computer and be able to access files they saved on another computer.

The results stated above show that in terms of availability of computers, schools have sufficient computers to use for teaching and learning by both teachers and learners. It is also shown in these results that computers are accessible to majority of those who are supposed to use them in schools. It is also evident in these results that some schools do not have networked computers to use for teaching and learning.

4.2.2.2 School principals and administration staff

In terms of availability and accessibility, all principals and school administration staff indicated that they had computers to work on. When asked if their computers were able to communicate with other computers in school, only 25% agreed while 75%

strongly disagreed. However, 40% of the sample indicated that they used computers to receive correspondence from the department.

4.3 USE OF COMPUTERS IN SCHOOLS

4.3.1 Learners

In investigating how important computers are to schools, the research showed how computers are used in schools as indicated in Table 4.2 below.

Table 4.2: How respondents use computers in schools

| Question | SD | D | A | SA | UNSURE |
|--|------|------|------|------|--------|
| Do you use computers to search for information on the internet on your own? | 18.6 | 29.3 | 28.0 | 20.2 | 3.9 |
| Do you use computers to type your assignments (or question papers)? | 19.2 | 24.4 | 36.5 | 15.3 | 4.6 |
| Do you use computers to retrieve information you saved previously? | 15.3 | 17.9 | 31.6 | 30.6 | 4.6 |
| Do learners use computers to submit school work electronically? | 38.4 | 40.4 | 11.7 | 3.9 | 5.5 |
| Do you use computer to discuss school work with other people who are not near you? | 44.0 | 35.2 | 13.4 | 2.3 | 5.2 |
| Are you able to use a computer to ask your teacher (or subject advisor) a question by sending a message? | 36.5 | 22.1 | 27.4 | 9.1 | 4.9 |
| Does the teacher guide learners when searching information on the internet? | 9.1 | 13.0 | 43.6 | 29.3 | 4.9 |
| Do you access the internet cafe' for downloading information because you cannot do it at school? | 14.3 | 29.6 | 26.4 | 24.4 | 5.2 |
| Do you use cell phone to access the internet because you cannot do so at school? | 6.5 | 5.9 | 33.2 | 49.8 | 4.6 |

It is shown in **Table 4.2** above that 48.2% as opposed to 47.9% of the respondents use computers to search for information on the internet while another 51.8% of the sample is confirmed that they use computers to type assignments. However, only 15.6% of the total sample use computers to submit school work electronically and only 15.7% use computers to discuss school work with people who are not near them. In the previous section, 41% of the respondents agreed and 28.3% strongly agreed that their computers were able to access the internet while in this section a total of 50.8% of the sample indicated that they access the internet café because they cannot access the internet at school. Further, a total of 83% of the sample

agreed that they use cell phones to access internet because they cannot do so at school.

From the above investigation of how computers are being used in schools, it is clear that a large number of computer users in schools only use computers offline. It is also shown that the most common use of computers in schools is for typing assignments and question papers for professionally presenting their work. A greater number of computer users in schools do not use computers to communicate with other people to discuss school work. However, the respondents have shown that there is a need for them to access information beyond the school infrastructure by accessing the internet café and also using their cell phones to access information beyond the school infrastructure.

4.3.2 Teachers

Table 4.3: Network and internet connectivity of school computers

| Question | Strongly Disagree | Slightly Disagree | Slightly Agree | Strongly Agree |
|--|-------------------|-------------------|----------------|----------------|
| Are your computers connected in a network (able to communicate to each other)? | 20.0 | 13.3 | 43.3 | 23.3 |
| Are your computers enabled to access internet? | 21.9 | 18.8 | 21.9 | 37.5 |

Sixty-six point six percent (66.6%) of teachers in the sample indicated that their computers are networked and able to communicate to each other while 59.4% indicated that their computers are able to access the internet and another 60.6% of teachers who participated in this study also indicated that they use the computer to illustrate to learners and 72.7% agreeing that they use the computer to conduct lessons. Seventy percent of these teachers also indicated that they use the computer to prepare their lesson while 86.7% of the sample of teachers uses a programme to

calculate and record learner marks. In terms of using educational DVD's to play for learners, 58.6% of teachers agreed that they do use them.

About 65.5% of teachers also disagree that they use computer simulation software which can simulate experiments such as those in Physics and Chemistry. Only 20.5% of the teachers post tasks on computer for their learners to find. A split response was experienced in response to a question that investigated if teachers use computers to communicate with fellow subject teachers in other schools, 50% of the teachers responded that they use computers to communicate with others while a total of 50% (just half) indicated that they do not.

Only 20.7% of the total sample of teachers use computers to receive work from learners electronically. This implies that a large number of teachers do not use fully the connectivity of their computers. Lastly, in this section, 70% of teachers indicated that they use computers to store learners' marks and other work documents. However, in the light of the above responses, it can be deduced that most teachers do not use computers to submit these marks to their immediate seniors and the administration staff.

4.3.3 School principals and administration staff

About 80% of respondents use computers to keep learner records and 60% use computers to prepare learners' progress reports. A total of 80% of the respondents indicated that they also use computers to keep teacher information. This percentage also indicates that they use computer to communicate with the area office and to distribute circulars to teachers. The same amount of respondents indicated that they use computers to receive marks from teachers.

4.4 BENEFITS

4.4.1 Learners

In **Table 4.4** below, the research indicate how respondents benefited from computers which were connected to an internet network. The eight questions tested the attitude of computer users in schools with access to the internet.

Table 4.4: How respondents benefit from school computers

| Question | SD | D | A | SA | UNSURE |
|---|------|------|------|------|--------|
| Do you usually need internet to do your challenging school work? | 6.5 | 7.5 | 33.9 | 47.9 | 4.2 |
| Do you prefer internet than text books for doing your school work? | 11.1 | 25.1 | 33.2 | 25.4 | 5.2 |
| Do you use internet to learn further what you have not yet covered at school? | 12.4 | 31.9 | 32.6 | 17.3 | 4.9 |
| Do you prefer internet to find explanations of confusing content? | 6.2 | 12.1 | 40.4 | 36.5 | 4.9 |
| Do you use the internet to check for solutions to difficult questions? | 6.5 | 11.4 | 37.1 | 39.1 | 5.9 |
| Do you use the internet to find more exercises for practice? | 15.3 | 30.6 | 32.6 | 15.3 | 6.2 |
| Do you use internet to find other methods of solving a subject content problem? | 10.4 | 24.4 | 40.7 | 17.9 | 6.5 |
| Does internet help you improve your performance at school/work? | 6.5 | 6.2 | 30.6 | 51.1 | 5.5 |

According to **Table 4.4**, 81.8% of the sample indicated that they needed to refer from the internet when doing their challenging school work while only 14% indicated otherwise. When asked if they preferred the internet as compared to text books for doing their school work, 58.6% of the respondents agreed and 49.9% of the total sample also indicated that they use internet to learn further the content they have not yet covered at school while 76.9% prefer the internet to find explanations to confusing content. About 76.2% check for solutions to difficult questions on the internet while 47.9% of the respondents use the internet to find more exercises on the internet for further practice of the subject content. Again, 58.6% of the total sample also indicated that they use internet to find more methods of solving subject content problems.

Just about half (51.1%) of the respondents strongly agree that the internet helps them improve their performance at school, 30.6% also agree to this while on the other hand only 12.7% of the total sample indicated the opposite and 5.5% were not sure if internet helped them improve their performance.

4.4.2 Teachers

When asked if computers simplified their teaching work, 57% of teachers strongly agreed to the statement while 32.1% indicated their agreement with the statement. Majority (79.5%) of teachers also indicated that computers improved their learners' understanding when used for teaching and learning while a very large majority (85.7%) of teachers forming the sample also agreed that the use of computers professionalised their work. From the results given by the first two questions (**Are your computers connected in a network?** and **Are your computers enabled to access internet?**) in the previous section, a greater number of computers that teachers use are connected to a network and therefore it is evident that these are the computers that teachers are making reference to in this section.

4.4.3 School principals and administration staff

A satisfactory number of respondents agreed that they benefited from computers. A total of 80% indicated that computers simplified their work whereas all (100%) of the respondents agreed that computers do professionalise their work and 60% of these school managing respondents also indicated that computers simplified their duties of managing the school records and assets. The sample also indicated that computers simplified the management of teacher leaves, class attendance and allocation of duties. A total of 80% acknowledged that the computers assisted them in drawing school time-table for class attendance and examinations.

4.5 DISCUSSION

In the light of the results obtained in this study, it is evident that a greater number of the computers that are being used in schools are networked. This discussion focuses on two types of network connectivity which schools are exposed to. Schools that participated in the study indicated that they have computers which are connected to the internet. There are also schools which have a local network connectivity which is described as Domain.

The first research question in this study (**What is the role of networked computers in the teaching and learning process?**) was to bring to light the role of networked computers in the teaching-learning process. According to eHow website, a computer network allows users to communicate easily with other computers and users in the network (communication). A computer network gives users the ability to place files in a centralized location which can then be accessed by others on the network from their separate computers (file sharing). A computer network enhances cost efficiency by allowing administrators to save money on software and updates, and lastly, "owners of the network can still install security suites that will protect all information on the network and the computers attached" (Dunn, n.d.).

In the first section of the questionnaire respondents were asked if their computers were enabled to access the internet and 69.3% agreed as in **Table 4.1(a)**. This question aimed at establishing the type of connectivity in schools. The last question of the first section asked if respondents could sit on any computer and still be able to retrieve files that they saved on another computer. About 55.4% of the

respondents agreed to the statement as shown in **Table 4.1(a)**. The implication in this regard is that most schools can access the internet but a lesser number is able to communicate within the school. This suggests that computers in most schools are connected to the internet but not in a domain, and others are connected in a domain but not connected to the internet. However, we should also consider that there are also schools with stand alone computers (not networked).

The results obtained in this study also confirm that Category A schools are better resourced as compared to Category B schools in terms of the availability of computers used for educational purposes. (*See Table 4.1(b)*). It is also revealed by these results as shown by **Table 4.1(d)** and **Table 4.1(e)** that Category A schools have a larger number of networked computers while a greater number of stand-alone computers is found in the Category B schools.

Although it is difficult to extract the actual percentage from the total that responded positively, there is evidence that these stand alone computers are being used to type assignments, question papers, and to retrieve information previously stored in them. This group of respondents can therefore be linked to a percentage of respondents that indicated that they use cell phones to access internet and also those who indicated that they access the internet café for downloading information because they cannot do it at school. (*See Table 4.2*). **Table 4.5** was developed with the interest of classifying schools according to their categories and to get the actual picture of how schools in both categories responded on specific aspects.

Table 4.5: A comparison between two categories on the use of cell phones and internet café to access internet

| Aspect | Category A | Category B |
|--------------------------|-------------|-------------|
| Use cell phone ... | 78 (27.9%) | 201 (72%) |
| Access internet café ... | 129 (46.2%) | 150 (53.7%) |

According to **Table 4.5**, a larger number of learners who use cell phones to access the internet are from Category B schools, and the same is shown for the number of learners accessing the internet café for downloading information. This might be attributed to limited or no internet access in their schools.

In the aspect of internet connectivity in schools, a greater number of learners have indicated that they use their networked computers to do their challenging school work, to learn further what they have not yet covered at school, to check for solutions to difficult questions, to find more exercises for practice, and to find other methods of solving subject content problems.

Teachers using computers connected in the internet have indicated that they use computers to search for subject content related information on the internet, to communicate with their subject advisors, and to discuss work related issues with teachers in other schools.

In the same aspect, principals and administration staff have indicated that they use their networked computers to receive correspondence from the department, to communicate with the area office, to distribute circulars to teachers, and to receive marks from teachers.

In terms of a localized network within the school, although being a lesser percentage, learners have indicated that they use networked computers to submit school work electronically, to discuss school work with other people who are not near them, and to ask their teacher questions by sending them messages. This has prompted the researcher to manually analyse the categories to which these learners belonged and the findings were that most of the learners who used computers for these aspects were from Category A school (*as shown in Table 4.6 below*).

Table 4.6: Use of school computer network by learners

| Aspect | Category A | Category B |
|-----------------------|-------------------|-------------------|
| Submit electronically | 52 (100%) | 0 |
| Discuss | 32 (61.5%) | 20 (38.5%) |
| Ask questions | 43 (82.7%) | 9 (17.3%) |

Teachers also indicated that they use networked computers to post tasks for learners to access when they log on the network and they also use these computers to receive work from their learners. These teachers also add up to a lesser percentage as compared to those who do not use computers for the mentioned aspects.

In addressing the second research question (**Do teachers and learners use computers to search for information?**), the results have shown that a satisfactory number of respondents use computers to search for information. (*See Table 4.2*). The results have also shown that even those who do not enjoy access

to networked computers still device means to search for information. This emphasises the need for connectivity in school computers.

With regard to the third research question (**Do school teaching staff and administration staff use computers as a central storage place for work documents?**), there was no sufficient evidence to suggest that schools have a central storage place for work documents. This is due to the minimal file sharing which is evident in the results. As it has been discussed above, most networked computers in schools are being used in the internet network as compared to how they are being used in a local network. (See **Table 4.1**). This suggests that users in schools do communicate with people outside the school but do not use computers to share files with others within the same school, hence the absence of a central storage place of information in a school.

When investigating what users of networked computers in schools thought of their computers, most learners agreed that these computers helped them improve their performance at school as indicated in **Table 4.4**. **Table 4.7** below also shows that about 89.2% of participating teachers indicated that networked computers simplified their teaching work, 68.5% believe that these computers improve their learners' understanding and 85.7% agree that computers professionalise their work.

Table 4.7: How beneficial computers are to teachers

| Question | Strongly Disagree | Slightly Disagree | Slightly Agree | Strongly Agree |
|--|-------------------|-------------------|----------------|----------------|
| Do computers simplify your teaching work? | 10.7 | 0 | 32.1 | 57.1 |
| Do computers improve your learners' understanding? | 10.7 | 10.7 | 46.4 | 32.1 |
| Do computers professionalise your work (presentation, neatness, and organise)? | 10.7 | 3.6 | 25.0 | 60.7 |

On the other hand **Table 4.8** below shows that 80% of principals and administration staff who were respondents in this study indicated that networked computers simplified their work, all participants (100%) agree that computers professionalised their work, 60% say computers simplified the management of a school and 100% believe that computers simplified managing teachers.

Table 4.8: How beneficial are computers to principals and administration staff.

| Question | Strongly Disagree | Slightly Disagree | Slightly Agree | Strongly Agree |
|---|-------------------|-------------------|----------------|----------------|
| Does a computer simplify your work? | 0 | 20.0 | 20.0 | 60.0 |
| Does computers professionalise your work (presentation, neatness, and organise)? | 0 | 0 | 40.0 | 60.0 |
| Does a computer simplify management of the school (records and assets)? | 0 | 40.0 | 20.0 | 40.0 |
| Does a computer simplify managing teachers (leave, class, attendance and allocation of duties)? | 0 | 0 | 40.0 | 60.0 |
| Does a computer assist you in drawing time table for classes and exams? | 20.0 | 0 | 40.0 | 40.0 |

4.6 CHAPTER SUMMARY

On the basis of the results analysed, it is clear that networked computers play a very important role in the enhancement of teaching and learning. They act as a source of reference that provides a wide range of information; they promptly provide answers and unlimited information. Networked computers also provide a platform for communication between teacher and learner, teacher and colleague, teacher and senior, the school and the department.

CHAPTER 5

RESEARCH DISCUSSIONS

5.1 INTRODUCTION

This chapter summarizes the main ideas from the findings of the research. Firstly, this chapter recalls the objectives of this research, and identifies issues that have limited the study. Furthermore, key findings are identified and discussed in summary. Lastly, I draw a conclusion based on the research objectives defined and the results obtained.

In an effort to study the role of networked computers in the enhancement of teaching and learning, the objectives of this research were to determine the advantages of networked computers over stand alone computers in a teaching and learning environment, to determine the availability of computers in schools, to determine how computers in schools (networked and stand alone) are used for teaching and learning, and how helpful to users are computers in schools.

5.2 LIMITATIONS OF THE STUDY

Although I feel that the sample is representative of all categories of schools found in the Ditsobotla district, it could have been better if there were more schools that participated in the study. However, the situation allowed this sample due to the fact that there is only one Category A school in the district and more of Category B schools.

Principals felt that after explanation was given, questionnaires should be left with the schools in order to allow them to adhere to the non-negotiables as stated by the state president. Ethically, it is correct not to pressurize respondents into participating. This resulted in teachers being reluctant in distributing questionnaires to learners and fellow teachers in the absence of the researcher. This caused a delay in the administering of the instrument and therefore taking more time than it was intended.

The research was further delayed by being postponed until learners and teachers were free to participate since it was examination time in schools. Learners' focus had to be kept on preparation for, and writing examinations while teachers had to be allowed time to invigilate learners' examinations without disturbance. This resulted in a number of teachers and learners not being available to participate in the study.

5.3 KEY FINDINGS

This research was driven by three aspects that made up the instrument. The aspects are discussed in the following paragraphs.

5.3.1 Availability and accessibility

Before it could be established how computers are being used in schools and how they benefit the users, it was important for the researcher to firstly investigate the availability and accessibility of computers. This addresses the second objective of this research. The research has found that participating schools did not have any problem regarding not having computers for teaching and learning. (See **Table 4.1**) However, the Category A school had more computers which were networked to communicate with other computers in the same school whereas in the Category B

schools, most computers could only access internet but could not communicate with other computers in the same school. (See **Table 4.1(e)** and **Table 4.2**). The second research objective referred to above was to determine the availability of networked computers in schools. It was found in this study that Category B schools although they have computers to use for teaching and learning, these schools do not have networked computers available for use in teaching and learning. (See **Table 3.1**).

As the participants were learners, teachers, administration assistants and principals, all participants indicated that they had computers to work on, as indicated in **Table 5.1** below. They have satisfactory accessibility to computers and could do their work without limitations in terms of accessibility. However, there is evidence that Category A schools do use computers to communicate within the school and with other people outside the school.

Table 5.1: Accessibility to computers by teachers, principals, and administration staff.

| Question | Strongly Disagree | Slightly Disagree | Slightly Agree | Strongly Agree |
|---|-------------------|-------------------|----------------|----------------|
| Do you have computer to work on? | 0 | 0 | 0 | 100 |
| Is your computer able to communicate with others within the school? | 75.0 | 0 | 25.0 | 0 |

5.3.2 Use of computers

The third research objective was to determine how computers in schools are being used for teaching and learning. It was found in this research that most computer users in Category B schools use their computers as stand-alone computers. The most common use of computers by learners in these schools is typing assignments

in order to present their work in a neat and professional form, as indicated in **Table 4.2**. This finding correlates with the findings of a study conducted by Bhukuvhani *et al.* (2011) where it was found that "instead of using Computer Aided Instruction (CAI) and other educational packages, word processing is the most used resource" (Bhukuvhani *et al.*, 2011).

These learners seldom use the school internet to search for information while doing their tasks and research projects. The most common use among teachers is typing question papers and storing work related records for future retrieval (*See Table 4.2*). However, teachers also use computers for playing educational DVDs for learners. (*See Table 5.2*). This is the only educational purpose that teachers are using computers for. There is also minimal use of computers as sources of information from which they can refer and find further information which might assist them in teaching their subjects and helping learners. Zamani (2010) also provides evidence that very low percentages of teachers had started using email to communicate with students, parents and internet to search for academic papers (Zamani, 2010).

Table 5.2: Computer use by teachers

| Question | Strongly Disagree | Slightly Disagree | Slightly Agree | Strongly Agree |
|--|-------------------|-------------------|----------------|----------------|
| Do you use a computer to play educational DVDs for learners? | 17.2 | 24.1 | 20.7 | 37.9 |
| Do you use a computer for simulation software (e.g. in Physics)? | 31.0 | 34.5 | 24.1 | 10.3 |
| Do you use a computer to post tasks to your learners? | 34.5 | 44.8 | 17.2 | 3.4 |
| Do you use a computer to receive work from your learners electronically? | 41.4 | 37.9 | 13.8 | 6.9 |
| Do you use a computer to store learner marks and work documents? | 26.7 | 3.3 | 10.0 | 60.0 |

On the other hand, as indicated in **Table 4.6**, the Category A school has networked computers which enable communication among colleagues in the same school. It is shown in this research that, in addition to the uses in Category B schools, a satisfactory number of learners in this school use computers to communicate with their teachers and to search for information on the internet. Teachers in this school also use their computers the way teachers in Category B schools use them but with additional uses of communicating within the school and outside the school. These teachers also use their computers to share files with colleagues and seniors in the same school.

5.3.3 Benefits of networked computers

In addressing the last objective of the study, the research investigated how networked computers were helpful to users in schools. Learners from both categories expressed their preference for internet instead of text books because through the internet they could attempt challenging school work, learn further, and that the internet helped them improve their performance at school. (*See Table 4.4*). A study by Wagner *et al.* (2005) has also found that among the potential impacts that ICT can have when applied to education are: student outcomes such as increased knowledge of school subjects, improved attitudes about learning, and the acquisition of new skills (Wagner et al., 2005).

Teachers on the other hand claim that computers simplified their work and helped their learners understand better while school principals and administration staff believe that computers simplified how they manage schools and human resources in schools.

With regards to the first objective of this research, and in the light of the findings discussed, as shown in **Table 4.6**, the use of computers networked in a domain provide the advantages of enabling file sharing amongst teachers and learners in the same school. Learners are able to reach their teachers' assistance through the computer. Learners can interact with experts outside the school to get further assistance with regards to their school work. This indicates that even reserved learners who are introverts are able to ask questions without facing the teacher or fearing embarrassment.

Teachers who use networked computers enjoy the advantages of being able to post tasks for their learners on the computer for them to find later. The advantage here is that the teachers do not have to wait until they have a lesson with learners to give them work to do. These teachers are also able to receive and share work related documents such as learner marks and circulars at their convenience. According to Mitchell (2012), "teachers can carry out their day-to-day communications with each other more efficiently through email and messaging. New class project can be easily disseminated to students" (Mitchelle, 2012).

As indicated in **Table 5.3** below, school principals and administration staff also enjoy reduced paper work and memorising of critical information. With the aid of networked computers information can be requested and received at their convenience.

Table 5.3: How principals and administration staff use computers.

| Question | Strongly Disagree | Slightly Disagree | Slightly Agree | Strongly Agree |
|--|-------------------|-------------------|----------------|----------------|
| Do you use a computer to keep learners' records? | 20.0 | 0 | 0 | 80.0 |
| Do you use a computer to prepare learners' progress reports? | 20.0 | 0 | 20.0 | 60.0 |
| Do you use a computer to keep school financial records? | 0 | 30.0 | 54.9 | 24.1 |
| Do you use a computer to receive correspondence from the department? | 0 | 60.0 | 20.0 | 20.0 |
| Do you use a computer to communicate with the area office? | 0 | 20.0 | 20.0 | 60.0 |
| Do you use a computer to distribute circulars to teachers? | 0 | 20.0 | 20.0 | 60.0 |
| Do you use a computer to receive marks from teachers? | 20.0 | 0 | 80.0 | 0 |
| Do you use a computer to keep records of school assets? | 0 | 40.0 | 40.0 | 20.0 |
| Do you use a computer to keep teacher information? | 20.0 | 0 | 20.0 | 60.0 |

5.4 RECOMMENDATIONS

Arising from this study a number of recommendations are proposed and noted here.

- Provision of networks to schools: Schools need to be networked in order to enhance information sharing within the school, accessibility of work related documents and learning and teaching correspondence.
- Use of computers as communication channels within the school system: Computers should be used to establish communication between a learner and the teacher, teacher and colleagues and seniors, and the school and the department.
- Embracing a paperless administration: School administration together with teachers should replace the distribution of information by hard copies with sending and posting of soft copies in order for them to fully utilize their networked computers as a central storage place for important information.

5.5 FUTURE RESEARCH

The introduction of computers in schools over a decade ago has resulted in teachers learning how to work on computers. Most teachers have undergone formal training on computer literacy in the past years and are skilled in packages such as Word

Processing, Spread Sheet and Presentation. These are the basics that every computer user needs in order to operate on a computer.

In every industry a computer is used as a tool to perform duties specific to that particular industry. For example: In an engineering industry, a draughts man needs to have the skill of drawing on a computer when performing their duties, this is in addition to the basic skills mentioned in the paragraph above. In the banking sector, a teller needs to have the ability to use the program specific for banking transactions in addition to the basics mentioned. In many industries, computer literacy might be an employment requirement but employees will still be trained on specific duty related programmes.

In the education sector, schools have been provided with computers and teachers trained in order for these computers to serve as tools that will help in the teaching and learning process. Given the situation, the big question is 'are teachers able to use these computers to teach after undergoing the training they receive'? The findings in this study show that not all teachers use computers to conduct their lessons. However, a greater number of teachers do use computers for other reasons related to their work. The skills that teachers possess in terms of using computers in conducting lessons remain a serious concern.

In the light of the above, it is recommended that a study be conducted which will investigate if teachers know what to do when integrating the use of computers in conducting lessons and also, a study which will investigate the need for additional teacher training in the actual activities to perform in a class situation when a computer is to be used in conducting lessons.

5.6 Conclusion

Comparatively, standalone computers in schools are being used only to store and present work neatly whilst networked computers enable communication amongst teachers, learners, school principals, administration staff and the department. Networked computers also enhance accessibility to information and important documents. Given these, it is evident that stand alone computers do not enhance the process of teaching and learning as networked computers do. In the context of this study it can therefore be concluded that networked computers through file sharing capabilities, central storage of information capabilities, and communication capabilities, are a very important tool for the process of teaching and learning.

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APPENDICES

Appendix A

Questionnaire used for data collection

The Role of Networked Computers in the Enhancement of Teaching and Learning

Introduction

The use of computers for educational purposes has become a requirement for achieving the curriculum requirements of the South African education system. It is a fact that most schools are exposed to the use of these technologies, however, it is still not clear how these technologies impact on teaching and learning of the current curriculum. This study examines the effects of networked computers in the enhancement of teaching and learning.

Please note:

- Your personal identity (i.e. Name and Surname) will not be required for this questionnaire.
- Your anonymous participation is encouraged.
- This questionnaire is strictly for academic purposes and does not pose a threat of any kind to the participants.
- You are requested to give as much honest answers as possible for the results to be reliable.
- **Learners** are requested to answer only **Section 1**
- **Teachers** are requested to answer **Section 1 and 2** only

B. Availability and accessibility

| B | Question: | 1 Strongly Disagree | 2 Disagree | 3 Agree | 4 Strongly Agree |
|----|--|---------------------------|---------------|------------|------------------------|
| 1 | Do you have computer laboratories in your school (Infrastructure)? | | | | |
| 2 | Are computer laboratories in your school sufficient for use by all learners? | | | | |
| 3 | Are computer laboratories in your school equipped with computers? | | | | |
| 4 | Are most of computers in your school in a working condition? | | | | |
| 5 | Is the number of computers enough for the whole class to use at once? | | | | |
| 6 | Are computers in your school only used by teachers and administration staff? | | | | |
| 7 | Are learners also allowed to use computers? | | | | |
| 8 | Do learners only use computers when the teacher requires them to do so? | | | | |
| 9 | Are learners allowed to use computers when they need to, during their free time? | | | | |
| 10 | Are your computers enabled to access internet? | | | | |
| 11 | Do your computers share a printer? | | | | |
| 12 | Can you sit on any computer and still be able to access files you saved on another computer? | | | | |

C. Use

| | | | | | |
|----|---|--|--|--|--|
| 13 | Do you use computers to search for information on the internet on your own? | | | | |
| 14 | Do you use computers to type your assignments (or question | | | | |

| | | | | | |
|----|--|--|--|--|--|
| | papers)? | | | | |
| 15 | Do you use computers to retrieve information you saved previously? | | | | |
| 16 | Do learners use computers to submit school work electronically? | | | | |
| 17 | Do you use computers to discuss school work with other people who are not near you? | | | | |
| 18 | Are you able to use a computer to ask your teacher (or subject advisor) a question by sending a message? | | | | |
| 19 | Does the teacher guide learners when searching information on the internet? | | | | |
| 20 | Do you access the internet café for downloading information because you cannot do it at school? | | | | |
| 21 | Do you use your cell phone to access the internet because you cannot at school? | | | | |

D. Benefits

| | | | | | |
|----|---|--|--|--|--|
| 22 | Do you usually need internet to do your challenging school work? | | | | |
| 23 | Do you prefer the internet more than text books for doing your school work? | | | | |
| 24 | Do you use internet to learn further what you have not yet covered at school? | | | | |
| 25 | Do you refer to the internet to find explanations of confusing content? | | | | |
| 26 | Do you use the internet to check for solutions to difficult questions? | | | | |
| 27 | Do you use the internet to find more exercises for practice? | | | | |
| 28 | Do you use the internet to find other methods of solving a | | | | |

| | | | | | |
|----|---|--|--|--|--|
| | subject content problem? | | | | |
| 29 | Does internet help you improve your performance at school / work? | | | | |

Section 2 (Teachers)

| B | Question: | 1 Strongly Disagree | 2 Slightly Disagree | 3 Slightly Agree | 4 Strongly Agree |
|----|--|---------------------------|---------------------------|------------------------|------------------------|
| 30 | Are your computers connected in a network (Able to communicate to each other)? | | | | |
| 31 | Are your computers enabled to access internet? | | | | |

Use

| | | | | | |
|----|--|--|--|--|--|
| 32 | Do you use a computer to illustrate to learners? | | | | |
| 33 | Do you use a computer to conduct a lesson? | | | | |
| 34 | Do you assign learners to search for information on the internet? | | | | |
| 35 | Do you use a computer to prepare a lesson? | | | | |
| 36 | Do you use a computer to record learner marks? | | | | |
| 37 | Do you use a computer to prepare a 'programmed to calculate' mark sheet (e.g. on Excel)? | | | | |
| 38 | Do you use a computer to play educational DVDs for learners? | | | | |
| 39 | Do you use a computer for simulation software (e.g. in Physics)? | | | | |
| 40 | Do you use a computer to post tasks to your learners? | | | | |
| 41 | Do you use a computer to communicate with fellow subject teachers in other schools? | | | | |
| 42 | Do you use a computer to receive | | | | |

| | | | | | |
|----|--|--|--|--|--|
| | work from your learners electronically? | | | | |
| 43 | Do you use a computer to store learner marks and work documents? | | | | |

Benefits

| | | | | | |
|----|---|--|--|--|--|
| 44 | Do computers simplify your teaching work? | | | | |
| 45 | Do computers improve your learners' understanding? | | | | |
| 46 | Do computers professionalise your work (Presentation, neatness, and organized)? | | | | |

Section 3 (Principal and Administration assistant)

| B | Question: | 1 Strongly Disagree | 2 Slightly Disagree | 3 Slightly Agree | 4 Strongly Agree |
|----|---|------------------------------------|------------------------------------|---------------------------------|---------------------------------|
| 47 | Do you have computer to work on? | | | | |
| 48 | Is your computer able to communicate with others within the school (Networked)? | | | | |

Use

| | Question: | 1 Strongly Disagree | 2 Slightly Disagree | 3 Slightly Agree | 4 Strongly Agree |
|----|--|------------------------------------|------------------------------------|---------------------------------|---------------------------------|
| 49 | Do you use a computer to keep learner records? | | | | |
| 50 | Do you use a computer to prepare learner progress reports? | | | | |
| 51 | Do you use a computer to keep school financial records? | | | | |
| 52 | Do you use a computer to receive | | | | |

| | | | | | |
|----|--|--|--|--|--|
| | Correspondence from the department? | | | | |
| 53 | Do you use a computer to communicate with the area office? | | | | |
| 54 | Do you use a computer to distribute circulars to teachers? | | | | |
| 55 | Do you use a computer to receive marks from teachers? | | | | |
| 56 | Do you use a computer to keep records of school assets? | | | | |
| 57 | Do you use a computer to keep teacher information? | | | | |

Benefits

| | | | | | |
|----|---|--|--|--|--|
| 58 | Does a computer simplify your work? | | | | |
| 59 | Does a computer professionalise your work (presentation, neatness, organized)? | | | | |
| 60 | Does a computer simplify management of the school (Records, and assets)? | | | | |
| 61 | Does a computer simplify managing teachers (leave, class attendance, and allocation of duties)? | | | | |
| 62 | Does a computer assist you in drawing time table for classes and exams? | | | | |

End of questionnaire. Thank you for your participation.

Appendix B

Permission letter from the university

0796911094



Graduate School of Business and
Government Leadership (GSB&GL)
Private Bag x 2946, Mmabatho
South Africa, 2735
Tel: 018-389 2437 Fax: 018-389 2335
Email: Graduateschool@nwu.ac.za

29 October 2012

TO WHOM IT MAY CONCERN

Permission to conduct research- Mr LKW Tholo -MBA student

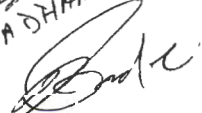
This letter serves to introduce Mr LKW Tholo who is presently a registered student for Master in Business Administration (MBA) programme at the Graduate School of Business and Government Leadership of the North West University. He is conducting a research project on, "The role of network computers in the enhancement of teaching and learning" towards a partial fulfillment of his MBA programme.

In this regard, your office is requested to afford him full co-operation to conduct this research. In particular, Mr LKW Tholo requires permission to access information, data or even to distribute questionnaires.

Your cooperation will be highly appreciated.


Felicia Moruntshe
Research Officer



APPROVED
BUT PLEASE
ADHARE TO NON-NEGOTIABLE


Appendix C

Permission letter from the Provincial Department of Education



education
Lefapha la Thuto
Noord-Wes Onderwys Departement
North West Education Department
NORTH WEST PROVINCE

10 Nelson Mandela Drive,
Mafikeng
Private Bag X10,
Mmabatho 2735
Tel.: (018) 388-1960 / 3002
Fax: 086 514 0126
e-mail: ssemaswe@nwpg.gov.za

NGAKA MODIRI MOLEMA DISTRICT

Enquiries: SO Molete
Tel.: 018 388 3383

To : The Area Manager
Ngaka Modiri Molema District

Attention : *School Managers*

From : Mr B.E. Monale
Acting Chief Director

Date : 30 October 2012


Subject : *Permission to conduct a research in schools*

Permission is hereby granted to Mr L.K.W. Tholo, a student at North West University to conduct a research on *"The role of network computers in the enhancement of teaching and learning"* in our schools.

Schools are requested to cooperate with him during this project, not forgetting to adhere to the non-negotiables of the State President.

Your cooperation and support in this regard is highly appreciated

Yours in education


Mr B.E. Monale
Acting Chief Director

