THE INTEGRATION OF COMPUTER TECHNOLOGY INTO THE CURRICULUM IN PREVIOUSLY DISADVANTAGED HIGH SCHOOOLS IN THE UMLAZI TOWNSHIP, KWAZULU-NATAL

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ABSTRACT

Computer technology in South African schools has been integrated into the curriculum to improve the standard of teaching and learning. This study explores the integration of computer technology into the curriculum in previously disadvantaged high schools in Umlazi, KwaZulu-Natal.

The results from this study state very clear that educators in previously disadvantaged high schools in Umlazi do not integrate computer technology into the curriculum. The educators are not trained to integrate computer technology into the curriculum. In these schools there were educators who were not computer literate. There were also schools who did not teach computer technology because the computers in the schools were not enough to meet the needs of the learners.

This study recommends that the South African Government need to provide support services to previously disadvantaged high schools. The government should make sure that all educators in previously disadvantaged high schools are trained to use computers and able to integrate computer technology into the various learning areas. Finally the government should make sure that each previously disadvantaged school has at least one computer laboratory as a starting point.

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- School Managers who allowed me to conduct this study in their schools.
- Educators who volunteered to participate in this study

DECLARATION

I, Thulani Basil Mhlongo, declare that this dissertation is my own work, and has not been submitted previously for any degree in any university.

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CHAPTER ONE

1.1 INTRODUCTION

The term integration is used to refer to the combination of technology and traditional teaching procedures to produce student learning. Integration is an attitude more than anything else. It comes with a willingness to combine technology and teaching into a productive experience that moves the learner to new understanding. Integration of technology into the curriculum requires a new perspective as well as time and work. Efficient use of computers requires that a teacher understand the goals of the curriculum and the capabilities of the computer in helping the teacher best meet these goals. The teacher must take a fresh look at the curriculum to be taught and ask whether there is a computer application that will enhance the achievement of selected goals (Merrill, Hammons, Tolman, Christensen, Vincent & Reynolds, 1992).

Computer technology is designed to introduce computer application and skills to the learners. This will enable the learners to use the computer in the classroom setting, as well as in their own personal use (Erwin, 2000).

According to the University of East London (2005), computer technology includes the following essential areas:

- Using computers in a variety of applications.
- Computer programming and software development.
- Hardware configuration, installation and interfacing.
- Networks and systems administration.

1.2 STATEMENT OF PURPOSE

The purpose of this study is to explore the integration of Computer Technology into the curriculum in previously disadvantaged high schools in Umlazi Township by educators.

1.3 CRITICAL QUESTIONS

In this study the researcher wants to answer the following questions:

- ***How*** do educators integrate Computer Technology into the curriculum?
- ***What*** impact does the integration of Computer Technology have on the curriculum?
- ***What*** are the potential benefits of integrating computer technology into the curriculum?

1.4 RATIONAL

The reason why the researcher conducted this study was because when he was in high school Computer Technology was not part of the curriculum in previously disadvantaged schools. As a result of that Computer Technology was not integrated into the curriculum. The schools were not well equipped with technological teaching tools. But now most of the previously disadvantaged high schools are provided with technological tools. Now Computer Technology is part of the curriculum. Because this is something new to them, I want to know how educators use Computer Technology as a teaching tool in different learning areas.

This topic is very important because Computer Technology can be used to enhance the standard of teaching and learning in previously disadvantaged schools. It is a process of training people's minds and abilities to be able to use modern technology to acquire

knowledge and skills. The researcher has developed interest on this topic because at the University of KwaZulu – Natal (Westville Campus), he specialized in Educational Technology in his Masters Degree. So the researcher has seen how Computer Technology can make teaching and learning more interesting.

The other thing that made the researcher want to conduct this study was that when he went to a tertiary institution he was one of the students who did not find it easy to use Computer Technology that was available to the students. Computer Technology was a new experience to most of the students who came from previously disadvantaged high schools. So the researcher does not want to see the students who come from previously disadvantaged high schools experiencing the difficulties that he experienced when he started tertiary education. The learners who come from previously disadvantaged schools should have no problems to use computer technology at tertiary level.

People who will benefit from the study are the educators and learners. The educators will be more familiar with new teaching methods. The educators will learn how to integrate Computer Technology into the curriculum. This will make teaching and learning far more easy. As a result of this study the learners will learn computer skills. This can also help the community who did not get a chance in their school days to use Computer Technology.

1.5 LITERATURE REVIEW

1.5.1 Electronic Data Systems (EDS) Grants

There were companies or organizations, like Electronic Data Systems (EDS) who encourage previously disadvantaged schools to integrate Computer Technology into the curriculum. The grants were funded by EDS teams and had accounts around the world. Through competitive application process, Educators applied for the grants and used them to purchase technology for their classrooms to enhance students learning. South Africa's Orange Moravian Primary School was one of the schools that were funded by EDS Grants in 2003. Many learners in this school were just learning to use computer. The school near Cape Town serves a poor community, with many of the 700 students living in informal settlements and fishing villages. A $ 1, 500 technology grant from EDS allowed the school to buy two computers, a printer and modem connection (EDS Global Community Affairs, 2003).

Portia Fortuine was the teacher who won the grant for the school. She said that, EDS was very instrumental in getting their technology plans off the ground. They wanted all their educators and learners to be computer literate. They wanted educators and learners to have their own e-mail addresses and engaged actively with schools locally, nationally and overseas. The school used computers primarily for improving reading and language skills among the students. The school planned to introduce computers to senior classes. Over the time, the school wanted to see technology integrated into all Oranjekloof classes. The EDS Technology Grant also wanted to give local residents a boost because the school offered them evening classes in computer skills. There were other schools in Johannesburg who were funded by the EDS, like Dawnview High school and Bermann

Primary School. In Bermann Primary School they said that they were going to offer computer literacy to the community as well (EDS Global Community Affairs, 2003).

In South Africa apartheid left large inequalities in the schools and many educational challenges. The technology grants were used to give the schools solid foundations on which to build. Education was the primary focus of EDS' community efforts. The company focused on bringing the "digital divide", separating technology haves and have-nots. The other South African schools receiving technology grants from EDS were AZ Bermann Primary School and Holy Cross Convent High School near Cape Town, Robin Hills Primary and Dawnview High School in Johannesburg. AZ Bermann Primary School used the money to build up an IT centre. The centre was going to be established to help learners in pre-school through eight grade learn about technology. The EDS also trained educators on software applications. The centre was also going to offer computer literacy classes to the community (EDS Global Community Affairs, 2003).

Computer education is an important priority for South Africa as the government seeks to improve the skills, knowledge and values as young people need to participate in society. Technology is seen as a way to improve education and to help boost the poor out of poverty and into the job market (EDS Global Community Affairs, 2003).

The researcher found it quiet difficult to understand how the whole school was going to operate with two computers and one printer. The other thing was that they did explain how the learners were going to integrate computer technology into the curriculum. The school said that computers were going to improve reading and language skills. But the

school did not explain how they were going to do that with only two computers that were available to them. They did not explain if the educators were trained to use computer technology and to integrate it into the curriculum. It was not clear how the community was going to be trained and who was going to train them.

1.5.2 Bridge Builder

Bardien (2001) called himself an Information and Communication Technology (ICT) activist. Bardien who was one of the first black representatives on the Western Cape Schools' Network, wanted to prioritize the development of ICT in disadvantaged schools. A report that was done by the University of the Western Cape in 1998 / 99 indicated that, most schools in South Africa struggle financially. Bardien has therefore called for the investigation of innovative and cheaper solutions that would give schools access to ICT (Bardien, 2001).

Bardien's initial aim was to give disadvantaged schools access to ICT on board of South Africa's Western Cape Schools' Network. The educational network organisation supplied Internet to primary and secondary schools in the Western Cape and promotes the use of the Internet in Education. Thanks to the introduction of information and communication technology at Alexander Sinton, a previously disadvantaged school on the Cape Flats.

The school children came up with an initiative to quickly mobilise the community to help find a missing girl. They asked the police to e-mail her photograph to the school, printed out copies and distributed it in their neighbourhood. The missing girl was found after their effort. Now learners at Alexander Sinton integrate computers and Internet into most of their school's work. They were in regular contact with students across the world

and swap information about each other's countries. Alexander Sinton has already assisted less advantaged schools in getting access to ICT. The school also encourages other schools to visit them and evaluate their technology as an additional option to acquiring ICT (Bardien, 2001).

In this reading the school did not make it clear how the learners integrated computers and Internet into their school's work. It is not known which grades were integrating computer technology into the curriculum and which learning areas were mostly involved in this integration. It was also a good thing that Alexander Sinton assisted less advantaged schools in getting access to the ICT. But, the school did not make it clear in what ways they helped other schools in terms of the ICT.

1.5.3 The Datatec Education and Technology Trust

Datatec, the international networking and IT services group established a R10 million fund to help boost South Africa's previously disadvantaged communities. To date, R3, 7 million has been allocated to projects to develop members of previously disadvantaged communities. R3 million has been used to build the Centre for Innovation at Hilton College in KwaZulu – Natal, which hosts a significant educational outreach program for KZN province. The Centre for Innovation at Hilton College was a key to a significant community involvement and outreach program, which included educate – the educator and learners training (Datatec, 2001).

R300 000 has been donated to Ulwazi Training Solutions in Woodmead, Johannesburg and R250 000 has been made available to an Ebony and Ivory Park project, Siyakhula

Bridging School. E W Hobbs, a school in Eldorado Park, has received a further R200 000 from the trust. The Trust focuses on funding the provision of infrastructure and skills for the teaching of mathematics, science and computer skills at secondary and tertiary levels. They are particularly concerned with helping to bridge the gap between high schools and post – matriculation studies (Datatec, 2001).

Ulwazi Training Solution offers IT technical training to matriculation from previously disadvantaged communities. At present the centre offers the A+ International Certificate in Computer Support. The Ulwazi Artisan Training Programme, trains students to become international certified computer technicians. It offers a slower paced, more comprehensive version of the A+ courses, which take into account the previously disadvantaged background of its students.

The Siyakhula Bridging School commenced in July 2000 for the purpose of providing an introduction to, and development of basic information technology skills to residents of the disadvantaged Ebony and Ivory Park communities. To date five courses of the bridging school have been successfully completed. Each course consists of a basic and advanced course, as well as an introduction to keyboard skills. 16 students have passed the advanced course and 28 students have passed the basic course.

1.5.4 Technology's Impact on Learning

According to the National School Boards Foundation (NSBA) (1995), findings, technology is making a significant, positive impact on education. Educational Technology as demonstrated a significant positive effect on achievement. Positive effects

have been found for all major subject areas, in preschool through higher education, and for both regular education and special needs students. Evidence suggests that interactive video is especially effective when the skills and concepts to be learned have a visual component and when the software incorporates a research-based instructional design. Use of online telecommunications for collaboration across classrooms in different geographic locations has been show to improve academic skills.

Educational Technology has been found to have positive effects on student attitudes toward learning and on student self-concept. Students felt more successful in school's work were more motivated to learn and have increased self-confidence and self esteem when using computer based instruction. This was particularly true when the technology allowed learners to control their own learning. The level of effectiveness of Educational Technology was influenced by the specific student population, the software design, the teacher's role, how the students are grouped, and the level of student access to the technology. Introducing technology into the learning environment has been shown to make learning more student-centered, to encourage co-operative learning and to stimulate increased teacher/student interaction (NBSA, 1995).

1.5.5 Teacher's Online but Disconnected

At Sanders Corner Elementary School in Loudoun County, the computer has become a teaching tool almost as basic as the textbook or the chalkboard. But, a number of Educators in the area lack the training to use computers in the class. Sixth grade teacher Eric Fleming, for example, would love to convert his students' weekly newsletter into a

classroom-designed Web site where parents could see what their children had learned each day. The school's hardware and software were capable of such an effort, but he was not. "That was all well beyond me, "said Fleming, considered one of Jermantown's most computer-fluent instructors (Washington Post, 2000).

Educators and school officials said the gap instead boiled down to the fact that some educators were getting more help than others in building on what they learned in technology training class. And some educators were more motivated than others to seek such help in the first place. Some schools, like Sanders Corner, had a full-time technology specialist who was regularly giving educators ideas on how to use computers to enliven their lessons; many others, like Jermantown, had to share that person with other schools (Washington Post, 2000).

"There were educators out there who were extraordinary. They pretty much taught themselves," said Linda G. Roberts, director of educational technology at the U.S. Department of education. "Another group was using some of the resources but was easily discouraged. . . . Most educators wanted to learn, but they said it took time and they needed help. In Washington area more than 95 percent of schools and nearly two-thirds of classrooms had computers connected to the Internet. Yet in a survey that was done by the National Center for Education Statistics, 79 percent of educators said they did not get enough help using technology in the classroom (Washington Post, 2000).

June Streckfus, executive director of the Maryland Business Roundtable, a nonprofit group of business leaders that was monitoring computer use in Maryland schools. She

said that, there was not enough integration of computer technology day in and day out that they would like to see. She also said that school administrators generally did not measure how well or how often educators used classroom technology. Nor have schools developed guidelines on what role computer technology should play in the curriculum, either by academic subject or by grade level (Washington Post, 2000).

Kathy Hayden, a technology resource educator since 1995, was a fourth-grade instructor in Loudoun who loved using computers in class. School staff members said her advice carried weight because she truly understood a classroom educator's job. At Sanders Corner, Hayden started "Tech Tuesday," a weekly training session that rotated among small groups of educators with common interests or skills. She also attended planning meetings of some grade educators. Sometimes she would teach a lesson with a classroom instructor who was shy about using computers. The Maryland Business Roundtable urged school districts to put a full-time technology specialist in every school. Fairfax school officials proposed spending $4 million to hire an additional 114 technology specialists, so that each would be assigned to no more than two schools (Washington Post, 2000).

This reading was relevant to the study in such a way that, the schools who were previously disadvantaged have now acquired computer technology. As these schools have computer technology, not all educators had formal training in the use of computer technology. The researcher was one of the educators who did not have formal training, of how to integrate computer technology into the curriculum. He had to register a computer course at the University of Natal to get formal training. Since the researcher started teaching he can not remember a time when the Department of Education in KwaZulu-

Natal organized workshops to educate the educators, in how they can integrate computer technology in their day to day classroom activities.

1.5.6 HOW EDUCATORS INTEGRATE COMPUTER TECHNOLOGY INTO THE CURRICULUM.

1.5.6.1 Introduction to Educational Technology

According to Sampath (1990), one of the main tasks of education in a modern society, was to keep pace with this advance in knowledge. In such society, knowledge cannot be received passively. It is something that is to be actively discovered. The main account in education should be on the awakening of curiosity, the stimulation of creativity, the development of proper interests, attitudes and values, and the building of essential skills such as independent study and capacity to think and judge for oneself. Educational Technology provides the necessary answer to all these problems. Technology of education is being developed with the aim not only of making education more widely available but also of improving the quality of education which is already available. The nature of these emerging educational Techniques has been influenced by modern psychology. Developments in technology bring about changes and shifts in educational goals which, in turn stimulate the emergence of newer techniques.

1.5.6.2 How is Computer Technology integrated into the Language Arts Education?

Word Processing and Desktop Publishing

Generally word processing and desktop publishers are viewed as the versatile and powerful software for teaching language topics, a word processing package may have various features depending on its purpose and intended users. Word processing software

designed for early elementary students may include draw features, easily imported graphics and text to speech capabilities. For upper elementary students, programs often include a spell checker and screen display often look more matured. Middle and high school students usually use word processing packages designed for adult use. This can help students to create announcements, flyers, invitations, special calendars and banner advertisement. This can help students to create school newspaper and write business letters (Roblyer & Edwards, 1997).

1.5.6.3 The Internet

The capability of communication with other students has provided unexpectedly powerful support for language arts and English activities. The rapid growth in the quantity and quality of World Wide Web site that provides major resource for educators and their learners. E-mail or chats help to gather information from expects. The learners, who send information to their favorite authors, may now have the web sites. Students collect book reviews from other students. These reviews are then used in a book review database. Educators use the misinformation on the Web to develop their learners' information literacy skills (Roblyer & Edwards, 1997).

1.5.6.4 Instructional Software and Software Tools

Several other kinds of software support and encourage correct language and sentence structure in students' writing. Software to support skill building within process writing includes spell checkers, style analyzers and other language analyzers. The increasing supply of critical thinking and problem solving programs represents source of instructional material closely aligned with language arts. Many of these programs cover

skills essential for reading comprehension, writing, information literacy and visual literacy (Robleyer & Edwards, 1997).

1.5.6.5 Computers in the Laboratory

Kahn (1985) said that, science laboratory was a place where every special sort of activity took place. The introduction of computers into the laboratory had a significant effect on all the aspect of laboratory work. Computers can function as device which controls, measures, sense, signal, calculate, display, plot and record. Computers can also be used as data representation. Experiments generate data and data must be represented in some form or another. Numbers can be converted into tabulations, line graphs, bar graphs, pie chats or scatter diagrams.

1.5.6.6 Using Computers in Mathematics

Pasamentier & Moresh (1983) stated that before computers are used one should first understand what is meant by computer programming and develop a plan. The plan would outline the steps that should be followed to solve a problem. Sequence of instructions should be developed. The instructions must be in a language that the computer understands. The study that was done by de Villiers & Cronje (2001), quoted in Pasamentier & Moresh (2001), showed that Mathematics provided many of the fundamental thinking skills which underpin scientific and technical thought. Learners also need to be prepared for the technological challenges of the future, and have well developed critical thinking and problem solving skills. To address the problem, schools have embarked on major computerization projects. Schools have at least one computer

laboratory. This will enable the learners to feel empowerment that is brought about by competence in computer technology.

1.5.6.7 How is Educational Technology Integrated into Special Education?

Educational Technology can play a major role in special education. It can also be used to assist learners who are developmentally delayed and those who are physically disabled. According to Robleyer & Edwards (1997), Educational Technology can improve motivation and self-concept; it can increase opportunities to use communication and interaction skills; it can also give support to help Educators cope with paper work, because special education is an area known for its tremendous paperwork. After drill and practice the second most application for children with learning disabilities and behavioral problems is word processing. Holzberg (1994), cited in Robleyer & Edward (1997), reports that word processing has helped students with a variety of disabilities and emotional problems make great strides in improving their written language skills. "Children, who may be incapable of writing an essay, paragraph, sentence, or even a word on paper, find that they can write with a word processor". Stimulation programs offer students opportunities to see the consequences of their choices. They are often designed to model reality, which enables students to develop their decision making and problem solving skills within the context of a safe learning environment.

1.5.7 "The Role of Technology in America's Schools."

The importance of Educational Technology

According to Chin (2000), Educational Technology is a crucial element of a quality education. Technology in the classroom enhances educational experience and prepares

students for employment in an economy growing increasingly dependent on technology. In the classroom students who have daily access to cutting-edge technology perform better academically. Studies have found students who use technology in the classroom show more enthusiasm, have higher attendance rates, develop better writing skills and display a greater capacity to communicate effectively about complex problems. These studies confirm what Chin (2000) has seen firsthand in his classroom and in the classrooms of his colleagues. Educational Technology helps bring excitement to the classroom, complementing our work by allowing students to see hands-on, practical applications for maths, science and the broad range of curriculum topics.

The use of Educational Technology also reaches beyond the classroom, to ensure that students are ready to compete in the global economy. Today's students will face a job market in which most, if not all, employment opportunities will require at least a basic technological competence. Computer literacy will often be a determining factor in employability for a wide range of jobs, including those outside the traditional technology field. Even today's fast food jobs require rudimentary computer skills (Chin, 2000).

1.6 METHODOLOGY

1.6.1 CASE STUDY

In this study the researcher was to doing a case study because he wanted to do an in – depth study of four schools, in Umlazi. The researcher wanted to get all the information that he needed about how schools integrate computer technology into the curriculum. The researcher had school, 1, 2, 3 and 4 in his study. In school one, he observed and interviewed Language, literacy and communication (LLC) and Human and Social

Science (HSS) educators. In school two it was Mathematics Literacy, Mathematics and Mathematics Science (MLMMS) and Natural Science (NS) educators. In school three, it was Arts and Culture (A&C) and Economic Management Science (EMS). In school four it was Technology and Life Orientation (L O). According to Tellis (1997), a case study is designed to study one case of something, like programs, cities or work sites, as a distinct whole with the goal of understanding the set as a distinct whole in its particular context. A case study primarily using qualitative techniques, but do not exclude quantitative data A research method which focuses on the characteristics, circumstances and complexity of a singe case. The case is viewed as being valued in its own right and whilst findings can raise awareness of general issues. The aim is not to generalize the findings to other cases.

1.6.2 QUALITATIVE RESEARCH

My study was based mostly on qualitative research, but in some cases the researcher used quantitative methods of interpreting the data. The researcher also used graphs and numbers to explain certain sections in his data. Wikipedia (2001), stated that qualitative research is a research that focuses on the experiences, interpretation, impressions or motivations of an individual or individuals, and that seeks to describe how people view things and why. It relates to beliefs, attitudes and changing behavior. Data can be collected through open – ended in-depth interviews, review of documents, artifacts, observation, participant's observation. Kreuger, (1988), quoted in Lewis (1995), stated that qualitative research taps into human tendencies where attitudes and perceptions are developed through interaction with other people.

1.7 INSTRUMENTS OF DATA COLLECTION

1.7.1 QUESTIONNAIRE

In this study the researcher also used questionnaires as one of the tools to collect information from the educators who did not take part in interviews and observations. The reason being the researcher was not going to be able to interview and observe all the staff members. The only way he could get data from other staff members was to use questionnaires. Questionnaires are a good too to collect data from a large number of people. Wilson (2000) defines questionnaires as a set of specially designed questions to which answers are written on a pre-prepared form. It tells you who your audience might be in demographic and psychographic terms. It tells you about your audience's behaviour and lifestyle. It is a way of finding out exactly what your audience knows and need to know about your topic. It is also containing up to date information, which is not available from any other source.

Wilson (2000) also pointed out that before the questions are designed, it is very important to think very carefully about what information is needed from whom. Your questionnaire is a tool to help you get that data. A poor quality questionnaire will yield poor quality data. Points to consider when designing a questionnaire include the following:

- Questions should clearly laid out and easy to read.
- Keep it short (no more than two sides of A4).
- Start off with easier questions (age, occupation, etc) and finish with the ones that have to be thought about a little more.
- Each question should ask for one piece of information.

Wilson (2000) stated clear that the researchers have to be nice and polite to the participants because they are doing a big favour. The questionnaire was going to try and address critical question number one.

These are the examples of the questions the researcher used in his questionnaire:

- Are you currently using Computer Technology in your classroom?
- If so, give some examples.
- For how long you have been using Computer Technology in your school?
- Have you ever received any formal training in integrating Computer Technology in the curriculum?
- Do you think it is necessary to integrate Computer Technology into the curriculum? Yes / No
- How do you rate the use of Computer Technology throughout the school?

  Very good / good / fair / poor
- Since the integration of Computer Technology in your learning area, how do you rate the performance of your learners?

  Very good / good / fair / poor
- From your own observation have the learners enjoyed lessons where you have integrated Computer Technology? Yes / No
- If you have to rate your self and your colleagues, would you say you are fully competent / competent / not competent in the use of Computer Technology in the classroom?
- What is your overall opinion about the integration of Computer Technology into the curriculum?

1.7.2 OBSERVATIONS

The other tool the researcher used to collect data in this study is observation. He observed how educators integrate computer technology into the curriculum in previously disadvantaged high schools. If educators allowed him to take part in a lesson, he was going to do so. He wanted to do participant observation. He wanted to be part of the class, so that he would get all the information he needed. If he worked with the learners and the educators he would stand a good chance to get in – depth information from both the educators and the learners. The researcher observed two educators per school in two learning areas. To observe two educators per school helped the researcher to cover all eight learning areas. Grant (1997), defined observation as a technique in which an investigator collects information through direct participation in or observation of a group, tribe or community. Observation is also defined as observing humans gather information as raw material for constructing fundamental knowledge.

1.7.3 INTERVIEWS

Individual semi-structured interviews and individual structured interviews

In this study the researcher used individual semi-structured interviews and individual structured interviews. He used these two types of interviews because; he started with questions where the participants responded with one word answer. After that he asked the questions where the participants elaborated on their answers. He used face to face interviews and interviewed the educators in their classrooms and in places where they felt more relaxed. He interviewed the educators before and after the lessons. To interview the educators before the lessons helped the researcher to know the plans of integrating Computer Technology into the curriculum. After the lessons the researcher had a chance

to ask questions about what he observed in the classroom.

Individual semi-structured interviews

Cunningham (1993), cited in Lewis (1995), stated that semi – structured interviews are an important part of any research project as they provide the opportunity for the researcher to investigate further, to solve problems and to gather data which could not have been obtained in other ways. Scott (1997), cited in Lewis (1995), stated that sometimes the interviewer has to wear many hats and assume different roles throughout the course of the discussion.

Some of the examples of semi-structured interview questions include:

- Do you think it is necessary to use Computer Technology in the classroom? Why?
- Do you think the use of Computer Technology in different subjects in your school has an impact on the way learners learn?
- If you have used Computer Technology in your classroom, have you experienced any problems with it? If yes, please explain.
- What plans to you have to overcome these problems?
- How does Computer Technology help to improve the standard of teaching and learning in your school?
- What is the future of Computer Technology in your school?

More questions came up from the conversation between the interviewer and the respondents.

Semi – structured interviews are unlike structured interviews framework, where detailed questions are formulated ahead of time, structured interviews start with more general questions or topic. Relevant topics are initially identified and the possible relationship between these topics and the issues such as availability, expense, effectiveness become the basis for more specific questions which do not need to be prepared in advance. Not all questions are designed and phrased ahead of time. The majority of questions are created during the interview, allowing both the interviewer and the person being interviewed the flexibility to probe for details or discuss issues. Semi – structured interviews are going to be used in critical question number three. Educators will be interviewed.

Structured interviews

According to Candace (2004), structured interviews are sometimes referred to as a patterned interview. This type of interview is very straightforward. The interviewer has a standard set of questions that are asked of all candidates. This makes it easier for the interviewer to evaluate and compare candidates. The features of structured interviews are:

- It is legitimate and reliable.
- It controls the flow of the interview.
- It makes the interview the same to everyone.
- Questions are pre-written, reducing nervousness for the interviewer.
- It maximizes the interviewer's time.

These are some examples of structured interview questions the researcher used in his interviews:

- In which learning area are you?

- In which learning area do you think the use of Computer Technology is mostly effective?
- Which tasks would you give to your learners that allow them to use Computer Technology?
- Do your learners enjoy lessons that integrate Computer Technology?

1.8 SAMPLING

Random Sampling

In this study the researcher gave all educators a fair chance to be selected for sampling. He did not want to select only the educators who had learners who were doing well in their school work. According to Ouyang (1996), random sampling is the process of selecting a sample in such a way that all individuals in the defined population have an equal and independent chance of being selected for the sample. It is considered as the best single way to obtain a representative sample that is required by inferential statistics. For example in a population of 100 people, everyone can be assigned a unique number, then the numbers are put in a hat and 40 members are drawn to choose 40 people to be in that sample. These are people from whom the researcher would collect information. In a random sample, all people in the population have an equal chance of being chosen.

The researcher visited four schools in Umlazi. He observed one educator per school and interviewed two educators; and gave four educators who did not participate in observations and interviews questionnaires to complete. In his sampling he worked with grade 10 educators. The reason was that grade 12 learners had June examinations and trials. In grade 11 they had June examination, external examinations and work

experience. So grade 11 and 12 learners were busy. The grade 10 learners had June examination only. They did not have any other formal examinations in mid – year. The researcher did not choose the juniors because they were still doing the all subjects. They were not specializing in certain subjects. In his sample the researcher asked for a list of grade 10 educators from the headmaster. He made copies and then cut them out neatly and folds them. He put all the folded pieces in a bowl and asked the Deputy Principal to pick up any two pieces from the bowl. This is how the participants were chosen.

1.9 THEORETICAL FRAMEWORK

1.9.1 CONSTRUCTIVISM

The researcher wanted this study to be based on the constructivism paradigm. He wanted to use this paradigm because it encourages learners to be actively involved in a lesson. It is

a philosophy of learning founded on the premise that, by reflecting on our experiences, we construct our own understanding of the world we live in. Each of us generates our own rules and mental models, which we use to make sense of our own experiences. Learning therefore, is simple the process of adjusting mental models to accommodate new experiences (Jacqueline & Martin Brooks, 1993).

Apple cited in Blackledge & Hunt (1989) stated that in constructivism learners are not expected to absorb knowledge. They are given a chance to think creatively and be actively involved in classroom activities. Collaghan cited in Blackledge & Hunt (1989), stated that to construct knowledge you need resources, such as libraries, television, computers, magazines, newspaper, oral sources, written sources and others. The

educators make use of these resources with the aid of the teacher. Educators are encouraged to facilitate rather than control and dominate.

1.9.1.1 Constructivist Learning Theory

According to Bencze, (2002) constructivism emphasises the building that occurs in people's minds when they learn. He stated that each person sees or observes depends on what is already stored in that person's mind. This suggests that learning from our environment is an active, rather than a passive process. In other words we each construct a unique mental image by combining information in our heads with the information we receive from our own sense organs. Learners can not be treated like their brains are blank slates to be written upon or empty vessels to be filled up with information. Learners are not passive. Rather are they often quiet active in learning?

For students to learn, therefore, experiences on their own are not enough; they need to receive different lances, like different laws and theories through which to view objects and events design tests and interpret data. Teaching is therefore about causing paradigm shifts; that is getting students to see things in new ways. Because knowledge is so communally based, moreover learners deserve access to knowledge of different communities. Learning should not be so conservative as to ignore knowledge and ways of knowing of different races, culture and societies. In other words, learning must be pluralist rather than conformist (Bencze, 2002).

1.9.1.2 Principles of Learning

Dewey (2002), cited in Bencze (2002), came up with some guiding principles of constructivist thinking that should be kept in mind when educators consider the role of educating learners.

- Learning is an active process in which the learner uses sensory input and constructs meaning out of it. Learning is not a passive acceptance of knowledge, which exists not there, but that learning involves the learner's engaging with the world.
- People learn to learn as they learn: Each meaning we construct makes us better able to give meaning to other sensations which can fit a similar pattern.
- The critical action of constructing meaning is mental: It happens in the mind. Physical actions, hands on experience may be necessary for learning. We need to take part in activities which engage the mind as well as the hands. (Dewey called this reflective activity).
- Learning involves language: The language we use influences learning.
- Learning is a social activity: Our learning is intimately associated with our connection with other human beings, our Educators, peers, families, as well as casual acquaintances.
- Learning is contextual: We learn in relationship with to what else we know, what we believe, our prejudices and our fears. We can not divorce learning from our lives.
- One needs knowledge to learn: It is not possible to assimilate new knowledge without having some structure developed from previous knowledge to build on. The more we know the more we learn. Therefore any effort to teach must be connected to the state of a learner must provide a path to the subject for the learner based on that learner's previous knowledge.

1.9.1.3 Teaching Implications in Classroom Practice

In the classroom, the constructivist teacher sets up problems and monitors student exploration, guides the direction of the student's inquiry and promotes new patterns of thinking. The teacher refers to raw data, primary source and interactive materials to provide experiences for their students rather than relying solely on another's set of data.

In a constructivist classroom:

- Student's autonomy and initiative are accepted and encouraged. By respecting student's ideas and encouraging independent thinking, Educators help students attain their own intellectual identity.
- The teacher asks open-ended questions and allows wait time for responses. The ways Educators ask questions and the ways students respond will structure the success of student's inquiry.
- Higher level thinking is encouraged. The constructivist teacher challenges students to reach beyond the simple factual response. He encourages students to connect and summarise concepts by analysing, predicting, justifying and defending their ideas.
- Students are engaged in conversation with the teacher and with each other. If the students have a chance to present what they think and hear others ideas, they can build a personal knowledge based that they understand.
- The students are engaged in experiences that challenges hypothesis and encourage discussion. The constructivist's teacher provides ample opportunities for students to test their hypothesis, especially through group discussion or concrete experiences. (Jacqueline & Martin Brooks, 1993).

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter the researcher has used different ideas from different books to illustrate the advantages and disadvantages of using computer technology in schools. This chapter shows how schools in South Africa and other countries started to introduce computer technology in their schools. It also gives ideas of how computer technology can be used across the curriculum. This chapter does not only cover good things that can be done by computers. It also covers the problems that can be experienced by a computer user and how to avoid them.

2.2 COMPUTERS IN SCHOOLS TODAY

In England computers have now been used in most schools for many years. In 1989 in England, the National Curriculum Council recommended that each school should have one computer in every class, quite an increase on the original one per school. In 1992, the Parliamentary Office for Science and Technology (POST) took this even further by recommending that there should be at least one computer for every twelve pupils, an estimated additional increase in requirements across the country of more than 300,000 computers. The staff must be trained in maximizing these scarce resources, and again, this implies a constant programme of learning if only to keep with new developments. The effectiveness of using Information Technology (IT), throughout the curriculum must be assessed and managed, again to maximize the effectiveness of these resources (Greenwood, 1993).

2.2.1 The Computer as A Cross Curricular Tool

According to Greenwood (1993) when computers were introduced in schools in early 80's were used for supplementing existing teaching methods in curriculum subjects such as English and Mathematics. Their effectiveness was very limited due to both lack of suitable software and a very real shortage of computers; most activities can only be performed on a 1:1 basis or in small group situations. It is now common to see computers in use for subjects ranging from Music, History, Geography and Languages, through to drawing and all the Sciences. The more computers are used by children, the more they gain keyboard and other computer skills, adding to their confidence in using such machines for many other purposes.

Computers help pupils to learn mathematics by developing a logical way of thinking, perhaps testing their own theories by using spreadsheets and other computer based tools, rather than by the more traditional of repetitious "parrot-fashion" learning. By the age of 16, pupils are expected to have covered the use of computers in the following five "strands" of capability: communication with word and music, by using packages such as word processors and desk-top publishing systems, incorporating tables and graphs in their work; the handling and retrieval of information, using databases; modeling of real life situations, for example by using a spreadsheet to simulate business performance and perform "what-if' analyses; measurement and control using a computer; study the social, economic and ethical implications of Information Technology (Greenwood, 1993).

2.2.2 Computer Traps and Pitfalls

In most of the time, computers are very reliable and can be an extremely powerful tool for helping the student to perform all sorts of complex work. A natural consequence of this can be that a computer user becomes very reliant on such a machine and as this happens, there is a danger that if a computer does happen to fail, a lot of work can suddenly be lost forever, causing immense problems to the poor unsuspecting user. Whilst this may sound a little frightening, once the reasons for such problems are understood, it is easy to adopt simple procedures which help minimize these risks. One of the most common problems encountered by anyone using a computer is loss of data. Having typed a masterpiece into the computer's word processor, if the power then fails before the work has been saved to disk, everything will be lost without a warning (Greenwood, 1993).

To prevent this happen, it is necessary to save the work to a disk file as the work continues. This is a simple discipline to adopt, but what happens if the computer's own hard disk fails? Data should always be backed-up at the end of every computing "session" onto another medium, such as the floppy disk or tape drive. There are many different types of backup procedures that can be adopted to overcome these problems. It is up to the user to decide which is most suitable, like data backups. All data files are copied each time. This takes less time and space than a full backup and still backs up the user's all important data files. Before anyone uses any computer for serious work, they should satisfy themselves that effective backup procedures are used (Greenwood, 1993).

2.2.3 Computer Viruses

A virus is nothing more than another computer program, usually written by a talented, bored software engineer. The virus attaches itself to any program run on an "infected machine". If the program is on a floppy disk and the disk is transferred to another machine, that machine now becomes infected. There are literally hundreds of known viruses, some are relatively harmless, causing silly messages to occasionally appear on the screen whilst others, such as "stealth" viruses can be particularly nasty and difficult to detect and to deal with. Such viruses are written to do unpredictable things to the computer, such as erasing all data at a pre-determined time or by causing insidious corruption of data in files (Greenwood, 1993).

The answer is two-fold. First, ensure that all incoming software is "Virus-Checked" using a reputable and up-to-date anti-virus package. Secondly, it is recommended to all users that they use software from recognized sources, and do not swap disks with friends or acquaintances. They may unwittingly be giving you a hidden present (Greenwood, 1993).

As Greenwood (1993), stated that in England the National Curriculum Council recommended that each school should have at least one computer in every classroom. In the case of previously disadvantaged schools in South Africa, they can start small by having one computer or two computers per school. One can be used to do administration work and the other one can also be used to do school work. Educators who are not computer literate can be encouraged to attend computer courses, so that they will be able to use computers that are available to the school. The schools that are planning to start computer studies should be made aware of the problems they might experience in

computer studies. They should be made aware of the computer virus and how to deal with it. The learners should be encouraged to visit sites that are educational.

2.3 COMPUTERS IN EDUCATION

2.3.1 The Impact of Computers in Education

Computer technology is beginning to have a significant impact in almost every aspect of education. It is hard to imagine an organization, whether it is large or small, that does not or could not advantageously use a computer in its operations. However, in this book, Computers in Education, Merrill (1992) did not feel that computers are a panacea for all the problems of education, nor do they feel that they should or will replace the teacher. Nonetheless, they do believe that computers are here to stay and that they do have a significant role to play in the classrooms of today and tomorrow (Merrill, Hammons, Tolman, Christensen, Vincent & Reynolds, 1992).

2.3.2 Example Application

2.3.2.1 School Newspaper

According to Harris, Arntsen, Thurman & Merrill (1987), quoted in Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds (1992), stated that Westmore Elementary school uses computers to challenge gifted and talented students in the production of an elementary school newspaper. During the first year, three sets of eight gifted and talented students from the second, fourth, and sixth grades were selected to serve as editors of the newspaper. After an examination and discussion of the parts of a newspaper, each student selected a particular section of the newspaper, such as world events, sports, comics,

school events, and so on, in which they would serve as editor. Editors then return to their own classrooms and asked their classmates to submit items for the newspaper.

All editors attended several training sessions where they received instruction and practice on basic journalism skills such as interviewing, writing, and editing. They also received instruction on how to use a computer as a word processor to type, edit, and print their articles. Once the students had typed and edited their articles on the computer, the teacher used a desktop publishing computer program to assemble and lay out the articles in a newspaper format specified by the students. The students reviewed the layout of the paper on the computer screen and suggested desired changes. The final version of the paper was printed on a computer printer and then photocopied for distribution to students, Educators and staff. This project provided an opportunity for students throughout the school to participate in a common project and develop a variety of skills in creativity, organization, and co-operation (Harris, Arntsen, Thurman & Merrill, 1987) quoted in Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds (1992).

2.3.2.2 Writing to Read

Leahy (1989), quoted in Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds (1992), pointed out that the Kettering City School in Ohio have significantly increased the writing and reading skills of their primary grade students through the implementation of a computer based program called Writing to Read. The Writing to Read System is based on the idea that children should learn to write before they learn to read by using a phonemic spelling system to encode the sounds and words that they say into written

letters and words. Children are taught to write what they can speak and to read what they write.

The center consists of six learning stations: the computer station, the writing/typing station, the work journal station, the listening library station, the multisensory materials station and the "make-words" station.

1. *The computer station* contains three or four microcomputers with audio capability where students spend 12 to 15 minutes each day listening to words and sounds, and than speaking the words and sounds and typing the letters that make up the sound and words. After completing a session at the computer station, students may move to one of the other stations to use and practice what they have learned.
2. *At writing/typing station*, made up of six to eight type writers or microcomputers with a word-processing program, students type the words they have learned from todays' or previous computer lessons. In the beginning they type one word per line. Soon they use their own words and write simple sentences (Martin & Friedberg, 1996), quoted in Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds (1992).
3. *At the listening library station*, children put on earphones to listen to cassette recordings of their favorite stories. As they listen, they use a finger to follow along the printed words of the story in a book. In time they begin to match the spoken word with the written word.
4. *At the work journal station,* children practice writing letters and words they have learned using soft lead pencils.

5. *The multisensory materials station* provides additional opportunities to use the sense of touch to reinforce the relationship between sounds and letters.
6. *At the" make –words" station,* the students use wooden block letters, letter cards and the like to play word games. The learners work in pairs at this and each of the other stations. Back in the regular classroom, Educators reinforce the activities of the Writing to Read Centre by reading to the children, allowing them to share their stories with each other, encouraging them to read books and schedule time for writing activities.

Between 1982 and 1994, the Educational Testing Service (ETS) tested 105 schools across the country. They found that on the average, Writing to Read kindergarten students scored 15 percentile points higher on standardized reading tests than did control group students (Martin & Friendberg, 1986), quoted in Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds (1992).

However the Writing to Read is not without its detractors. Salvin (1990), quoted in Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds (1992), summarizes several recent multiyear studies that show that even though Writing to Read seems to have positive effects in kindergarten, those effects appear to drop out by the end of the first and second grades.

2.3.2.3 Computer –based Manipulatives

According to Merrill, Hammons, Tolman, Christensen, Vincent & Reynolds (1992), many educators have found that the use of physical objects that children can touch or feel, pick up, hold in their hands, turn, arrange in different patterns, or otherwise

manipulate are a valuable aid in helping children move from concrete to abstract ideas. These physical objects are often referred to as manipulatives and include children's blocks of various sizes, shapes and colors. Several research studies have shown that manipulatives are especially valuable in the learning of mathematics. In summarizing the research, Suydam (1985), quoted in Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds (1992), concludes: "the use of manipulative material in mathematics instruction result in increased achievement across a variety of topics at every grade level from kindergarten through grade 8, at every achievement level, and at every ability level".

The children can play a game on the computer using the program called Gertrude's Secrets. The computer can provide immediate feedback for those who make errors in playing the game. The children are able to relate quickly to the computer software because it displays colored graphic objects that look very similar to the physical attribute blocks and are used in the same way. The computer game adds to the learning process by providing an extra level of abstraction, immediate feedback that minimizes the likelihood of a child's forming misconceptions, and positive reinforcement. The computer software can also provide an unlimited number of pieces and even allow the children to create new shapes. With the use of device to project the computer display onto a large screen in the front of the classroom, the teacher can demonstrate concepts to the whole class by using the computer based manipulatives (Merrill, Hammons, Tolman, Christensen, Vincent & Reynolds, 1992).

Many other computer programs are available that mirror other physical manipulatives used in the classroom. Elastic Lines simulates the geoboard on which students may explore geometric concepts. Puzzle Tanks provides representations of containers of many different sizes that students can use to solve problems related to volume by filling and emptying containers of specified volume. A wide assortment of math manipulatives is represented in these programs: Math Concepts; Exploring Measurement, Time and Money; and Hand-On Math. Simulated manipulatives are also available for more advanced mathematics in programs such as Algebra Concepts, Geometry and Calculus (Merrill, Hammons, Tolman, Christensen, Vincent & Reynolds, 1992).

2.3.2.4 Science Simulations

According to Merrill, Hammons, Tolman, Christensen, Vincent & Reynolds (1992), students from elementary through high school are learning concepts and problem-solving skills in the earth, life and physical sciences with the aid of a computer-based integrated learning system developed by Wasatch Education System Corporation. Six units of instruction are provided in each of the three science areas. The microcomputers in each classroom are all connected by cables to central computer station called a file server. By connecting the computers in a network, all the computer-based instruction software and students performance data can be stored in the central file server. This configuration eliminates problems related to software checkout and distribution and facilitates the generation of a variety of individual, class, and school progress reports. For example, in the Weather unit, students use simulated instruments to take weather readings in eight major cities across the United States. Two thermometers are provided to measure air temperature in Fahrenheit and Celsius.

An anemometer is used to measure wind speed, a weather vane to measure wind direction, a hygrometer to measure relative humidity, a rain gauge to measure precipitation and a barometer to measure air pressure. Computer-based lessons teach students what each instrument is for and how to read it and gather data. The simulation provides weather readings from each of the simulated instruments for times each day for the month of March form eight different cities. Students select a city, day and time of day to see the desired instrument readings. A teacher's guide suggest a wide variety of questions and exploration activities students can do to look for patterns in the weather data, compare pressure before and after a storm, determine how wind changes affected other readings, and so on. Many non-computer discussions and activities are also suggested (Merrill, Hammons, Tolman, Christenson, Vincent & Reynolds, 1992).

To aid students in their data-gathering and analysis activities, several computer-based tools are provided: an electronic database in which to record observations, an electronic notebook for making notes, a calculator, a glossary and a graphic utility. An electronic mail facility is also provided so that students can write notes to each other and to the teacher. This tool encourages the exchange of information and ideas (Merrill, Hammons, Tolman, Christensen, Vincent & Reynolds, 1992).

2.3.2.5 Research Results on the Effects of Computer-based Instruction

Numerous research studies have been conducted to determine the effects of computer based instruction on student learning, student attitudes and instructional time. They have been conducted across all levels of education: elementary, post-secondary and adult.

Most of the reviewers used a sophisticated analysis technique referred to as metal-analysis, which allowed them to equate the results from many different studies and determine an average effect size across all the studies reviewed. This effect size is generally reported in terms of standard deviation and percentile changes (Merrill, Hammons, Tolman, Christenson, Vincent & Reynolds, 1992).

Kulik & Kulik (1987) combined the data from several of the reviews in an analysis of 199 comparative studies. Thirty two of these studies were conducted in elementary schools, 42 in high schools, 101 in institutions of higher education, and 24 in adult education settings. The results of their meta-analyses showed that computer-based instruction, when compared to conventional instruction, raised examination scores by 0.31 standard deviations or from the 50^{th} to the 61^{st} percentile. Twenty eight of the studies reported that computer-based instruction reduced instruction time by an average of 32 percent and 17 studies indicated that students interest toward instruction were raised 0.28 standard deviations.

The use of computer-based instruction, when compared to conventional instruction, has a moderate positive effect on student achievement and attitudes toward computers and instruction and it is substantially reduces instructional time. These results indicate that computer based instruction can have positive benefits, although certainly it is not a panacea. One of the advantages of computer based instruction is that it is visible, replicable and transportable. It can be examined, tested, revised and improved (Merrill, Hammons, Tolman, Christenson, Vincent & Reynolds, 1992).

2.4 CURRICULUM INTEGRATION

2.4.1 Reading and the Language Arts

2.4.1.1 Why Integrate Technology into Classroom Curricular?

By looking into the work place now, we can see the need for skilled labor capable of using technology on the job. Some students will need to know to use word processor to meet employer needs. Database management software is used by financial, management and engineering personnel to solve problems generated on the job. If our students have an understanding of what this software can accomplish and how its application can save time, energy and money, they will be able to make greater contributions to productively more quickly than their predecessors could (Merrill, Hammons, Tolman, Christensen, Vincent & Reynolds, 1992).

Many educators believe that if we consider computer use in the same way that we think of reading and writing, we will create a population that is more computer literate. By teaching the computer and other technological tools as part of our normal curricula and then asking students to use these tools to complete educational activities, we develop students who are better prepared to use technology in later life. Just as we teach our students how to read and write in the early years, we need to teach them how to use a computer. Because the computer has such a wide variety of educational uses, the process of learning how to use the computer as a learning and problem solving tool takes a number of years. Educators and researchers are still learning how and when this can be done, but there is no doubt that it is necessary (Merrill, Hammons, Tolman, Christensen, Vincent & Reynolds, 1992).

2.4.1.2 Use Computers Where They Best Fit

In her book, Computers, Curriculum and Whole-Class Instruction, Collis (1992), quoted in Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds (1992), presented detailed lessons demonstrating how clear goals can be creatively and motivationally achieved using computers. Collis (1992) emphasizes the points at which computer applications more easily fit into various subjects commonly taught in elementary and secondary school curricula. Collis (1992), logically argues that word processing can enhance student writing skills; that simulation software can develop student inquiry skills in social studies and science; that computer can help capture and analyze scientific data; that database management software can help students collect, organize, classify and retrieve social science information; that graphic software displays can assist students in interpreting science and social science information. Collis believed that educators will more readily integrate technology into their instruction if they start with those points at which technology seems to fit naturally.

2.4.1.3 Organizing Resources to Promote Integration

As a result of limited budgets, many administrators have chosen to cluster their computer resources into laboratory settings and hire computer specialists to oversee computer use in their school. Classes are then scheduled into the lab, frequently without the classroom teacher. This practice often limits the computer curriculum to that of computer literacy development only. It takes a visionary administrator to create computerized environment in which integration can flourish with a minimal budget. These administrators know that teacher training is the key. If classroom Educators remain computer illiterate, integration is impossible. Educators must first be computer literate and then be introduced to specific

integrative strategies that enhance what they are already doing in their classrooms. Once this is accomplished, Educators must have ample time and resources to explore and play with integration. Obviously, this takes time and resources to accomplish (Merrill, Hammons, Tolman, Christensen, Vincent & Reynolds, 1992).

If educators go to the laboratories with their students or are involved in the decision of what is done in computer labs, integration can still be achieved. Once budgets allow for computer placement in classrooms as well as labs, then educators can choose the equipment configuration that best meets their curricula needs. Those educators who have become computer literate and who have access to a computer lab and computers in their classrooms have developed rich educational environments. For example, a teacher may use a single classroom computer, a projection system, and a word processor to accompany a brainstorming session involving discussions by the whole class. As the students make their verbal contributions, the information can be categorized or placed in outline form and displayed on a large screen. After the discussion is complete, this information can be printed out and copies made immediately or students can directly load the information into other computers to expand and refine the material electronically. Educators who can access computer labs can teach electronic tools such as word processing, database management and spreadsheet application faster and more effectively. After students master the basics of these applications, they are free to use them in class or laboratory settings, depending on which is easier and available (Merrill, Hammons, Tolman, Christensen, Vincent & Reynolds, 1992).

2.4.1.4 Enhancing Writing by Using Word Processing

When over viewing all the software used in the subject areas, one tool stands out as primary integration vehicle selected by educators: word processing. Many educators have selected word processing as their personal entrance into the computer world. After experiencing positive personal benefits, many are motivated to use the tool to enhance student learning, particularly by developing student writing skills (Merrill, Hammons, Tolman, Christensen, Vincent & Reynolds, 1992).

2.4.1.5 Word Processing and Process Writing

Many writing development projects such as the Bay writing project and the South Coast Writing Project in California have focused on developing student writing capabilities by assisting students while they write rather than evaluating a finished product. This approach is a process approach, focusing on developing process rather than isolated writing skills. Word processing gives students the ability to alter their work easily while they write. As children work at computers, educators, aides or parent volunteers can monitor students' work and assist them as they write, thus taking advantage of a teachable moment. Because they can easily move a cursor and add or delete versus the traditional pattern of erasing or starting over again, students more readily accept and use suggestions for change. Another positive attribute of word processing is that it lends itself to collaborative writing efforts (Merrill, Hammons, Tolman, Christensen, Vincent & Reynolds, 1992).

2.4.1.6 Word Processing and Development of Writing Skills

Although many educators are using the process approach to teach writing, some educators develop writing skills in isolation. Educators are frequently frustrated by lack of reinforcement or extension activities when teaching specific writing concepts such as writing a complete sentence or paragraph. The computer provides an alternative that can be cost effective and that lets educators easily alter activities to meet specific class and student needs. Integration strategies of electronically based writing activities include using specific activities to reinforce text-based writing assignments for the whole class.

Some educators use software that is actually a collection of activities that have been developed by using selected word processing software. For instance, writing development experts like Jon Madian have produced a series of writing activities to help elementary and secondary students develop their writing skills. Because they are created using the word processor and are merely text files, educators are free to easily modify and adapt the files to meet individual class or student needs. The advantage of using electronically based reinforcement for writing activities is that educators can easily tailor the activity to meet an individual need and that a student can more easily modify the text, whether it is during the draft, composition, or correction phase (Merrill, Hammons, Tolman, Christensen, Vincent & Reynolds, 1992).

2.4.1.7 Grammar, spelling, and Punctuation

According to Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds (1992), major concern of elementary and secondary educators is the capability of their students to

master the mechanics of writing, grammar, spelling and punctuation. Here again, educators can choose between a skills or process approach.

Skills Approach

Grammar

Grammar Gremlins by Davidson provides all three in one software program designed for elementary students. The program includes rules on grammar, punctuation, and the usage such as capitalization, possessives and contractions, plurals, parts of speech, sentence structure and subject-verb agreement. It has record-keeping capabilities and an editor, allowing for the addition of tutorial and multiple-choice screens. The flexibility of this program gives Educators and students a wide variety of approaches to learning and reinforcing specific rules. Many Educators are using this versatile program in classroom and lab settings.

Grammar Quest is a series of educational games on the parts of speech. Each game provides practice with a different part or parts of speech. Schwartz and Vockell (1998), quoted in Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds (1992), describe a series of games including Secret Language, Acrobat (pronoun), Duelling Catapults (verbs), and Grammar 9 all parts of speech) designed to help students practice using different parts of speech. Secret Language focuses on noun and passages from literature with scrambled nouns. The game requires players to identify the function the noun plays and to unscramble the letters of the word correctly.

Spelling

The Minnesota Educational Computing Consortium has produced a number of spelling programs designed to help students in grades one through twelve. Spelling workout is based on the test-study-test method and provides detailed records to assist in diagnosis. Word can be added using an editor or Spelling Series Toolkit, which provides 6,700 words, definitions, a sample context sentence, and three misspellings of each word. Some spelling software is totally based on a drill and practice/game format. By increasing student time-on-task with traditionally unmotivating activities, the software can have a dramatic impact on spelling scores (Merrill, Hammons, Tolman, Christensen, Vincent & Reynolds, 1992).

Punctuation

The combination of tutorial, drill and practice and game formats has provided educators with a motivating tool to increase student time-on-task with punctuation rules and usage. For example, Commas by Micro Power and Light presents 12 comma rules. Students select the appropriate rule, study the examples and then apply the rule in practice sentences and receive feedback. A wide variety of programs on the market are designed to provide tutorials as well as drill-and practice on punctuation rules. Selection of appropriate programs and verification that rules used in the classroom match those used by software are critical. Monitoring student contact time with drill-and-practice programs is also recommended. Due to the repetition of some programs, boredom and over attention to the game portions of some programs are prevalent (Merrill, Hammons, Tolman, Christensen, Vincent & Reynolds, 1992).

2.4.2 Issues in Educational Computing

2.4.2.1 Equal Access

As long as educators have software and hardware shortages, equal access remains a concern. Whenever shortages exist, priorities and compromises become strong realities. Many questions emerge concerning who determines the criteria and who makes the ultimate decisions regarding computer use. Who should have access to computers while computer resources are insufficient to meet student needs? In many cases if every student were given equal computer time, little effect would be realized and use of computer could be restricted to once a month per student for a short session. What criteria should be used to determine who gets to use the computer? Should those students who stand to make the greatest gain have priority standing? Should the computer be used primarily for remedial purposes? Handicapped students have special needs that can be powerfully served by computers. Yet, gifted children can profit from the intellectual challenge and have a strong chance of being primary computer users as adults. What about the majority of students who are neither handicapped nor gifted (Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds, 1992)?

Another topic that keeps surfacing is gender-namely, ensuring that girls have equitable access to technology in schools. When microcomputers were first introduced into school settings, such stereotyping thinking that considered boys to be more mechanical and maths orientated affected some educators' attitudes and decisions when determining who had access to this new technology. A 1993 computer literacy survey indicated that two-thirds of all the classroom users were male, even though more than 50 percent of students were female (Computer Literacy Survey, 1983), quoted in Merrill, Hammons, Tolman,

Christensen, Vincent and Reynolds (1992). As Educators started scheduling students onto computers and a greater variety of software categories was adopted by schools, girls began spending more time on computers (Burger, 1993), quoted in Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds (1992).

In terms of equitable computer use, minority students form another at-risk group. Minority students are more likely to be poorer school districts where computer equipment is limited. Because educators are increasingly offering computer-assisted instruction and the use of computer tools in classrooms is increasing, students who do not have access are loosing not only valuable experience in computer literacy but valuable instructional time as well (Watt, 1982), quoted in Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds (1992).

2.4.2.2 Computer Crime

Computer crime includes all activities in which a computer is used in a criminal act. Such crimes include information destruction, theft of service, theft of information, physical destruction, alteration of data, theft of money, and software piracy. Information destruction, crime is the erasing of information stored in a computer. A theft of service may be accomplished by an intruder who uses a company computer for private purposes. Theft of information may be committed by competitors interested in confidential trade information. Physical destruction of information involves destruction of computer files. An example of alteration of information is when a student uses a home computer and modem to access a school database to alter undesirable grades (Perry & Wallich, 1984), quoted in Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds (1992).

2.4.2.3 Software Piracy

Software piracy, the illegal duplication of software, remains a severe and chronic international problem. According to a March, 1998, report issued by the International Trade Commission in Arlington, Virginia, American software and hardware companies lost more than $4.1 billion in sales in 1996-most of it due to software theft (Forster, 1990), quoted in Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds (1992). Software piracy has been further complicated by the current trend of abandoning protection codes (used to reduce illegal copying). This trend stems from the need to remain competitive in business markets, placing the burden back on individuals to make ethical decisions. The International Council for Computers in Education (ICCE) has addressed this concern by publishing a policy statement aimed at solving the problems inherent in providing and securing educational software. The stated need is to ensure that educators can access quality software for reasonable prices and that hardware and software developers and vendors can maintain a fair return on their investment. Educators' ethical practices include the following:

- District approved written policy statements will assert that copyright laws and publisher license agreements will be observed.
- Educators will try to prevent unauthorized copying of programs on school equipment.
- A school-level representative will be clearly designated as responsible for enforcement.
- Students will receive instruction on legal and ethical issues of computer use (Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds, 1992).

When the learners in previously disadvantaged schools are taught to use computers, they should be made aware of the things that they are allowed to do and not allowed to do. There are some illegal activities that can be done on a computer. The learners should be encouraged to visit sites that are educational. They should also be made aware of computer viruses and how to treat them.

2.4.2.4 Computer Viruses

In 1986 and 1987 two Pakistani brothers had the distinction of becoming the first individuals to unleash a computer virus on the world. A computer virus is a program that infects other programs by modifying them to include a version of it. And like real virus, these carry a genetic code to place the virus into its main logic, usually on a hard disk (Palmore, 1989), quoted in Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds, (1992).

According to Palmore (1989), quoted in Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds (1992), once the virus infects a computer system, it lies dormant but infects any other program it can reach. So, disks initialized on that computer or programs that are sent over telecommunication lines will carry the virus to other computers. More than 25 viral strains have been discovered with new ones expected. Presently the viruses act in different ways and are typically placed into several categories: the Brain or Scores virus attacks the operating system and affects other programs on the disk; the Trojan Horse virus disguises itself and damages the user's data; Worms are viruses that gradually eat away files as the disks are used; and Time Bombs wait until a particular date and leave a message or destroy a disk.

In South Africa the department of education in each province should start making plans to encourage previously disadvantaged schools to start using computer technology. The department of education must first make sure that all schools are equipped with computer technology. The educators should be trained to use computer technology. The department of education should make sure that workshops are organized to help the educators to integrate computer technology into the curriculum. Previously disadvantaged schools will never be able to compete with Ex–model C Schools if the department of education does not make sure that the playing field is level.

2.5 EMPOWERING EDUCATORS TO USE COMPUTERS EFFECTIVELY ACROSS THE CURRICULUM

According to Paul, (1999) South African schools began using computers about twenty years ago, at much the same time as computers began to appear on secretary's and manager's desks downtown. These early machines were unsophisticated by today's standards. The limited word – processing, spreadsheet and data based packages on offer were crude and somewhat unfriendly, forcing many to learn basic and other high level programming languages in order to get the machine to do specific tasks.

There was a palpable sense of excitement about personal computing and an overriding belief that we at last had a tool which would revolutionize teaching and learning, a tool that would enable Educators and children to do new things and to do exiting things better and more efficiently (Greenwood, 1993).

2.5.1 Why use computers in schools?

Hawkridge (1990), quoted in Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds, identified and described four main rationales for the use of computers in schools. These are:

- The social rationale
- The vocational rationale
- The pedagogic rationale
- The catalytic rationale

2.5.1.1 The Social Rationale

The social rational suggests that all children should be aware and unafraid of how computers work. Because computers play an increasingly important part in modern life and because schools are supposed to prepare children for adult life, it follows that schools should provide some measure of computer awareness.

2.5.1.2 The Vocational Rationale

This rationale suggests that children should learn to operate computers because learning to programme gives children confidence in their ability to control computers. Learning how to use application programmes (word processing, spreadsheets) provide skills that will be needed later in life. Computer literacy and computer science should therefore be offered at schools.

2.5.1.3 The Pedagogic Rationale

This rationale is based on the belief that computers are able to teach. Computers aided learning and computers aided instruction offer certain advantages over traditional methods.

2.5.1.4 The Catalytic Rationale

The belief here is that computers are able to change education for the better. Managerial, administrative and teaching efficiency can be improved. The use of computers enables Educators to place more emphasis on important problem solving approaches rather that tedious rote learning and calculation. Computers give both children and Educators more independence. Collaborative learning rather than competitive learning can be stressed.

According to Paul (1999) the idea of improving teaching and learning has gripped the imagination of educator's world wide. The idea of enriching the curriculum, improving delivery, extending traditional methods of presenting information and offering new opportunities through the techniques that computers make possible is very exciting. The catalyst rationale clearly has been most potential and supporters of this rationale see computers providing children with the opportunity to move away from rigid curricular, rote learning and teacher centered lessons by giving more control to children to curricular by using computers and thus bring educational opportunities to a large number of students.

2.5.2 How do we use computers in schools?

Taylor (1990), quoted in Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds (1992), suggested that there are three basic ways of using computers in schools. These are:

- The computer as a tutor
- The computer as tool
- The computer as tutee

2.5.3 The computer as tutor

Here, tutoring systems present subject material, to which the learner responds. This type of material is programmed by specialists and includes drill and practice exercises and tutorials. This kind of programme varies widely, from the simply repetitive to sophisticated tutorials which keep check of progress and suggest areas for remediation. It also includes sophisticated simulations, such as those used to train pilots and astronauts. In this mode, the computer is relatively inflexible as it controls or "programmes" the child. It matches Hawkridge's pedagogic rationale.

2.5.4 The computer as tool

Tools include software like word processing packages, spreadsheet, data bases, presentation software, desk top publishing, CD Rom based encyclopedias, HTML editors and the world wide web, to name a few. These are generally curriculum or content free, in that they can be applied to a wide variety of educational and other activities.

2.5.5 What is happening in South African schools today?

According to Paul (1999), the computers have been instrumental in changing the way that businesses operate quite radically, but they seem to have had little effect on the way that educators teach or the way that children learn in schools. This experience is not limited to South Africa. Noble (1996), quoted in Merrill, Hammons, Tolman Christensen, Vincent and Reynolds (1992), commenting on the move in the United States to link every school to the information highway, has stated that "Most observers agree that, despite promising experiments, the billions already spent on technology have not had a significant impact on school effectiveness." A report of the U.S. Congress Office of Technology (Gonzales and Roblyer, 1996), quoted in Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds (1992), found that:

- Despite having access to technology in schools, many educators reported that they did not use computers and other technologies regularly for instruction.
- A majority of educators felt inadequately prepared to use technology resources, particularly computer based technologies.
- Despite the importance of technology in teacher education, it was not central to the teacher preparation experience in most U.S. colleges of education.
- Districts spend far less on teacher development than on hardware and software.
- Much of the teacher development activity focused on the mechanics, not on integrating technology into the curriculum.
- Educators lacked an understanding of curricular uses of technology and were unaware of the resources technology can offer them as professionals in carrying many aspects of their jobs.

Paul (1999) stated that his own experience from ongoing visits to (mainly) primary schools in East London (South Africa) reflects the findings of the Congress Office of Technology. More schools are getting computers in increasing numbers, together with the latest operating systems and software. However, a visit to these schools by Paul (1999) shows educators teaching much the same way as they have done for decades and children still working largely with paper, pencil and textbooks. Very few schools are able to articulate a clear vision for computer and computing, or have a written plan with respect to the use of the equipment that they have. In many schools, all classes attend computer lessons, but in most cases a child's access to the computer is limited to about an hour a week. Still very few children produce written work electronically, use CD ROM based information or the World Wide Web purposefully as a research tool, or present oral work with the aid of presentation software.

2.5.6 What should we be doing?

Paul (1999) believed that children should be using computers in schools daily, as research, problem solving, creative and presentation tools.

2.5.7 Computers as research tools

The World Wide Web

The World Wide Web is a massive information resource, offering a wide variety of information to a host of users. There are search engines like Yahoo, Alta Vista, Google, Amanzi and others that are used. In some cases the Educators and the researchers are provided access to such resources on their own web sites (Paul, 1999).

CD Rom based information

There is a wide variety of information on CD Rom. These include encyclopedias like Encarta, atlases like Encarta World Atlas and other information like Microsoft Oceans, Microsoft Dangerous Creatures, and Microsoft Ancient Lands. The advantages of using this kind of software is that text, graphics and sound clips can be copied directly from them, making it unnecessary for children to rewrite and Photostat material. This allows them to concentrate on other important aspects of writing such as design and layout, summarizing and synthesizing (Paul, 1999).

2.5.8 Computers as Problem Solving Tools

A variety of software provides the opportunity for problem solving activities, including spreadsheets for mathematical problem solving and investigations, data base software for manipulation and analysis, and specific applications like SimCity (Where children have to design a city, taking into account the many problems presented to town planners). These present a useful environment for children to work collaboratively in a problem-solving mode (Paul, 1999).

2.5.9 Computers as creative tools

The learners can use Microsoft Movie Maker, which allows children to make their own movies, with action, sound and story line (Paul, 1999).

2.5.10 Computers as presentation tools

Word processors

Word processors are powerful tools which allow one to create, edit and format text in a variety of ways. They also allow one to present a clean and tidy final copy. An added advantage is that the information can be stored digitally more or less forever, allowing one to revisit the information and change it, should one need to. This has a big advantage over traditional (pen and paper) methods of presenting work (Paul, 1999).

Presentation packages

Presentation packages like Microsoft Power Point, Corel Presentation and Lotus Freelance Graphics are widely used in many settings. They offer a variety of advantages over old methods of presenting information, including the ability to use pictures, tables, organizational charts, video clips and sound. Presentation software allows one to incorporate all the features (slide projector, video player and tape recorder) into one presentation at the click of the mouse button.

The Webpage – a new creative canvas for presenting project work

Project work in schools is usually presented in a project book of sorts, or on a piece of card which gets stuck on the classroom wall. The webpage offers many advantages over this method. It allows a high degree of manipulation with respect to images and text, including sound and video. It also allows one to provide links to related information, across the world in many cases. It is also easily updated, allowing the project to become dynamic rather than static (Paul, 1999).

2.5.11 What are the problem areas?

There would seem to be four main reasons for the problem as it relates to schools in East London, South Africa.

- A shortage of computers in numbers great enough to provide meaningful access for children and staff, because of the high cost of hardware and software.
- Poor placement of existing resources in laboratories where they are difficult to access.
- A lack of knowledge about the computers and their potential as learning tools on the part of the educators.
- A lack of carefully developed plan for the use of technology across the curriculum.

Most educators simply do not have an effective working knowledge of computers and, of those who do, only a few really understand the educational potential that computers provide. It is this area that needs addressing if schools are to embrace computers and begin using them effectively on daily basis because "only when educators become comfortable with the technology will students will reap the benefits (Armstrong, 1996), quoted in Paul (1999)..

Staff development in the area of educational computing in South Africa has not proved very effective mainly because of limited budgets and inadequate time for training. Programmes, offered by both education departments and outside agencies, have usually involved intensive two to three day crash courses on other software such as spreadsheets at a later date. The assumption has been that the educators involved will take the knowledge gained back to their schools and share it with their colleagues. In reality,

learning to use a computer effectively is much more complicated than has been assumed by course designers. Hoffman (1996), quoted in Paul (1999), has stated that the technology integration literature agrees that "educators need an estimated five to six years of staff development" before they become successful integrators of technology in their classrooms.

2.5.12 What can we do About these Problems?

The most important prerequisite for success is to have the whole school (governing body, principal and the staff) committed to a policy of efficient and successful computer use. Until this is achieved, computing will remain a fragmented, ad hoc activity falling to accusation that schools in South Africa use their computer centres as little else but "showcases" to attract new pupils. With commitment, a workable and effective policy with respect to the use of computers is possible. The following points might be considered:

Planning

- Think about the outcomes you want and consider how computers can help you achieve such outcomes.
- Concentrate on activities in which computers allow us to do things better than before (effective presentation of work, access to information) as well as things that were impossible to do, like data analysis and manipulation.
- Concentrate on computers as learning/pupil tools rather than computers as teaching or teacher tool.
- Get an outside educational expert to facilitate policy and curriculum design if you need to (Paul, 1999).

Training

- As in industry, schools should remember that they should be spending as much on training as they do on hardware and software. Provide effective staff development for all members.
- Encourage educators to work collaboratively in developing workable modules. These should make use of the special potential that computers provide. A collaborative effort supports free and frank discussion and ensures that everyone is part of the solution.
- Encourage an action research approach, where educators plan, use, evaluate and update their modules.

Have faith and patience. Change will not occur overnight. However, as educators work with computers, they develop an understanding of their power and the way in which they can be applied as classroom tools (Paul, 1999).

2.6 Complete Information Technology (IT) solution for Roedean School (South Africa) to equip learners for life in the information age

2.6.1 Citrix MentraFrame, Internet and Knowledge Network IT Curriculum

According to Newsweek (1999), quoted in Knowledge Network (2000), the question educators worldwide ask is how to teach children to think in the information age. Added to this is an even deeper and more significant issue regarding the teaching of creativity to pupils and preparing them their role as knowledge workers in the information age. During 1998 Roedean School South Africa (SA) realized that the biggest challenge facing the

school with regard to its Information Technology (IT) environment was to stay current in a world where:

- Expensive equipment becomes dared the moment that it is bought.,
- The same equipment becomes obsolete within a year or two,
- The focus of training can be determined by software that changes virtually every year,
- The industry's needs for skills change with the seasons,
- Skilled trainers and Educators are hard to find and difficult to keep,
- More often than not learners know more than their educators.

This led to Roedean School (SA) taking a very careful and well thought out look at the way in which they were planning to prepare and educate the pupils at the school for the digital age (Knowledge Network, 2000).

2.6.2 Background

Each of the three schools making up Roedean School (SA) have their own computer equipment, ranging from older 486 and Pentium 1 work stations and printers to newly purchased Pentium 11 multimedia workstations. A variety of printers, scanners and digital cameras are available to the pupils. Added to this was the fact that the need existed to deal with three different schools, each with their own information technology needs and agendas. Numerous classrooms, multiple information technology centres and a mixture of application software and operating systems also added to the equation (Knowledge Network, 2000).

The school wanted to make a PC available to each teacher in the school and in the administration area, to afford them the opportunity to have a productivity tool in the classroom to assist with their work in preparing, analyzing and integrating technology in the classrooms. Educators at the different schools and in the information technology centres are also faced with the problem of having to teach – and in that teach meaningful and relevant information, using the equipment listed above. It was decided that the cost of upgrading the entire system consisting of more than 100 Personal Computers alone would be costly for the school. An alternative would have to be found. The choice fell on a new technology offered by CITRIX called Win Frame (which was later to be upgraded to Meta Frame). This system working with Microsoft NT Terminal Server, offered the school the opportunity to allow the older workstations at the school to run the newest software via a Thin Client Server environment (Knowledge Network, 2000).

A Thin Client Server environment allowed the schools to not only rejuvenate the existing hardware, but to cut the cost of future development considerably. It would mean that the school no longer needed to buy the newest and fastest workstations, but that more scaled down machines could perform on par with their more expensive counterparts (Knowledge Network, 2000).

2.6.3 Knowledge Network appointed as Project Managers

The management of the installation and upgrade was left to Knowledge Network when Knowledge Network was appointed in July 1999 as Project Managers for Roedean School South Africa (SA). This means that the responsibility fell on Knowledge Network to ensure that the network installation is done in a way which maximizes the performance

for multiple, simultaneous access of full multimedia software and is in the long term maintainable by the school staff appointed to handle the day-to-day operations of the network (Knowledge Network, 2000).

In addition, the school indicated that there were other short term needs, of which the provision of an Internet solution for the school was paramount. Among the other needs indicated by the school were:

- The purchase of additional application server software licenses,
- Teacher development
- Better utilization of existing equipment
- Planning of additional technology solutions and
- The integration of technology into the classrooms at the school

The school further decided to upgrade their existing Internet service, so as to accommodate every one of the more than 700 pupils at the school having Internet and e-mail excess. It was also decided that Roedean School (SA) would host and maintain their Internet website at . They wanted a Firewall and Proxy server, their own mail server to handle the messages generated by the staff and pupils at the school and the option to create an Intranet at the school to publish information that the pupils could use in a digital environment for research and development. Roedean School (SA) also required of Knowledge Network to research and recommends the best possible solution for their Internet needs (Knowledge Network, 2000).

2.6.4 CITRIX Solution / Internet Solution

After a comprehensive report and recommendations by Knowledge Network it was decided to implement a networking solution from Acronym and an Internet service via CITEC at Roedean School (SA). These suppliers could offer the school the hardware and Internet solutions that were required. The Internet service was fully implemented in August 1999 and the process of installing the CITRIX environment at the school commenced in August 1999 (Knowledge Network).

The school is currently hosting their website at and every teacher and pupils are to have their own e-mail address in the roedeanschool.co.za domain. According to Asselbergs, quoted in Newsweek (1999), the school bursar at Roedean School (SA), the solution implemented by the CITEC gives the school the freedom to have unlimited and guaranteed access to the Internet and e-mail at a reasonable priced fixed rate every month (Knowledge Network, 2000).

2.6.5 Teaching Creativity, Thinking Skills – Developing Tomorrow's Corporate Leaders in the Information Age

After a very careful consideration Roedean School (SA) decided to adopt the Knowledge Network Information Technology (IT) Curriculum in September 1999. The decision was made to train two educators at the school, Mrs. Michelle Macaulay and Mrs. Jacqueline Topping in the Knowledge Network ILAMM (Integrated Learning and Mentoring Methodology) so as to equip them to present the knowledge; and personal achievement and growth for every learner. Learners learn how to use a computer as a tool, are

equipped with skills they need for life in the information age – the business world they are set to inherit (Knowledge Network, 2000).

Mrs. Topping, the senior school Information Technology teacher, who has also completed the Knowledge Network Web site Development Diploma course, feels that the key for her in using the Knowledge Network IT Curriculum has been the fact that she has input into the way the curriculum is implemented, and on which level it is implemented. The Knowledge Network IT Curriculum solution for Roedean School (SA) accommodates the level of skill of the learner. There are six levels in the curriculum. Schools are accommodated according to the level of knowledge and skill of the learner. Educators attend on going training which forms part of the Knowledge network teacher development programme for schools. Learners at Roedean School (SA) will complete the Knowledge Network Diploma Curriculum and will leave school with a qualification (Knowledge Network, 2000).

2.7 INTERNET

2.7.1 What is the Internet?

Internet is a world wide network of computer networks. It is an interconnection of large and small networks around the globe. The Internet began in 1962 as a resilient computer network for US military and over the time has grown into a global communication tool of more than 12,000 computer networks that share a common addressing scheme (Distance Education (DE), 2000).

According to Mantex, (1999) Internet is global network of networks that connects more than three million computers (called host). The Internet is the visual space in which users send and receive email, login to remote computers (telnet), browse databases of information and send and receive programs contained on these computers.

Internet is one of the most powerful tools that are used in modern education. It is used mostly to research information and for communication. The learners should be taught the skill of using Internet as a learning tool. But the learners should be made aware of the disadvantages of using Internet. They should be taught to be critical about the information they get from the Internet. They should not accept everything they find in the Internet as fact.

2.7.2 Strategies for Using the Internet in the Classroom

According to Knowledge Network Explorer (2003), Internet in itself can not be considered a great teaching tool, but paired up with instructional knowledge and careful evaluation by educators it can be very powerful. There are many strategies that can help students and the educators use the internet effectively. The educators need to take time to learn how to better integrate it into their teaching program. Here are some of the ways that the internet has been used in the classroom:

2.7.3 Research

The school library is not the only place where students can go for quality research resources. The internet offers many credible and expansive resources for students to use to do research. There must be a structure for the students however when sending them

online to do research. Students should also be taught how to effectively search the web for their own for resources.

2.7.4 Introducing a Concept

Often time's students need a good introduction for them to proceed in understanding a particular concept. There are many good text and multimedia resources on the Internet that can serve as the first introduction. A Filamentality Treasure Hunt is an excellent way to structure an introduction to a particular concept. Using cites like Brainpop can also give a student the background to gain a deeper understanding.

2.7.5 Meeting the Needs of all Learners

For students who are often finished early or have more advanced skills in certain curricular areas, the Internet can be an excellent way to supplement and extend upon learning. There are also many sites on the Internet that offer remediation or more primary activities to help reinforce learning for those who need a little extra help. Blue Web'n offers many links to web sites and activities that educators can use to help meet the needs of all learners.

2.7.6 Information Literacy Skills

Students and educators must have the literacy skills that are important for this new age of information. Teaching students skills like web searching and website evaluation are becoming just as important as teaching mathematics and reading skills. The SBC/UCLA 21ST Century Literacies Homepage is an excellent site that offers lesson plans and

resources to teach your students the necessary skills to flourish in today's society and in the future.

2.7.7 Accessing Primary Resources

There is no better resource than the Internet for locating and viewing primary sources materials. The Library of Congress site American Memory is one of the best sites to see actual artifacts of the American history. There are many other museums and other locations on the Internet in which to see and experience many of the great treasures of human history. Giving students access to this brings them closer to the very fabric of mankind.

2.7.8 Promoting Higher Level Thinking

Getting students to work and learn at higher level is the goal of most educators. Often times the curriculum that is given to educators does not support this goal. With the Internet, educators and students now have access to many inquiry-based learning experiences like WebQuests that have been created by other educators. These activities give students the structure in which to use the Internet to help them solve higher level problems.

2.7.9 Email Friends

Having students correspond with students in other parts of the country or world is a powerful way to get them to better understand the differences and similarities that exist between people around the world. Sites like Epals make it easy to setup and monitor student email discussion and also reinforce the lost art of letter writing.

2.7.10 Discussion

Internet technologies like discussion boards and chat rooms allow all students an equal environment in which to participate in class discussions. They also extend learning and collaboration outside of the walls of the classroom. Tapped in is a free resource that many educators are using to setup structured dialogues on curriculum topics for their class.

2.7.11 Animation

Sometimes a two dimensional drawing on the white board does not give students the best way to witness a particular process. There are many animated examples of scientific processes available on the Internet. Using a search engine like Soople (http://www.soople.com) to locate them can be relatively quick if you or your students use the right search engine terms. Brain pop offers many animated examples of science concepts, as well as a range of other curricular as well.

2.7.12 Classroom Websites

There are many advantages to having a classroom website. One is that students and parents have access to the class schedule and assignments on a continuous basis. Posting the assignment documents also saves on the phone calls and emails asking for lost assignment sheets. Having a classroom web site is also essential as a jumping off point for students to use the Internet. Many educators post their hot lists or web links directly from their website so students can get to the most important and useful resources without having to search for them their selves. A lot of educators also use their site to post student work and portfolios.

2.7.13 The Pros and Cons of Implementing the Internet in the Classroom

Disadvantages of Internet Implementation for Students

- Given the nature of the web – the fact that anyone with access to it can put information upon it – it is inevitable that there is room for incorrect information to also make its way onto the network. This means that users always have to question the reliability of the information. If students are not aware and conscious of this problem, they may use and learn wrong facts about anything from historical information to scientific data
- Some Web services may be harmful because of the ways in which they offer students alternatives to doing their work. There are numerous sites on the Web that offer term papers and book reports for sale, or even for free. This raises numerous issues concerning plagiarism and work ethic that have to be addressed by administrators before implementing the network in the classroom.
- Montgomery cites the results of a survey according to which the majority of children queried in the research put greater trust in their computers than did in their parents. It is suggested that the creation of a non-commercial children's civic sector could serve as an alternative to commercial sites and thus contribute to shaping youth-geared web content in more educational ways than advertising sites do (Hargittai, 1997).

Adapting the positive aspect of the Internet requires great effort from the educators. Current teaching practices have to be reevaluated and some changes may need to be made. Educators may need to be trained in the use of the new technological tools and their skills require continuous updating, although this may come easier once the initial

investments in training have been made. Steps concerning professional development can be assisted through the use of Internet tools. Discussion groups among educators and technical professionals can aide in their training. When a school decides to introduce the Internet in the curriculum, the funds required for teacher training must also be remembered and adequate resources need to be set aside for this purpose (Hargittai, 1997).

2.8 ADRESS BY THE DEPUTY MINISTER OF EDUCATION, MR ENVER SURTY, MP, AT OFFICIAL OPENING OF THE SHUTTLEWORTH FOUNDATION TUXLAB ROADSHOW, MTN SCIENCE, CAPE TOWN

According to Surty (2005), it is known that there is a need for fundamental change in the way education and training is offered in South Africa. The challenges facing education in South Africa are located within a broader political-economic context. South Africa is indeed a country of two economies. At the one end there is a highly sophisticated, largely urban, globally connected and competitive part of the system; alongside which lies a marginalized, largely rural, poverty stricken part of the system.

The black majority, almost exclusively African, populates the marginalized part of the system. It is this recognition that has motivated the Ministry and the department of education to mobilize society and focus attention on the equalizing capability and potential of Information Communication Technology (ICT). The department of education recognizes the importance of ITC in enabling the Ministry to reach their development goals and objectives as enshrined in the Freedom Charter. The rapid advance of ICT

allows the Ministry to disseminate relevant information more effectively to communities disadvantaged by distance (Surty, 2005).

The department of education and the Ministry are committed to increase investment in those subjects that forms the basis of ICT namely Mathematics, Science and Technology. The National Mathematics and Science strategy forms a critical part of this thrust toward encouraging greater interest in ICT. In South Africa we need young people who will grow up having been exposed to basic desktop PC systems, young people who will grow up using and understanding the technology, young people who are computer literate. This may require a review of the current methodologies used in the teaching of computer studies (Surty, 2005).

A huge majority of learners have no access to a computer and information highway. Only 29% of public schools in this country have access to Information Technology (IT) infrastructure. Internet access is even worse, as less than 10% of schools have access to the Internet. These generalizations of course hide the unevenness across provinces and schools within provinces. Improvements are negotiable in all provinces, even in those provinces that were below the national average (Surty, 2005).

The e-Education White Paper

In the e-Education White Paper, the department of education has set out targets to be achieved by the end of 2013 or 2014. Although ambitious, these targets are achievable and a concert effort must be made to reach them. They need collective will, unity of purpose and a coordination of efforts. The targets that have to be achieved by 2007 are to:

- Build an education and training system to support ICT integration in teaching and learning and improved management and administration;
- Build Educators' and managers' confidence in the use of ICTs;
- Build a framework for competencies for teacher development in the integration of ICTs into the curriculum;
- Establish an ICT presence in schools;
- Ensure that schools use education content of high quality;
- Ensure that schools are connected, that they access the Internet and communicate electronically; and that
- Communities' use and support ICT facilities in public schools.

In this regard, the primary responsibility of the Ministry of Education is to set norms and standards. To this end, the Ministry has declared the White Paper on e-Education (Surty, 2005).

In every developing country, infrastructure and the maintenance and sustainability of that infrastructure remain a challenge. There are key questions that need to be answered. These amongst others, include the following: Do we aim to have at least one computer in each of our 28 000 schools for improving the management and administration of the school? Do we aim to put computer labs in every school, or also to make 3-5 computers available for teacher use? Is a computer in every class is not perhaps a better option? Or do we attempt to do all of the above? At present, we are targeting to ensure that there is at least one computer per school for improved management and administration and further make available 3-5 computers for teaching and learning, used as a starting point. This will incrementally grow to the desired goal of a computer lab of about 25 computers per

school. A further challenge relates to the maintenance and sustainability of the infrastructure and its use. Often the delivery of infrastructure at a school is no guarantee of its use. Where such infrastructure is used, the care and the maintenance necessary is sometimes so feeble that the project dies a natural death within months. This also links to another challenge – the safety of the infrastructure. There are many cases where high cost infrastructure is lost within days of being installed. Creative solutions to these and other problems must always remain a priority (Surty, 2005).

The government has a responsibility to improve the access of ICTs to all. Our objective should be to make education available through technology and not simply only to make technology more affordable to all schools. The real challenge we face is to gain substantial pedagogic, or teaching and learning value, from the use of open source. We have to begin to shift our mindset from the traditional view that only a teacher as a subject specialist in a classroom can offer a worthwhile learning experience. We need to expand that view point to that of understanding that technology opens a whole new dimension of access to information that can assist our Educators and learners to gain knowledge and wisdom (Surty, 2005).

According to Surty (2005), in South Africa we need to change the way our learners learn and the way our educators educate. Firstly in each province the department of education needs to pay more attention to previously disadvantaged schools. It is a good idea if the Minister of education has realized that Information Communication Technology is very important and it plays a vital role in South African education. In future it will be good to start technology awareness in primary schools, so that by the time the learners are in

grade 8 they are all computer literate. In grade 8 they will start to integrate computer technology into the curriculum.

The Ministry of Education has set the target to be achieved by 2013 or 2014. It will be a good idea if they would try and reach these targets step by step. They are not expected to reach all of them by 2013 or 2014 as they planned. They need to make sure that they achieve something in each an every year to improve the standard of computer technology in previously disadvantages schools. But to achieve the targets they need to start small by making sure that at least there is a computer in each school. They need to make sure that there is at least one educator who is specializing in computer technology. If the schools do not educators who specialize in computer technology, the Department of Education should make sure that they train at least one educator per school. Then the teacher would come back and train the other Educators. But if the schools do not have computers, this is impossible (Surty, 2005).

2.9 CONCLUSION

The researcher in this chapter was showing different ideas of integrating computer technology into the curriculum. These ideas are made possible by choosing the right theory to work under. In the next chapter the researcher has decided to work under the Constructivist Theory.

CHAPTER THREE

THEORETICAL FRAMEWORK

CONSTRUCTIVISM

3.1 INTRODUCTION

In this study the researcher has decided to use the constructivism paradigm. This paradigm of constructivism is used because the researcher is one of those people who believe that knowledge is constructed. It is not something that you gain from other people. According to constructivist paradigm learning takes place when one is actively involved in a lesson. It is not easy to forget something that you have made yourself, but it is easy to forget when you just sit and listen to other people. A person does not learn anything when she or he is passive. For Dewey quoted in SCIMAST Classroom Compass (1995) education depends on action, knowledge and ideas emerged only from a situation in which learners had to draw them out of experiences that had meaning and importance to them. Under constructivism there is social constructivism. In social constructivism learning situations had to occur in a social context, such as a classroom, when students joined in manipulating and, thus, created a community of learners who build their knowledge together.

3.2 WHAT IS CONSTRUCTIVISM?

According to Funderstanding (1998) constructivism is a philosophy of learning founded on the premise that, by reflecting on our experiences, we construct our own understanding of the world we live in. Each of us generates our own rules and mental

models, which we use to make sense of our experiences. Learning, therefore, is simply the process of adjusting our mental models to accommodate new experiences.

According to Bruner (1986) learning is an active process in which learners construct new ideas or concepts based upon their current/past knowledge. The learner selects and transforms information, constructs hypothesizes, and makes decisions, relying on a cognitive structure to do so. Cognitive structures provide meaning and organization to experiences and allows the individual to go beyond the information given. As far as the instruction is concerned, the instructor should try and encourage students to discover principles by themselves. The instructor and the student should engage in an active dialogue. The task of the instructor is to translate information to be learned into a format appropriate to the learner's current state of understanding. Curriculum should be organized in a spiral manner so that the student continually builds upon what they have already learned.

3.3 SOCIAL CONSTRUCTIVISM

3.3.1 What is Social Constructivism?

According to Kim (2001) social constructivism emphasizes the importance of culture and context in understanding what occurs in society and constructing knowledge based on this understanding. This perspective is closely associated with many contemporary theories, most notably the developmental theory of Vigotsky, Bruner and Bandura's social cognitive theory.

3.3.2 Assumptions of Social Constructivism

According to Kim (2001) social constructivism is based on specific assumptions about reality, knowledge and learning. To understand and apply models of instruction that are rooted in the perspective of social constructivists, it is important to know the premises that underlie them.

Reality: Social constructivists believe that reality is constructed through human activity. Members of the society together invent the properties of the world (Kukla, 2000) quoted in Social Constructivism. For the social constructivist, reality cannot be discovered and it does not exist prior to its social invention.

Knowledge: To social constructivists, knowledge is also a human product and is socially and culturally constructed. Individuals create meaning through their interactions with each other and with the environment they live in. Learning: Social constructivists view learning as a social process. It does not take place within an individual, nor is it a passive development of behaviors that are shaped by external forces. Meaningful learning occurs when individuals are engaged in social activities (Kim, 2001).

3.3.3 Intersubjectivity of Social meaning

Intersubjectivity is a shared understanding among individuals whole interaction is based on common interests and assumptions that form the ground for their communication (Rogoff, 1990) quoted in Kim (2001). Constructivism of social meanings, therefore, involves inter-subjectivity among individuals. Social meanings and knowledge are shaped and evolve through negotiation within the communicating groups. Any personal meanings shaped through these experiences are affected by the inter-subjectivity of the

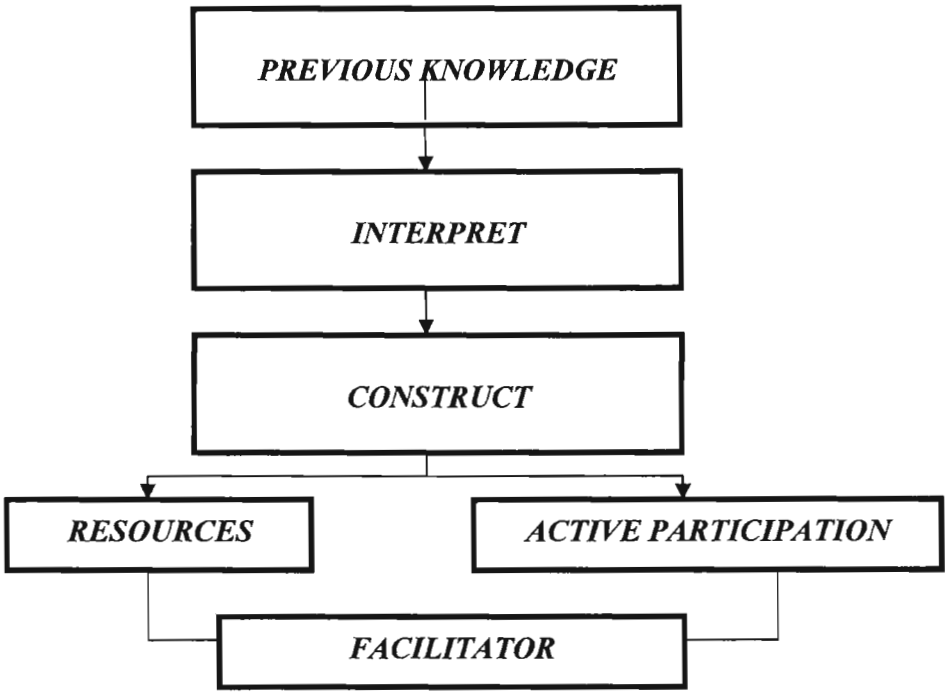
community to which the people belong. Inter-subjectivity not only provides the grounds for communication but also supports people to extend their understanding of new information and activities among the group members. Knowledge is derived from interactions between people and their environments and resides within cultures.

From all the readings that the researcher has done, he believes that in constructivism to be able to construct meaningful knowledge one needs previous knowledge. The learner brings the knowledge to the school. The learner use previous knowledge to interpret what he or she is learning at school. This is done through communication with other people. In this way knowledge is constructed. To construct knowledge one needs resources. If the school does not have teaching resources it is quiet difficult for the learners to construct knowledge. Teaching resources help learners to be actively engaged in a lesson. The duty of the educator is to facilitate the learning situation.

After reading the books that explain how knowledge is constructed, the researcher decided to draw up a diagram that shows his understanding of how the knowledge is constructed.

FIGURE 1

The stages of how meaningful knowledge is constructed in a constructivism paradigm.



This is the diagram that was drawn by the researcher. It shows the stages of how meaningful knowledge is constructed in a constructivism paradigm.

3.4 CONSTRUCTIVISM IN EDUCATION: OPINIONS AND SECOND OPINIONS ON CONTROVESIAL ISSUES

3.4.1 The Constructivist Landscape

According to Phillips (2000) constructivism refers to a set of views about how individuals learn. Constructivist view is that learners actively construct their own set of meanings or understandings; knowledge is not a mere copy of the external world, nor is knowledge acquired by passive absorption or by simple transference from one person (teacher) to another (a learner). In sum knowledge is made, not acquired. Some constructivist of this broad type go on to stress that it is not possible that any two individuals will construct the same understandings; even if they use the same linguistic formulations to express what they have leaned, their deep understandings might be quiet different.

3.4.2 The Looseness of Fit Among Elements of a Constructivist Pedagogy

According to Howe and Berv (1999) quoted in Constructivism in Phillips (2000), constructivist theory has its primary roots in the work of Jean Piaget and Lev Vygotsky (1994). It is by no means a stretch to claim that John Dewey also held a constructivist theory of learning, indeed in a rather carefully developed form. Constructivist learning theory has two basic premises: learning takes as its starting point the knowledge, attitudes, and interests' students bring to the learning situation, and learning results from the interaction between these characteristics and experience in such a way that learners construct their own understanding, from the inside, as it were. Instructions must be designed so as to provide experiences that effectively interact with these characteristics of students so that they may construct their own understanding.

According to Brooks (1993) quoted in Phillips (2000), educators want students to take responsibility for their own learning, to be autonomous thinkers, to develop integrated understandings of concepts, and to pose and seek to answer important questions. Designing the curriculum in such a way that it reflects careful thought about the teacher-student relationship, is relevant to students' interests, addresses real world problems, values students' efforts to come to terms with ideas and arguments of and encourages their full participation.

3.4.3 Constructivism and Education

According to Von Glasersfeld (1992) quoted in Merrill, Hammons, Tolman, Christensen, Vincent and Reynolds (1992), from a constructivist perspective, learning is primarily a process of assimilation and accommodation to disturbances in the subject's experimental environment. The disturbances alert the subject to the need to check cognitive patterns previously established and to recognize those problems that call for new and equilibrating solutions. Comparing, recognizing similarities and differences, and constructing solutions are than amongst the most important cognitive abilities a constructivist teacher would hope to foster. As long as student's solution to a problem achieves a viable goal, it has to be credited. Von Glasersfeld adds that learning how to think and how to do so independently are also goals to be adopted. By his lights students are better motivated when they encounter the satisfaction of thinking out viable solutions for themselves. They do not need external rewards, as the behaviorists would have it.

A constructivist teacher has two specific tasks: to establish a learning environment suited to providing perturbations for the student's mental constructive process and to project a

model of each individual student's in mental development and constructions, one that will allow the teacher to understand the student's notion of a viable solution (Von Glasersfeld (1992), quoted in Phillips (2000).

For Von Glasersfeld (1992) quoted in Phillips (2000), external criteria such as test results ought to set demands on student's understanding. Radical constructivists refuse in fact to allow that tests demonstrate student understanding. For them instead of teaching to the test or to shared curriculum goals that is, to the results of construction, Educators ought to pay close attention to the process of individual student learning. In radical constructivism there is a need for the individual to construct others, for there have to be others to corroborate individual construction. Hence, argues Von Glasersfeld (1992), his view is not solipsistic. Solipsism is the metaphysical view that only one individual mind exists; there are to be no other minds, no external world. An obvious point is that if one is a solipsist then why worries about educating others, they do not exist.

On the constructivist view, concepts are nothing more than means to organize and classify similar experiences. If a child lacks the concept of rattle, that is, lacks the means to pick out and organize similar experiences and to classify them all as rattle, he needs to abstract that concept from his own experiences, or so the stay goes.

3.4.4 Appraising Constructivism in Science and Mathematics

According to Matthews (1991) quoted in Phillips (2000), constructivism is undoubtedly a major theoretical influence in contemporary science and mathematics education; many would say it is the major influence. Multiculturalist proposals in science and mathematics

education are put forward in a way that simple assume constructivist pedagogical epistemological and anthological positions. For many years constructivism has become part of the educational future. Although constructivism began as a theory of learning, it has progressively expanded its dominion, becoming a theory of teaching, a theory of education, a theory of educational administration, a theory of the origin of ideas, a theory of both personal knowledge and scientific knowledge. Constructivism has become education's version of a grand unified theory.

This approach (Constructivism) holds promise for the pursuit of educational objectives other than those associated exclusively with cognitive development. The constructivist point of view makes it possible to develop a vision of the whole educational phenomena which is comprehensive and penetrating. Constructivism is a postmodern theory of knowledge with the potential to transform educational theory. It is thus not surprising that, for several years now, across country, pre-service and service Educators have been considering constructivism as a referent for their philosophies of education. Constructivism is not just a theory about learning, teaching and philosophy of education. It is a theory about one of culture's greatest and most enduring achievements, namely science. Indeed as an epistemology, constructivism speaks to the nature of science. If it does so speak, then it certainly has a claim to our attention (Matthews (1991), quoted in Phillips (2000).

But even the nature of science and the nature of education do not between them exhaust the putative explanatory reach of constructivism which increasingly presents itself as an ethical and political theory, as well as learning, a teaching, and an epistemological theory.

There is also a sense in which constructivism implies caring-caring for ideas, personal theories, self image, human development, professional esteem, it is not take it or leave it epistemology. Constructivism is thought to be a morally superior position to its rivals in learning theory and pedagogy. For some constructivism is even larger than a theory of learning, education and science; it is almost a world view. Pepin quoted in Constructivism in Education, goes on to say that constructivism also offers a global perspective on the meaning of the human adventure, on the way human beings impart meaning to their whole existence in order to survive and adapt.

3.5 MATHEMATICS EDUCATION

3.5.1 Constructivism in the Classroom

According to Math Forum (1994) students need to construct their own understanding of each mathematical concept, so that primary role of teaching is not to lecture, explain, or otherwise attempt to transfer mathematical knowledge, but to create situations for students that will foster their making the necessary mental constructions. A critical aspect of the approach is a decomposition of each mathematical concept into developmental steps following a Piagetian theory of knowledge based on observation of, and interviews with, students as they attempt to learn a concept.

Constructivism cuts a nice path between the main ideas that has influenced how maths has been taught: the concept of math as facts to be transmitted to the student, and the view that some people have it and some people don't, where the educator's task is to figure out how smart students are and choose the right tasks for them to perform (Maths Forum, 1994).

In contrast, constructivism focuses our attention on how people learn. It suggests that math knowledge result from people forming models in response to the questions and challenges that come from actively engaging maths problems and environments – not from simply taking in information, nor as merely the blossoming of an innate gift. The challenge in teaching is to create experiences that engage the student and support his or her own explanation, evaluation, communication, and application of the mathematical models needed to make sense of these experiences. Given this view, there are many approaches to improving teaching: look for different ways to engage individual students, develop rich environments for explorations, prepare coherent problem sets and challenges that focus the model building effort, elicit and communicate student perceptions and interpretations, and so on (Maths Forum, 1994).

3.5.2 Curriculum Influence

Constructivist influence has extended beyond just the research and scholarly community; it has had an impact on a number of national curricular documents and national statements. In United States of America, the National Science Educators Association's Standards for Teacher Preparation – standards according to which the value of institutions' teacher education programs are to be evaluated – is replete with the endorsement of constructivism. The mathematics components of the National Profiles in Australia and the National Curriculum in England are influenced by constructivist thought (Math Forum, 1994).

3.6 CONSTRUCTIVISM AND EDUCATION

3.6.1 Beyond Epistemological Correctness

According to Larochelle & Bednarz (1998), constructivism implies that knowledge is always knowledge that a person constructs, it has prompted the development of didactic situations which stress the need to encourage greater participation of scholarly knowledge. Constructivism breaks radically with the foundations of empiric-realism, which claims to encode reality in terms of substances and phenomena which are independent of the observers. So doing, it challenges age-old beliefs which maintain that facts speak for themselves, that knowledge is the reflection of ontological reality, and that language objectively refers to this reality.

Constructivism reintroduces what objectivism has always sought to live out, namely, properties of the observer within the description of his or her observations Thus, the constructivist approach creates additional discomfort, so to speak, since, by the same token, it reintroduces the notion of responsibility for one's actions (Larochelle & Bednarz, 1998).

3.6.2 From Epistemological Constructivism to Teaching: a Variety of Views

According to Larochelle & Bednarz (1998), knowledge cannot be transmitted; it cannot be neutral either. Instead it is constructed, negotiated, propelled by a project and perpetuated for as long as it enables its creators to organize their reality in a variety of fashion. Knowledge can no longer be typified according to the usual semantic categories: now instead, it must be viewed in terms of a dynamic process. Researchers and Educators must now be able to unceasingly re-examine the conceptual framework guiding their

interpretation of students' solutions. They must also consider students solutions in terms of experience – generated potentialities for action standing in relationship to one another according to the type of cognitive activities which such potentialities frame or set off.

Amerio (1991), quoted in Larochelle & Bednarz (1996), has stated that constructivism may also be understood as a powerful tool to question and challenge the usual power / knowledge relationship. In constructivism the knowing subject is also an acting subject: he or she knows that he or she can act, do and bring about change. Accordingly, constructivism may be viewed as a lever of social empowerment which goes beyond the here and now by devoting attention not only to the beliefs and social relationships which often appear immobilized, but also to the means precisely by which they may be mobilized and potentially transformed by acting subjects.

3.7 CONCLUSION

As this chapter focused in the constructivist theory that encourages active learning rather than passive learning. In the following chapter the researcher focuses on the case study that was done in four different schools in which the findings will be based on. It will be evident in the next chapter that the researcher has visited different schools to collect data.

CHAPTER FOUR

METHODOLOGY

4.1 INTRODUCTION

The researcher's methodology in this study was a case study. The researcher decided to use a case study because he wanted to do a thoroughly research in four previously disadvantaged high schools in Umlazi. The researcher wanted to see how the schools integrate computer technology into the curriculum. The researcher had one case study. Under this case study there were four different schools. To conduct the study the researcher used interviews, questionnaires and observations. This chapter shows very clear how data was collected from four different schools and the difficulties that were experienced by the researcher while conducting the study.

4.2 CASE STUDY

This case study was done in four high schools in Umlazi Township. These schools were previously disadvantaged. The researcher was doing an in-depth study of how the previously disadvantaged high schools in Umlazi integrate the computer technology into the curriculum. The researcher referred to them as school one, two, three and four. According to Stake (1995), quoted in Gray (2003), a case study is the study of the particularity and complexity of a single case, coming to understand its activity within circumstances.

Gray (2003), stated that while case studies can be carried out in relation to quantitative research, either as "fleshing out" of a specific illustrative case or as a preliminary

exploratory project which identifies key issues for further investigation, they can provide valuable, free standing projects, producing useful knowledge and generating conceptual and theoretical work. The case study is a model frequently found in educational and other kinds of social and cultural research and in addition to the above, its usefulness as an examination of issues or problems has been highlighted by Stake (1995). His work is primarily in the field of education where case study projects have been useful in examining issues and problems associated with schooling and other educational context. By focusing on an issue, the researcher has a clear focus and defined parameters for the study.

4.3 INSTRUMENTS OF COLLECTING THE DATA

The researcher used the following instruments to collect data from four schools at Umlazi: he used a cassette recorder and the cassette to record all the interviews; he also used semi-structured individual interview questions and group interviews to get data; the questionnaire was used to get data from the educators who were not part of the interviews; and lastly he used non-participant observation to get an understanding of how educators integrated computer technology into the curriculum when they educate learners.

4.4 METHOD OF COLLECTING THE DATA

4.4.1 SAMPLING

4.4.1.1 INTERVIEWS

The researcher used the following semi-structured interview questions in his study:

1. Do you have computers in your school?

2. What type of computers do you have?
3. In which operating system do you run your application software? (Windows 95, 98, 2000 or XP Professional)
4. How many computers do you have in your school?
5. Do you think it is necessary to use computer technology in the classroom? Why?
6. What programs do you use in your learning area?
7. Do you think the use of computer technology in different learning areas in your school has an impact on the way learners learn?
8. If you have used computer technology in your classroom, have you experienced any problems with it? If yes, please explain.
9. What plans do you have to overcome these problems?
10. Does computer technology help to improve the standard of teaching and learning in your school?
11. If yes, how does it help?
12. What is the future of computer technology in your school?

According to Bless & Higson-Smith (2000), unstructured or semi-structured interviews are very helpful in exploratory research, as well as when considering a pilot survey before the formulation of a final questionnaire. These methods help to clarify concepts and problems and they allow for the establishment of a list of possible answers or solutions which, in turn, facilitate the construction of more highly structured interviews. In particular, they facilitate the elimination of superfluous questions and reformulation of ambiguous ones. They also allow for the discovery of new aspects of the problem by

exploring in detail the explanations supplied by respondents. The wealth and quality of the data gathered are strongly dependent on the skill of the interviewer and the confidence inspired in respondents. The type of questions asked and encouraging comments made at the correct moment are also very important.

The weakness of unstructured interviews lies partly in the fact that if the interviewers are not competent they may introduce many biases. In particular, recording the comments of participants is a delicate matter because of the great variety of answers and their complexity. Moreover the interviews are time consuming and thus expensive.

The focus group interviews are conducted in an unstructured or semi-structured way. In other words the researcher or facilitator of the focus group draws up a list of broad questions, topic or themes. These are used to develop discussion among the focus group participants. The advantages of using group interviews are that participants are able to discuss the issues in questions with each other. One person's idea may set off a whole string of related thoughts and ideas in another person. Similarly, one participant may question the remarks of another. When this happens there is an opportunity for the whole group to explore the disagreement in detail, thereby producing a much deeper understanding of the problem. A careful record of the debate between participants can give the researcher much deeper insight into a topic than would have been gained from interviewing participants individually (Bless & Higson-Smith, 2000).

Another important advantage of this technique is that it provides an opportunity for participants to learn from each other, and perhaps to resolve important dilemmas with

which they are confronted. This is very useful in action research where part of the researcher's goal is to help address a particular problem facing a particular group of people. For this reason, the focus group method of data collection might turn out to be extremely comfortable for many people and may for this reason be the method of choice. (Bless & Higson-Smith, 2000)

There are, however, many potential dangers of using focus groups and the success of this approach depends in large part upon the skill of the group facilitator. Group facilitation is aimed at ensuring that a safe environment for uncensored communication is created. In particular, the facilitator should make sure that everyone in the group has real opportunities to contribute, and that the group does not prevent some members from freely expressing their ideas. Some members of the group might tend to dominate and they would need to be restrained by the facilitators. Others might find it extremely difficult to express their thoughts and they would need encouragement. Some group members dominate others purposefully or without realizing it for a range of different reasons. People with more education, or more self confidence, or better linguistic skills will tend to speak more than others. Thus the results of the focus group could be biased towards those people who contributed more to the discussion.

When the researcher was doing group interviews in school number three he did not experience major problems because there were two educators only. The first problem was that the time that he was given was not enough. The researcher was given one hour to interview two educators. Educator one was dominating in the interviews because he was the senior staff member in the school. Most of the time educator number two waited for

educator number one to say something before he would respond to the question. The researcher asked them to take turns to answer the questions so that both of them would have a chance to respond to all questions.

School One

In school number one the researcher interviewed two educators. He used random sampling, to give all educators in the school an equal opportunity to be selected for the interviews. According to Babbie (2001), the purpose of sampling is to select a set of elements from a population in such a way that descriptions of those population from which the elements are selected.

In random selection, each element has an equal chance of selection independent of any other event in the selection process. Flipping a coin is the most frequently cited example: Provided that the coin is perfect (that is not biased in terms of coming up heads or tails), the selection of a head or a tail is independent of previous selections of heads or tails. No matter how many heads turn up in a row, the chance that the next flip will produce heads is exactly 50-50. The reason for using random selection is twofold; firstly this procedure serves as a check on conscious or unconscious bias on the part of the researcher. The researcher who selects cases on an intuitive bias might very well select cases that would support his or her research expectations or hypothesis. Random selection erases this danger. More important, random selection offers access to the body of probability theory, which provides the basis of estimating the characteristics of the population as well as estimates of the accuracy of samples (Babbie, 2001).

First Step

On the 21st of April 2005 the researcher went to the school Principal to ask for permission. The appointment was at 8h30. The researcher had to explain to the school principal why and how he was going to interview educators. What the researcher was going to do with the information that was collected from the school. The school Principal was happy with the researcher's explanation and he allowed him to conduct the study in the school. The researcher was told to work hand in hand with the Deputy Principal. But the deputy was not available that day. The researcher had to come back again. He made an appointment to see him the following day before the school starts.

Second Step

On the 22nd of April the researcher went back to the school to meet the Deputy Principal. He gave the researcher a list of grade 10 educators they have in school and he selected all educators who were going to participate in interviews. The researcher cut out all the names in the list and folds them. He put the names in a bowl and asked the Deputy Principal to pick up two names from the bowl. He called in the two educators and the asked for their permission to be interviewed. They both agreed. It was agreed that the researcher was going to come and interview the educators on the 28th of April. The researcher was given one hour per educator. The first interview started at 8h00. The second interview started at 9h00. The researcher was allowed to use the cassette recorder. The interviews took place in the Deputy Principal's office.

Final Step

On the 28th of April the researcher went to the school to interview the educators. He used individual semi-structured interviews. The interviews went well. The researcher gave five other educators the questionnaire and observed one lesson.

School Two

In school two the researcher interviewed two educators. He used semi – structured interviews.

First Step

The appointment with the Headmaster was at 9h00. He gave the researcher the permission to conduct the study in the school. At break time the Headmaster asked the researcher to go to the staffroom and explain to the educators how he wanted them to help him with his study. The told them that he wanted to interview two educators and give four other educators the questionnaire. The researcher also told them that he would like to observe at least one lesson. Most of the educators were not willing to participate in the interviews, because they said that they were not computer literate. They said they were willing to help with the questionnaire. At least two computer educators volunteered to be interviewed. It was agreed that the researcher was going to interview them on the 28th of April at 11h00.

Second Step

On the 28th of April the researcher went to the school. He used the office of one of the computer educators to conduct the interviews. The researcher was given two hours to

interview the educators. Each educator had an hour. The researcher used individual semi-structured interviews. He also gave four other educators the questionnaire and observed one lesson. The researcher was allowed to use the cassette recorder.

School Three

In school three the researcher used group interviews.

First Step

In school three the researcher went to the school Principal on the 21st of April to ask for permission. The appointment was at 11h30. She agreed that the researcher can come on the 28th of April to conduct the interviews in her school. But she said that the researcher can only interview the educators after school, not during the school hours. The researcher used random sampling to select two educators that were going to participate in the interview. The school secretary gave the researcher the list of all the educators. He cut out the names, folded them and put them in a box. He asked the school secretary to pick up two names in the box. The researcher met the two educators at lunch break. They both agreed to be interviewed. They also allowed the researcher to use cassette recorder. But they preferred group interviews, because they said they had other commitments after school. So the researcher had to work with both of them for one hour twenty minutes after school.

Second Step

The interview went very well on the 28th of April. The researcher arrived at school during lunch break because he had to give four other educators the questionnaire and observe

one lesson. He used group interview as they asked. Both educators were participating. The researcher encouraged them to take turns to answer the questions. The interview was conducted in the school library.

School Four

In school four the researcher also interviewed two educators and he used individual semi-structured interviews.

First Step

In school four the researcher visited the school on the 21st of April to get permission from the Headmaster to conduct the study. The researcher was given permission by the Headmaster and he was told to lease with the deputy principal if he wanted to communicate with the school.

Second Step

The researcher went back to the school on the 9th of May to meet the Deputy Principal and the educators that were going to take part in his study. The researcher did not use random sampling because the Deputy Principal gave him the names of two educators that he was going to interview. The researcher went to the staff room to meet the two educators. He met the educators and they both agreed to be interviewed. But they did not allow the researcher to use cassette recorder. They did not want to be recorded, so the researcher had to respect their decision. Both parties agreed that the interviews were going to take place on the 19th of May.

Third Step

The first interview took place on the 19th of May. It went well. The second interview took place on the 30th of May because educator number two was not at school on the 19th of May. In both interviews the researcher was not allowed to use the cassette recorder. He wrote everything on paper. He also observed one lesson.

4.4.1.2 QUESTIONNAIRE

Four educators in each school who did not participate in the interviews were given the questionnaire. The researcher used the following questions in the questionnaire:

1. Are you currently using computer technology in your school?

2. If so give some examples of how you use computer technology in your school?

3. For how long you have been using computer technology in your school?

4. Have you ever received any formal training in integrating computer technology in the curriculum?

5. Do you think it is necessary to integrate computer technology into the curriculum? Yes/No

6. How do you rate the use of computer technology through out the school?

7. Since the integration of computer technology in your learning area, how do you rate the performance of your learners?

Very good / good / fair / poor

8. From your own observation have the learners enjoyed lessons where you have integrated computer technology? Yes / No

9. If you have to rate yourself and your colleagues, would you say are you fully competent / competent / not yet competent in the integration of computer technology in the classroom?

10. What is your overall opinion about the integration of computer technology into the curriculum?

According to Caplovitz (1983), questionnaires are suitable for obtaining a wide range of information about individual's factual information, information about beliefs, attitudes, values, expectations, reasons, or explanations, and even information about social relations. Questions that appear on the questionnaire fall into two basic types, open-ended and closed-ended, or checklist questions. In the open-ended question, the respondent is allowed to respond in any way. In the closed-ended question, a set of response categories is provided with the question and respondent is asked to choose the response that comes closest to his or her position. An open-ended question is: What do you think about the present state of the economy? A close-ended question is: Do you think in the current state of the economy that (a) wages are too high, (b) wages are too low, or (c) wages are about right?

There are pros and cons about each of these types of questions. The open-ended question is especially suitable when researchers are not sure of the responses to the question. A major problem of the open-ended questions is that the respondents might address different dimensions of the question, so that their answers are not comparable. The drawback of checklist questions is that the responses offered may not capture the nuances of the respondent's sentiments and feelings; there is also a risk of putting words in the

respondent's mouth, distorting his views. But there are many virtues to closed-ended questions. They tend to clarify the meaning of the question, specifying the dimensions of the question that are important to the researcher (Caplovitz, 1983).

Checklist questions are much easier to process than open-ended questions. Each open-ended question requires the researcher to build a code for classifying the answers and a rather lengthy operation of the data processing, known as coding, must take place. In short, open-ended questions add considerable time and cost to the data processing phrase of the researcher. Open-ended questions are particularly valuable during the early phrases of the research, when the researcher is developing the questionnaire. The first draft of a questionnaire will have a number of open-ended questions that will generate the range of responses to the questions (Caplovitz, 1983).

Questionnaire is good when the researcher want to collect information from a large number of people. The problems that were experienced by the researcher were that the educators did not complete all questions. Some educators lost them and the researcher gave them the new ones. The best way to collect information using a questionnaire is to make sure that you sit with the educators and help them to answer the questions. In this case the researcher will be able to get all the information in time.

4.4.1.3 OBSERVATION

NON – PARTICIPANT OBSERVATION

In this study the researcher used non – participant observation because his intention was to sit in class and observe if the educators do integrate computer technology into their

learning areas. The researcher included the following in the observation schedule: The number of learners in class; working individually, in pairs or in groups; layout of the classroom; resources used during the lesson; how the resources were used; any problems due to resource issue.

From what the researcher observed in four schools at Umlazi, the educators did not use computer technology in their learning areas. The schools that have computer educators went to the computer room to teach computer literacy and there was nothing more than that. The teaching aids that were used in class were: class work books, chalkboard, text books and dictionaries.

According to Bless & Higson-Smith (1997), simple observation is also called non-participant observation, is the recording of events as observed by an outsider. For example, an outsider placed at the road junction can observe cars passing or pedestrians crossing the road, the speed of the cars, the number and causes of accidents and so on. But this method has some weaknesses. People who feel that they are being observed may change their behavior, become uneasy or stop activities altogether. Thus, although simple observation is based on the assumption that the observer merely records facts without interaction with the observed, in fact the observation itself introduces biases as people become aware of being observed.

According to EASEIT-Eng (2000) when the researcher is observing a lesson or any activity it is very important to have observation schedule. Observation schedule is not intended to act as a checklist, but as guidelines or a reminder to be alert and on the

lookout for certain things. Some of the factual information can be recorded immediately. The researchers should try to introduce themselves to the learners and explain their role. It will also be necessary to outline the reason for their presence. The researchers should try to be unobtrusive as possible during the observation and simple make notes about what they see.

4.5 CONCLUSION

In this chapter the researcher was showing how he negotiated with the school managers to get permission to conduct the study in the schools and the problems he experienced while negotiating with the School Managers. Based on the case study performed by the researcher, as highlighted in this chapter, the next chapter the researcher will now look at the findings from four schools that were visited.

CHAPTER FIVE

5.1 FINDINGS

5.1.1 INTRODUCTION

In this chapter the researcher is analyzing the data that was collected in four different schools. This chapter is going to answer all the critical questions that are in chapter one. All the people who participated in this study are going to give the indication whether the previously disadvantaged schools in Umlazi are integrating the computer technology into the curriculum or not. Once the data has been analyzed the researcher is going to draw up the conclusion. After the conclusion the researcher is going to recommend what should be done if the schools are not integrating computer technology into the curriculum. Or what the schools should improve on if they are integrating computer technology into the curriculum.

5.1.2 SEMI-STRUCTURED INTERVIEWS

The researcher interviewed eight educators in fours schools. In school one the researcher interviewed Mathematics and Natural Science educators. In school two he interviewed Accounting and Computer Technology educators. In school three he interviewed Biology and History educators. In school four he interviewed English and Life Orientation educators.

Questions and responses

1. Do you have computers in your school?

All eight educators said that they had computers in their schools. In school one and school two computers were used to educate computer literacy. In school three and four the computers were only used by the headmaster and the administration staff to do administration work.

2. What type of computers do you have?

In all schools the educators use different name brands. In school one both educators said that they use Sahara computers. In school two the educators said that they use Samsung and Hewitt Package computers. In school three the educators said that they use Mercer computers. In school four both educators said that they did not know the brand names of school computers because they do not use them.

3. In which operation system do you run your application software?

(Windows 95, 98, 2000 or XP Professional)

All four schools that were visited used windows 2000. School two used both windows 98 and 2000.

4. How many computers do you have in your school?

In school one both educators agreed that in the computer laboratory they had about 30 computers. But they are not sure about the total number of the computers they have in the school. They said that there were computers in the front office; in the headmaster's office and in the deputy headmaster's office. The Head of Departments had computers as well

in their offices. They said that the computer laboratory was used to teach computer literacy in grade 8, 9 and 10. The learners were not doing computers in grade 11 and 12. In school two they had 35 computers in the computer lab. They only used 20 of them because the others were broken. The educators were not sure about the number of computers in the front office and in the headmaster's office. In school three they had two second hand computers that were donated by Lever Brothers. The other computer was broken. The other computer that was working was used by the front office. In school four they had two computers used by the front office and the headmaster. In total 45% of the computers belonged to school one; 49% belonged to school two; 3% belonged to school three and the other 3% to school four.

5. Do you think it is necessary to use computer technology in the classroom? Why?

In school one; educator one said that, it is very important to use computer technology in class because it enriches the child's mind. The educators can research information from the computer. They can use it to store the information for future use. He also said that it saves time because you can visit different libraries on the Internet to find books that are available to the subject that they are researching. Educator two said that, it is necessary to use computer technology in class because it can help to get more information and the learners do not rely on the book as the only source of information.

In school two, educator one said that it is important to use computer technology in the classroom, because technology is used world wide and the learners are going to benefit from the high technology that is provided to them in schools. Educator two said that yes, absolutely, it makes teaching very easy. It also allows learners to explore more in their

subjects. Learners enjoy it very much. It also brings the learners closer to real life, job related activities and it also allows them to be computer literate and they learn to solve their own computer problems and it creates a fascinating and vibrant learning atmosphere.

In school three both educators said that it is necessary to use computer technology in the classroom. The learners do assignments and store information in the computer. They can also use the computers to find books from the library. They can also use e-mail to communicate with other learners. In school four educator one said yes, it helps learners to keep abreast with the latest trends in the world and to access information easily. Educator two said that, it is necessary because it makes the information more accessible and it is not time consuming.

6. What computer programs do you use in your learning area?

All eight educators said that they do not use any computer programs in their learning areas because they do not use computer technology in their learning areas. They said that, they are not trained to integrate computer technology into the curriculum. They also said that the learners do computer literacy only. They do not use computers in other subjects.

7. Do you think the use of computer technology in different learning areas in your school has an impact on the way learners learn?

Educator one said that, at present moment they do not use computers in different learning areas. Computers are only used to teach computer literacy in grade 8, 9 and 10. He said if they can use it in different learning areas, it can help the learners to get information from

the Internet. They will not only rely on the educators and text books to get information. The learners can learn to use the E-mail. They can communicate with other learners via the E-mail. The learner's performance can improve if the computer is going to be used as a teaching aid. This can also develop interest from the learners to learn more about computers in tertiary institutions.

Educator two said that if the school can use computer technology in all their learning areas, the standard of teaching and learning can improve as well. The learners learn more skills from the computer, like typing their own notes, using internet to send and receive e-mails.

In school two, educator one said that they only use computer technology when they do computer typing. They do not use computer technology in other subjects. They do computer literacy in grade 10, 11 and 12. She said they would like to link computer technology in other learning areas, but they do not have enough computers in the school. The number of learners per class is big. They have about 60 learners per class. But she thinks that computer technology can help the learners to do their assignments, mostly the grade 12 learners. She trained at Edgewood College to teach computer literacy but not to integrate computer technology into different learning areas.

Educator two said that if they can use computer technology in all learning areas, the learners can learn more from self discovery and discover new things themselves. Computer technology can also make their work more presentable through typing out their assignments. The computer can also teach them spelling and grammar as it provides them with alternative grammar options and proper spelling. Because they also view and

observe things on the computer, they can use their sense of sight a lot. Learners can now do work faster than usual as processing on the computer is very quick and easy. She also thought that the learners learn more when they are actively involved throughout the lesson and the use of computers in learning areas allows them to be creative and be involved.

In school three both educators said that the use of computer technology in schools can improve the way learners learn. They can research information from the internet. This can help them to learn new skills like typing and to find information using the Internet. But in their school they need to train all the educators to be computer literate before they even introduce computer technology to the learners. After that they will learn how to integrate computer technology into the curriculum. At the moment there are only two educators who are computer literate at the school. But the two educators did not train to integrate computer technology into the curriculum. In school four, educator one said yes, it will have a positive impact because right now it seems as if the learners are in their own world, they are legging behind. Educator two said that learners can be able to get information which is relevant to their own learning areas, like Internet.

8. If you have used computer technology in classroom have you experienced any problems with it? If yes please explain.

In school one both educators said that they do not use computer technology in class but they have noticed that there is a problem with the number of learners per computer. They do not have enough computers in the school. It is always better if the child is going to use

his or her own computer rather than sharing a computer. The other problem is the computer virus and the disks are easily damaged. Some times they get lost.

Both educators said that the following problems are experienced by the school: The first problem is that the learners start computer literacy in grade 10 and they are not all computer literate. The learners who are not computer literate are encouraged to attend extra lessons. The second problem is the electricity power failure, which might be caused by the over used of computers. The computers they use in school are not new, they are second hand computers that were donated by different companies. Out of 35 computers in the computer laboratory only 20 computers were working. Some learners have to share the computers. If the learners are not properly monitored, they tend to do other work on the computer other than what is required of them. The Internet seems to aggravate the problem. Learners visit explicit sites which should only be accessed by adults. Another problem would be the fact that if a learner is not yet competent in the use of a computer, he or she might battle to complete the given tasks.

In school four they do not use computer technology in the classroom because they do not have enough computers in the school. But they do have some problems with the computer that is used by the front office. The Internet is always down. The computer freezes sometimes because it is over used. They have to wait for it to get right because they do not have another computer to use. The school has Internet in the computer that is used by the front office. The Internet is not used often. They still use the traditional way of communicating with other schools like faxing or letter writing. They do not use e-mail.

In school four the educators said that they do not use computer technology in their learning areas, but if there was a breakdown in some cases they could not fix it, they had to rely on technical staff. Educator one said that in hr previous school some learners wanted to use the Internet having not finished the project at hand and tend to rely on the Internet and use the library less. They also said that learners would not concentrate on the topic being taught at that moment. Some learners would play games and download other unnecessary information not relevant.

9. What plans do you have to overcome these problems?

All eight educators gave some suggestions about how these problems could be solved. The educators can bring these issues to the attention of the school management. The schools need to buy more computers or ask for sponsorship from different companies. The school management must be made aware about the value of computers in the school. Each school should form a committee that is going to market the school to different companies. Schools should have technicians who are going to fix the broken computers. But sometimes he is committed he does not get enough time to fix or service all the computers that are broken. To solve the explicit site visiting on the Internet, some sites should be blocked and the learners should not get access to those sites at all. To solve the problem of learners doing other tasks other those allocated to them, they should be closely monitored or perhaps the school should purchase the software that allows the educator to have access to a learners screen from the educator's computer. Each high school should have a computer laboratory.

10. Does computer technology help to improve the standard of teaching and in your school?

All eight educators said yes it can help to improve the standard of teaching and learning in the schools.

11. If yes how does it help to improve the standard of teaching and learning?

In school one the educators said that it can be used as a teaching aid to find information from the Internet. It can help educators to be more creative by coming up with different styles of teaching, using computers. In Mathematics it can also help the learners with formulas. The learners can also design their own formulas and use them in class. The other advantage of using computers in class is that you can do a lot of work in a short space of time. It can help the educators to prepare their worksheets beforehand and save them in the computer. When the learners come to class they can activate the computers and do their worksheets. The educator suggested that in most cases it is always better to make the learners think first before they find the information in the computers.

In school two and three the educators said that they can do their worksheets and class lists on the computers. It can help to improve the school results if it is used across the curriculum. It can help to raise the learner's level of interest and school attendance as they are always willing to discover and learn new things; increase learner performance; increase learner participation in classroom activities and learners find other alternatives to solve problems in Mathematics and Science. It can also help both educators and learners to learn about the interrelatedness of different learning areas. But not all the staff members have eccess to the computers. They are only used by the school management,

computer Educators and the head of departments. This makes things difficult for the educators to integrate computer technology into the curriculum. The educators and the text books are not the only source of information. The educators can encourage the learners to use Internet to get more information about what they are learning in class. In this case the educator becomes the facilitator.

In school four the educators said that it can help to have access to information and help to improve their standard of living as individuals. It will be easy for them to access services on the Internet. Educators can plan lessons at home and come to present to the learners. Educators do not have to write on the chalkboard which is time consuming.

12 What is the future of computer technology in your school?

In school one the educators said that the future of computer technology in the school is very good to both educators and the learners. The school introduced computer literacy in grade 8. Most of the learners in the school do enjoy computer studies. This will help the learners as early as grade 8 to be computer literate. The school is planning to have another computer laboratory because, computer studies in the school is in demand. This will not only help them to do their school work, but in their outside world they need to be computer literate. In most places of employment they need people who are computer literate. Learners also need computers for your personal interests, like Internet banking or do your shopping through Internet. People can also buy shares from different companies through the Internet. Learners can also communicate with other people all over the world by e-mailing them. The value of computer technology is very important. It gives learners

life skills. Educators also suggested that it is going to be good if the learners are going to do computer technology right up to grade 12.

In school two educators said that the future of computer technology in the school is promising, the only problem is that the school does not have enough computers. The learners are showing interest. The headmaster is planning to get more computers and start computer studies in grade 8. This will help them when they choose matriculation subjects. They will be able to choose computers as one of the matriculation subjects because all of them will be computer literate by the time they start grade 10. If they get more computers in the school, all educators will have equal excess to the computers. The educators will be able to integrate computer technology into the curriculum. This will also help the learners to pursue their careers in computer studies at tertiary institutions. The learners are attending computers nine times in nine day circle. This shows that computer technology is one of the most important subjects in the school.

In school three the educators said that in future they see the school using computer technology in all learning areas. The school needs to buy more computers and software programs to help learners with their school projects. If they buy more computers in the school, it will allow the learners to have more access to the computers. She also hopes that the integration of computer technology into the curriculum is going to be ultimately enjoyed and embraced by all the educators, whom at the moment fear and disapprove of this wonderful move in the education of our future leaders.

The future of computer technology in the school is good, but it is not bright as it should be. The school is building the computer laboratories. The company called Smiley has donated 24 computers to the school. At the moment the school is trying to make sure that the security around the school is tight. They want to make sure that the computers are safe. They have not identified the educators who are going to teach computer studies in the school. The school is looking for the educators who are well experienced in computer studies. In the school there are educators who are computer literate, but they do not know how to integrate computer technology into the curriculum.

In school four the future of computer technology is promising to be good. There are plans to set up a computer centre but the problem is that there are other important things that need to be done before they set up a computer centre. The school does not have enough classrooms, textbooks and furniture so when it comes to priorities the computer centre is at the end of the list. Once they opened the computer centre, they will be able to produce learners who are going to be competitive in the work place and who will cope with computer challenges anywhere in the world.

5.1.3

THE ANALYSIS OF THE RESPONSES FROM INTERVIEWS

TABLE 1

NUMBER OF COMPUTERS AND SOFTWARE PACKAGES USED PER SCHOOL INTERVIEWED

School	*Number of computers per school*	*Operating System*	*Software package in use*
School 1	38	Windows 2000	Not sure
School 2	35	Windows 98	Microsoft Office
School 3	2	Windows 2000	Microsoft Office
School 4	2	Windows 2000	None
Total in all four schools	77		

Schools using Windows 2000	3
Schools using Windows 98	1

FIGURE 2

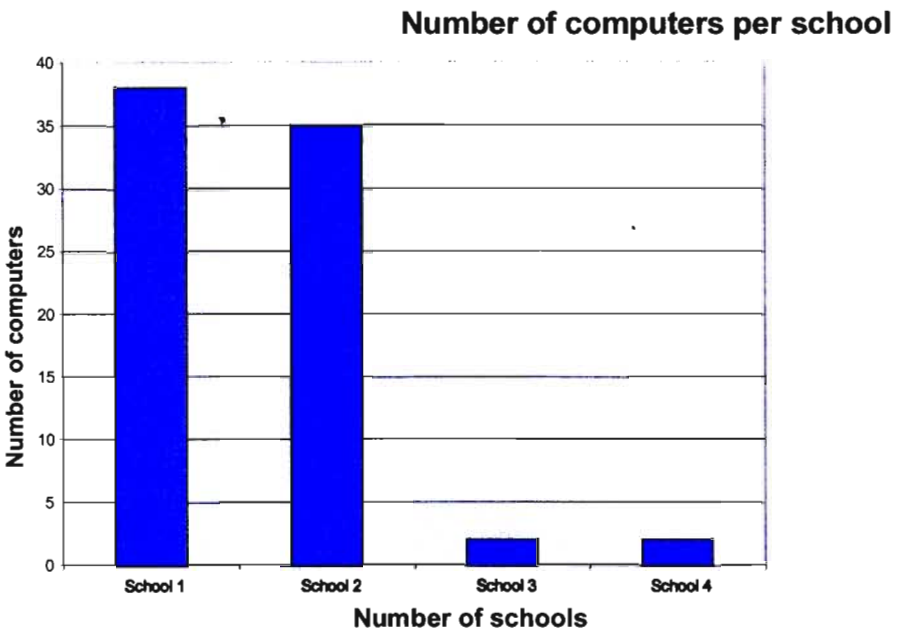


Figure 2 shows the number of computers in each school. It is evident from the graph above that School 1 has the most number of computers in comparison with the other three; it has 38 computers in total. School 2 is next with 35 computers in the school. School three and four both have the least computers, each with 2 computers. From this knowledge we can look at a number of issues and draw some conclusions based on this information, for example, if you look at the ratio of learner-computer, it becomes clear that these schools do not have enough computer facilities. School 1 has an average of 1200 learners enrolled, that means that there are 1200 learner sharing 38 computers. The ratio is thus 31.58:1, what that basically means is that there are 35.58 learners per 1 computer. School 2 has an average learner enrollment of 500, and having 35 computers, that works out to 14:1. School 3 has an average enrollment of 260 learners with only 2 computers in the school, which gives a ratio of 130 learners to 1 computer. School 4 has an average learner enrollment of 280, which works out to 140:1.

FIGURE 3

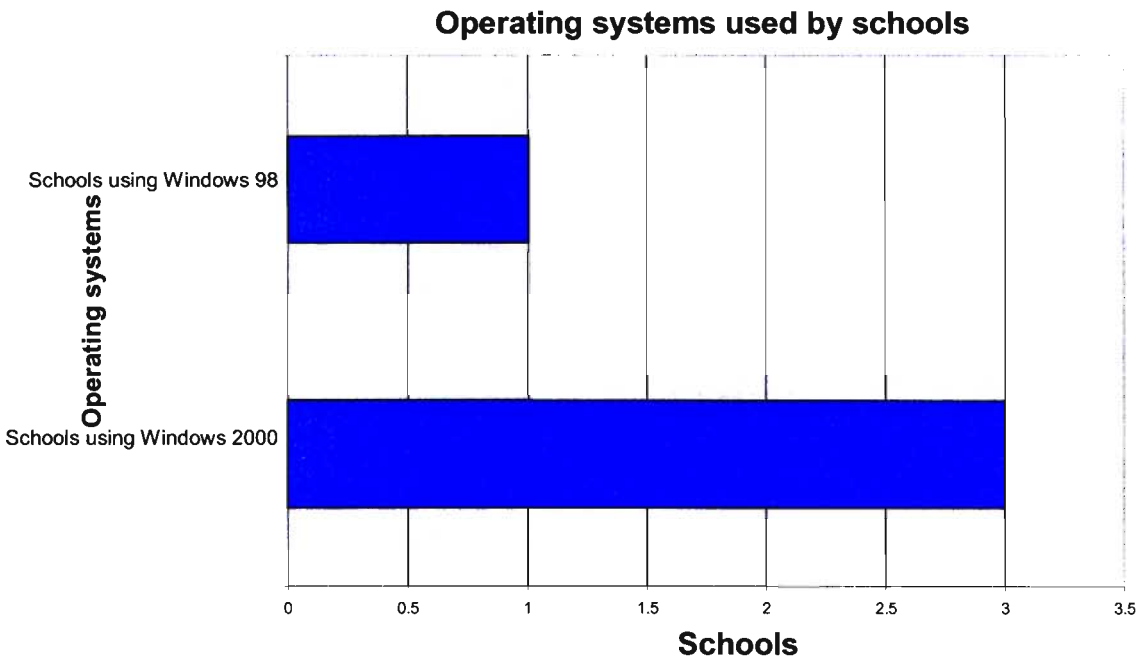


Figure 3 shows the operating systems that are used by the schools. From the schools in the case studies, School 1 to School 4, most of the school's computers are operating in the Windows 2000 operating system. Only one of the schools, School 2 is operating their computers under Windows 98. None of the schools is using Windows XP as yet.

5.1.4 QUESTIONNAIRE

When the researcher collected the questionnaire from the educators, he did not get all of them. He collected twelve out of sixteen. This is how the educators responded to the questionnaire:

1. **Are you currently using computer technology in your classroom? Yes /No**

   One educator said yes he/she used computer technology in the classroom and eleven said no because they do not have computers in the school.

2. **If yes, please would you give examples of computer programs you have used and examples as how you have used them?**

   The educator said they use the following programs in school: Microsoft Word, Microsoft Excel, Microsoft Access and Microsoft Power Point.

3. **For how long have you been using computer technology in your learning area? 0 – 2years/ 2 – 5 years/ 5 + years.**

   One educator said he/she has been using computer technology in their learning area for about 2 – 5 years. Eleven educators said they do not use computer technology in their schools. All twelve educators said they are not trained to integrate computer technology into the curriculum.

4. **Do you think it is necessary to integrate computer technology in your learning area? Yes / No?**

   All twelve educators said yes it is necessary to integrate computer technology in their learning areas.

5. **Please give reasons for your above response?**

   They said it is necessary to integrate computer technology into the curriculum as it allows their learners to be at the same level with other international learners.

With every thing now computerized or linked to technology, it allows the learners to understand how things function and make them familiar with what to expect from the working world. It opens up their eyes about the world of technology and builds their interests in scientific projects as they are eager to know how a specific thing works and troubleshoot as to how specific problems can be solved. As there is a world – wide shift from manual things to automated or computerized products, it is wise to familiarize the learners so that they can understand why this move is essential and important. We need to move with international trends.

6. **Have you ever received any formal training in computer technology or the integration of computer technology? Yes / No?**

   Four educators said yes they have received formal training in computer technology. But eight of them said they did not received formal training in computer technology. All twelve of them has never received formal training in the integration of computer technology into the curriculum.

7. **If yes, what kind of training did you receive?**

   Four of them said they have done computer studies at colleges of education.

8. **How would you rate the use of computer technology throughout your school? Very good / good / fair / poor?**

   Four educators said it is good because they have big plans for the use of computer technology throughout the school. Two educators said it is fair because computers are not used throughout the school and there are educators who have no excess in

the use of computers. Six educators said it is poor because they do not have computers in their schools that are used by the learners.

9. **Have you noted any significant improvement in learner performance if you have integrated computer technology in your learning area?**

   One educator said he/she noted some improvement because computer technology is used in her learning area. Eleven educators said they have not noted any significant changes because they do not use computer technology in their learning areas.

10. **From your own observation, have the learners enjoyed the lessons where you have integrated computer technology in their lessons? Yes / No?**

    Twelve of them said no because they have not yet started integrating computer technology in their learning areas.

11. **If you had to rate yourself, would you say that you are competent / not yet competent in the use of computer technology in the classroom?**

    Four educators said they are competent. Eight educators said they are not yet competent in the use of computer technology in the classroom.

TABLE 2

THE ANALYSIS OF THE RESPONSES FROM QUESTIONNAIRES

SCHOOLS INTERVIEWED	QUESTIONS ASKED AND RESPONSES *Formal training in* *Computer Tech. received*		*No of respondents not yet competent in the use of* *Computer Tech.*		*No of respondents competent in the use of Computer Tech.*	*Use of computer tech.* *Rating*
School 1						
Respondent 1	no		not yet competent			good
Respondent 2	no		not yet competent			good
Respondent 3	no		not yet competent			good
Respondent 4	yes				competent	fair
Total respondents		4	Total respondents		4	Total respondents
Total respondents with formal training		1	Total competent		1	Total respondents with good rating
Total respondents with no formal training		3	Total not yet competent		3	Total respondents with fair/poor rating
School 2						
Respondent 1	yes				competent	good
Respondent 2	yes				competent	fair
Respondent 3	no		not yet competent			fair
Respondent 4	no		not yet competent			poor
Total respondents		4	Total respondents		4	Total respondents
Total respondents with formal training		2	Total competent		2	Total respondents with good rating

Total respondents with no training	2	Total not yet competent	2	Total respondents with fair/poor rating
School 3				
Respondent 1	yes		competent	poor
Respondent 2	no	not yet competent		poor
Respondent 3	no	not yet competent		poor
Respondent 4	no	not yet competent		poor
Total respondents	4	Total respondents	4	Total respondents
Total respondents with formal training	1	Total competent	1	Total respondents with good rating
Total respondents with no formal training	3	Total not yet competent	3	Total respondents with fair/poor rating
School 4				
Respondent 1	no	not yet competent		poor
Respondent 2	yes		competent	poor
Respondent 3	no	not yet competent		poor
Respondent 4	no	not yet competent		poor
Total respondents	4	Total respondents	4	Total respondents
Total respondents with formal training	1	Total competent	1	Total respondents with good rating
Total respondents with no formal training	3	Total not yet competent	3	Total respondents with fair/poor rating
Total number of respondents	16			
Average competent respondents	1.25			
Average respondents with formal training	1.25			

FIGURE 4

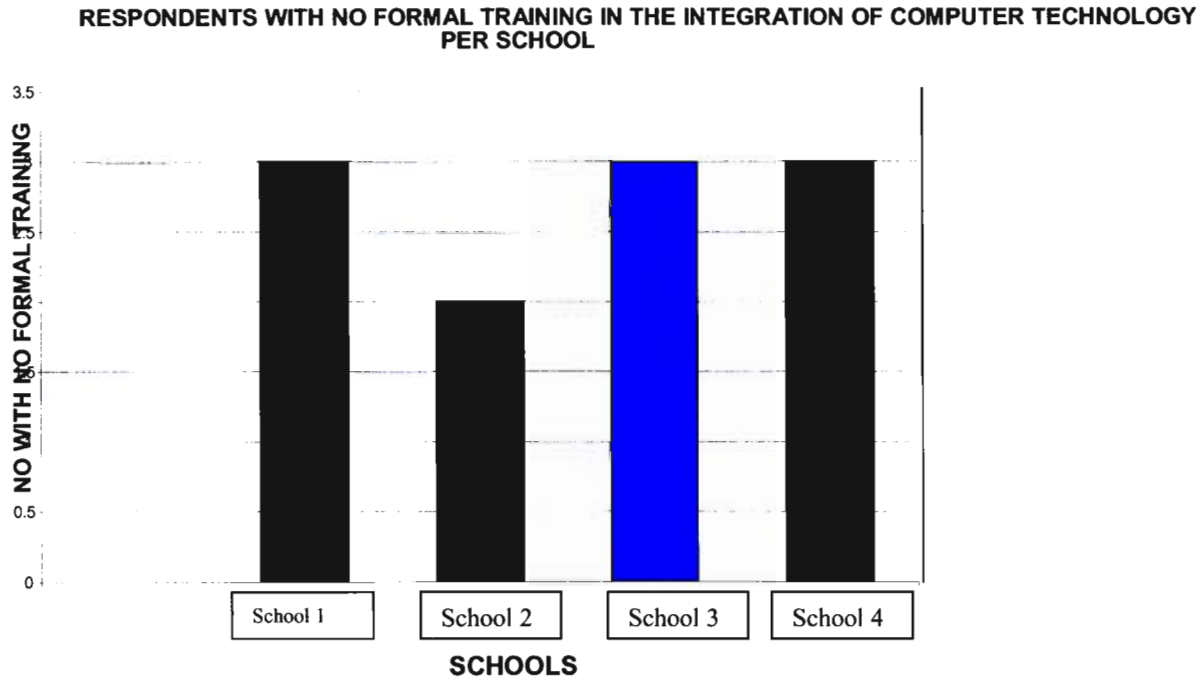


Figure 4 shows the number of respondents with no formal training in computer technology. Each school had four respondents, and out of the four respondents, this graph aims to depict the total number of respondents who have had no form of formal training in the integration of computer technology in the curriculum. School 1 out of their 4, had 3 respondents who haven't had this training. School 2 had 2, School 3 had 3 and School 4 had 3 as well.

FIGURE 5

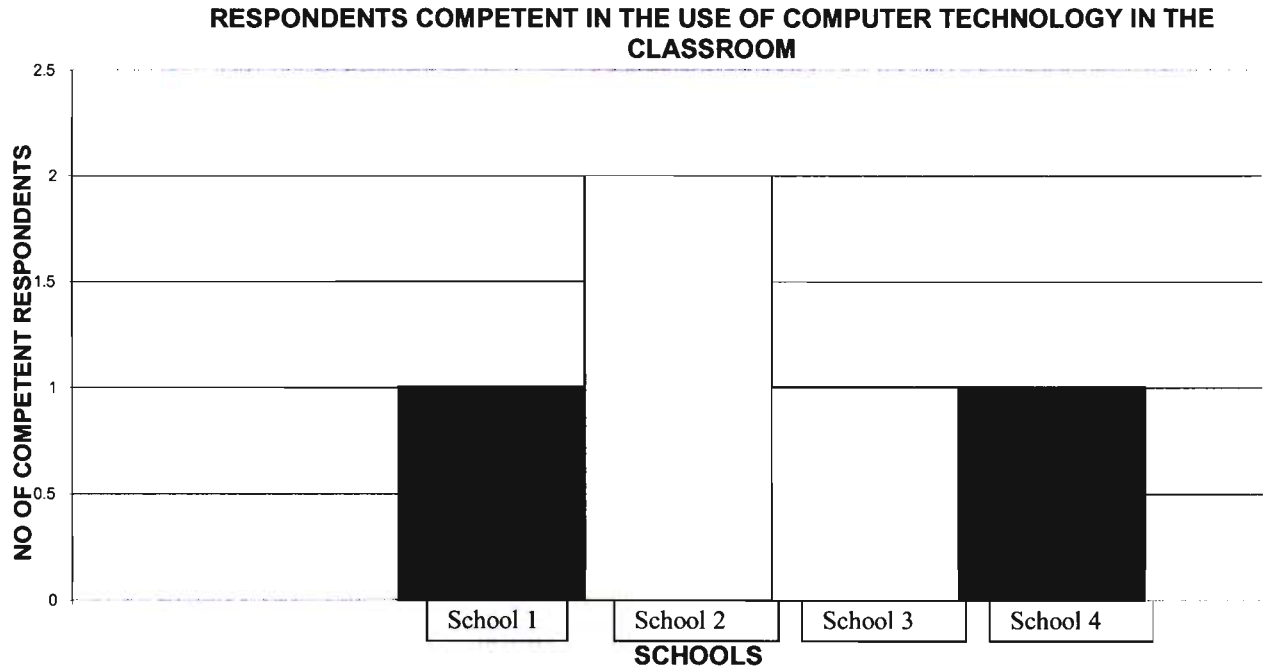


Figure 5 shows the number of educators who are competent in the use of computer technology per school out of four respondents. This graph is also based on four respondents per case study. School 1 had only one respondent who is competent in the use of computer technology in the classroom. School 2 had two respondents; School 3 had 1 as well as School 4.

5.2 DATA INTERPRETATION

5.2.1 Previous Knowledge

Previous knowledge is the knowledge that the learner has acquired through past experiences and exposure. It is knowledge that she/he comes to class already in possession of. In previously disadvantaged high schools that were visited by the researcher, educators do not integrate computer technology into the curriculum. They do not have previous knowledge because at high school level they did not learn computer technology. Even in tertiary institutions they did not learn computer technology. If these educators do not have background knowledge of computer technology, they will not be able to integrate computer technology into their learning areas. According to Dewey quoted in SCIMAST Classroom Compass (1995) education depended on action, knowledge and ideas emerged only from a situation in which learners had to draw them out of experiences that had meaning and importance to them. Jacqueline and Martin Brooks (1993) stated that by reflecting on our experiences, one can construct his or her understanding of the world. Each person generates rules and mental models, which are used to make sense of experiences. Learning therefore, is simple the process of adjusting mental models to accommodate new experiences. In the data collection instruments, the question of previous knowledge was covered in the following sections:

Interviews: Questions 3, 8 and 9

Questionnaires: Questions 3, 6 and 7

5.2.2 Interpret and Construct

When learners interpret the new information use their past experiences to construct knowledge. The lack of past experiences from the educators in previously disadvantaged schools would make it quiet for them to form an understanding of computer technology.

The interpretation and construction sections were covered in the following questions in the data collection tool:

Interviews: Questions 10, 11 and 12

Questionnaire: Question 4 and 5

5.2.3 Resources

To construct knowledge one needs resources. The schools that were visited by the researcher were under resourced. If the schools do not have enough resources it is going to be difficult the educators will not be able to integrate compute technology into the curriculum. The schools are lagging behind in high technology. Collagham cited in Blackledge and Hunt (1989), stated that to construct knowledge one needs resources, such as libraries, television, computers, magazines, oral sources, written sources and others. Learners use these resources with the aid of the educator. Educators are encouraged to facilitate rather than control and dominate

The resources were covered in the data collection tools as follows:

Interviews: Question 1, 2 and 4

Questionnaire: Question 2

5.2.4 Active Participation

The resources will help the learners to be actively involved in a lesson. When the researcher observed the lessons there was active participation among the learners. The learners still see the educator as the source of information. If there is no active participation learning will not be fun or interesting to the learners. If they are not interested they will not be able to form an understanding of what is being taught in class. Apple cited in Blackledge and Hunt (1989), stated that in constructivism learners are not expected to absorb knowledge. They are given a chance to think creatively and be actively involved in classroom activities. Dewey quoted in Blackledge and Hunt (1989), stated that physical actions, hands on experience may be necessary for learning. People need to take part in activities which engage the mind as well as the hands.

In this case the duty of the educator is to facilitate the learning situation. In schools that were visited by the researcher, the educators were not facilitating the situation. Instead they were feeding the learners with the information. The learners were not given a chance to think creatively and construct their own understanding about what they were learning in class. Jacqueline and Martin Brooks (1993) stated that in the classroom, the constructivist educator sets up problems and monitors student exploration, guides the direction of the student's inquiry and promotes new patterns of thinking. The educator refers to raw data, primary source and interactive materials to provide experiences for their students rather than relying on another's set of data.

Questions on active participation were covered in the data collection tools as follows:

Interviews: Question 5, 6 and 7

Questionnaire: Question 1, 8, 9, 10 and 11

5.2.5 Interviews

In four schools that were visited by the researcher only two of them teach computer technology. School one and two teach computer technology. School three and four do not teach computer technology. If school three and four do not teach computer technology it is clear that there are no chances that they will be able to integrate computer technology into the curriculum. Even the schools that teach computer literacy do not integrate computer technology into the curriculum. The educators are not trained to integrate computer technology into the curriculum. The number of computers per school does not allow the educators to use computer technology in their learning areas. The results of this study show that educators in previously disadvantaged schools do not integrate computer technology into the curriculum.

All eight educators who were interviewed do not use computer technology in their learning areas. Only three of them were computer literate. The other five educators were not computer literate. All twelve educators will not be able to integrate computer technology in their learning areas because they are not trained to integrate it into their learning areas. Five of them are not computer literate.

5.2.6 Questionnaire

Out of twelve educators who completed the questionnaire, there was only one educator who used computer technology in the classroom. This educator has used computer technology in the classroom for about two to five years. This shows that there are so many educators who do not use computer technology in their classrooms. It is quiet clear

that they do not integrate computer technology in their learning areas. All twelve educators said that they do not integrate computer technology in their learning areas. The problem they cited was that they have never done computer literacy and they have never trained to integrate computer technology in their learning areas.

There was only one educator who received formal training in computer technology. If there was only one educator out of twelve who received formal training, it shows there is still a lot of work that needs to be done in promoting the use of computer technology in previously disadvantaged schools. This will help the educators to be at the same level with ex-model c schools. The previously disadvantaged schools are legging behind in computer technology. The schools need computer laboratories and educators who are well trained to integrate computer technology into the curriculum.

Four out of twelve educators said that the use of computer technology in their schools was good; two educators said that it was fair and six said it was poor. This shows that the use of computer technology in previously disadvantaged schools was not up to standard. This was the issue that needed to be addressed as soon as possible, to bridge the gap between ex-model c schools and previously disadvantaged schools. In this case learners do not get equal opportunities in schools. Learners are entitled to equal educational opportunities no matter where they come from. Only four educators out of twelve who said they were competent in the use of computer technology. Eight of them said that, they were not yet competent. They still needed training and motivation so that they will be confident in the use of computer technology.

5.3 CONCLUSION

From the data that was collected from the study, the researcher can conclude that the previously disadvantaged schools in Umlazi do not integrate computer technology into the curriculum. The reason why they do not integrate computer technology into the curriculum is because most of the educators are not computer literate. The few educators who are computer literate are not trained to integrate computer technology into the curriculum. There are schools that do not have computer laboratories. The schools that have computer laboratories do not have enough computers to be used by the staff members and the learners. So it is not possible for the previously disadvantaged schools to integrate computer technology into the curriculum because of the above reasons. But in few years to come they do see a bright future in computer technology in their schools.

CHAPTER 6

6.1 RECOMMENDATIONS

The researcher made the following recommendations in the integration of computer technology in previously disadvantaged schools.

- School educators should be trained to use computers to make sure that all of them are computer literate. The Department of Education should organize some computer literacy workshops for the previously disadvantaged school educators. They need to make sure that all educators are computer literate before they train them to integrate computer technology into their learning areas.
- Previously disadvantaged educators must be encouraged by the Department of Education to visit schools that have started to integrate computer technology into the curriculum. They need to observe how other schools integrate computer technology in other learning areas. They should also get an idea of what computer programs are available to use.
- The schools must make sure that they find good computer educators who are going to help them to start off computer studies.
- Each high school should have a computer laboratory. The schools that do not have enough money to buy computers should go out to companies and ask for donations, so that they can be able to buy computers.
- The Department of Education needs to tell the schools that have computers to tight security to make sure that computers are safe.
- The Department of Education should organize technicians who are going to service computers in schools and help if the educators are experiencing some problems.

- The School Management should make sure that all the computers are working in school. The computers should be connected to Internet, so that the learners will be able to use E-mail to communicate with other learners around the world. The Internet can also help them find information they need for their school projects.
- All educators and the learners in the school should have an equal access to the computer laboratory. The educators should be allowed to book the computer laboratory and use it for their learning areas.
- The schools should be encouraged to buy computer programs that can be used in different learning areas. Educators should be made aware of the computer programs that can be used in their learning areas.
- The primary schools should be encouraged the Department of Education to teach computer studies as well, so that by the time the learners come to high school they are all computer literate. This would make things easier for the high school educators when they want to integrate computer technology into their learning areas. They will not have to start teaching learners how to use a computer. All learners will be at the same level in terms of computer technology.
- The school can also use the computer laboratory to offer afternoon classes to the community and charge them. This will help the school to raise funds to buy more computers for the school. The community who are computer illiterate will also benefit from the afternoon classes.

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6.4 APPENDIX A

SEMISTRUCTURED INTERVIEWS

INTERVIEWS WITH EDUCATORS

Semi-structured interviews were conducted to find out how educators integrate computer technology into the curriculum.

1. Do you have computers in your school?

2. What type of computers do you have?

3. In which operating system do you run your application software? (Windows 95, 98, 2000 or XP Professional)

4. How many computers do you have in your school?

5. Do you think it is necessary to use computer technology in the classroom? Why?

6. What programs do you use in your learning area?

7. Do you think the use of computer technology in different learning areas in your school has an impact on the way learners learn?

8. If you have used computer technology in your classroom, have you experienced any problems with it? If yes, please explain.

9. What plans do you have to overcome these problems?

10. Does computer technology help to improve the standard of teaching and learning in your school?

11. If yes, how does it help?

12. What is the future of computer technology in your school?

6.5 APPENDIX B

QUESTIONNAIRE

Questionnaire was used to collect information from educators who did not participate in the interviews.

Please assist me to conduct research on the Integration of Computer Technology into the curriculum. Your participation and honesty will be greatly appreciated. Please assist by answering as many questions as you can.

Whenever appropriate, please ✓ the appropriate response.

1. Are you currently using Computer Technology in your classroom? YES NO

2. If yes, please would you give examples of computer programs you have used and examples as to how you have used them.

_____

_____

_____

_____

3. For how long have you been using Computer Technology in your learning area?

0-2 YEARS 2-5 YEARS 5+ YEARS

4. Do you think it is necessary to integrate Computer Technology in your learning area?

YES NO

5. Please give reasons for your above response

_____

_____

_____

_____

6. Have you ever received any formal training in Computer Technology or the integration of Computer Technology in the curriculum?

YES NO

7. If yes, what kind of training did you receive?

_____

_____

_____

_____

8. How would you rate the use of Computer Technology throughout your school?

VERY GOOD GOOD FAIR POOR

9. Have you noted any significant improvement in learner performance if you have integrated Computer Technology in your learning area?

_____

_____

_____

_____

10. From your own observation, have the learners enjoyed the lessons where you have integrated Computer Technology in their lessons?

YES NO

11. If you had to rate yourself, would you say that you are COMPETENT NOT YET COMPETENT in the use of Computer Technology in the classroom

Thank you very much for your time and participation.
T.B Mhlongo

OBSERVATION SCHEDULE

Observation schedule was used as a guideline when the researcher was observing lessons in schools at Umlazi.

Date: _____ .

Time: _____

Observed Lesson: _____

OBSERVATION	**NOTES**
Number learners per class	
Working individually/pairs/groups	
Lay out of the classroom	
Resources used	

6.7 APPENDIX D

UNIVERSITY OF KWAZULU-NATAL

ETHICAL CLEARANCE APPLICATION FORM (HUMAN AND SOCIAL SCIENCES)

Aug 2005

Inquiries:
Ms Phumelele Ximba
Tel: 260 3587
Email:

PLEASE NOTE THAT THE FORM MUST BE COMPLETED IN TYPED SCRIPT; HANDWRITTEN APPLICATIONS WILL NOT BE CONSIDERED

SECTION 1: PERSONAL DETAILS

1.1 **Full Name & Surname of Applicant :** Thulani Basil Mhlongo
1.2 Title (Ms/ Mr/ Mrs/ Dr/ Professor etc) : Mr
1.3 Student Number (where applicable) : 204001417
Staff Number (where applicable) : N/A
1.4 School : School of education
1.5 Faculty : Faculty of education
1.6 Campus : Edgewood Campus
1.7 Existing Qualifications : HDE and B E D. Honours
1.8 Proposed Qualification for Project (where applicable) : Master's Degree in Educational Technology

2. Contact Details

Tel. No. : (031) 705 5508
Cell. No. : 083 259 7946
e-mail : thbamh@webmail.co.za
Postal address (in the case of students and external applicants) : 33 Hilmer Street
New Germany
3610

3. SUPERVISOR/ PROJECT LEADER DETAILS

NAME	TELEPHONE NO.	EMAIL	DEPARTMENT / INSTITUTION	QUALIFICATIONS
3.1 Mr B. S. Khoza	083 311 1468	khozas@ukzn.ac.za	School of Ed. Studies / UKZN	Master's Degree in Educational Technology
3.2				
3.3				

SECTION 2: PROJECT DESCRIPTION

Please do *not* provide your full research proposal here: what is required is a short project description of not more than two pages that gives, under the following headings, a brief overview spelling out the background to the study, the key questions to be addressed, the participants (or subjects) and research site, including a full description of the sample, and the research approach/ methods

2.1 Project title:
The integration of computer technology into the curriculum in previously disadvantaged high schools in Umlazi.

2.2 Location of the study (where will the study be conducted):
Umlazi Township

2.3 Objectives of and need for the study
(Set out the major objectives and the theoretical approach of the research, indicating briefly, why you believe the study is needed.)

The reason why the researcher conducted this research is because when he was in high school Computer Technology was not part of the curriculum in previously disadvantaged schools. As a result of that Computer Technology was not integrated into the curriculum. The schools were not well equipped with technological teaching tools. But now most of the previously disadvantaged high schools are provided with technological tools. Now Computer Technology is a part of the curriculum. Because this is something new to them, I want to know how educators integrate Computer Technology as a teaching tool in different learning areas.
This topic is very important because Computer Technology can be used to enhance the standard of teaching and learning in previously disadvantaged schools. It is a process of training people's minds and abilities to be able to use modern technology to acquire knowledge and skills. I have developed interest on this topic because at the University of KwaZulu – Natal (Westville Campus), I specialize in Educational Technology in my Masters Degree. So I have seen how Computer Technology can make teaching and learning more interesting.

The other thing that makes me want to conduct this research is that when I went to tertiary institution I was one of the students who did not find it easy to use Computer Technology that was available to the students. Computer Technology was a new experience to most of the students who came from previously disadvantaged high schools. So I do not want to see the students who come from previously disadvantaged high schools experiencing the difficulties that we experienced when we started tertiary education. The learners who come from previously disadvantaged schools should have no problems to use Computer Technology at tertiary level.

People whom I hope will benefit from the study are the educators and learners. Educators will be more familiar with new teaching methods. The educators will learn how to integrate Computer Technology into the curriculum. This will make teaching and learning far more easily. As a result of this study learners may learn computer skills. This can also help the community who did not get a chance in their school days to use Computer Technology. By the end of the study it will be recommended that, educators should provide evening classes to the community.

2.4 Questions to be answered in the research
(Set out the critical questions which you intend to answer by undertaking this research.)

In my study I want to answer the following questions:

- ***How*** do teachers integrate Computer Technology into the curriculum?
- ***What*** impact does the integration of Computer Technology have on the curriculum?
- ***Why*** is it important to integrate Computer Technology into the curriculum?

2.5 Research approach/ methods

(This section should explain how you will go about answering the critical questions which you have identified under 2.4 above. Set out the approach within which you will work, and indicate in step-by-step point form the methods you will use in this research in order to answer the critical questions.
For a study that involves surveys, please append a provisional copy of the questionnaire to be used. The questionnaire should show how informed consent is to be achieved as well as indicate to respondents that they may withdraw their participation at any time, should they so wish.)

To answer my critical questions I am going to use observation for critical question number one. In critical question number two I am going to use interviews. In critical question number three I am going to use questionnaires.

- **OBSERVATIONS**

In critical question number one I am going to observe how educators integrate computer technology into the curriculum. If the teacher allows me to take part in a lesson, I would do so. I will do participant observation. I would like to be part of the class, so that I will get all the information that I need. If I work with the learners and the teacher I am standing a good chance to get in – depth information from both the educators and the learners. I would like to observe two educators per school in two learning areas. To observe two educators per school will help me to cover all eight learning areas.

- **INTERVIEWS**

- **Individual semi-structured interviews and individual structured interviews**

In my research I would like to do individual semi-structured interviews and individual structured interviews. I want to use these two types of interviews because, I want to start with questions where the participants will give me one word answer. After that I will start asking the questions where the participants will have to elaborate on their answers. I would like to do face to face interviews and interview the educators in their classrooms or in a place where they feel more relaxed. I would like to interview the educators before and after the lesson. To interview the educators before the lesson it will help me to know the plans of integrating Computer Technology into the curriculum. After the lesson I will get a chance to ask questions about what I have observed in the classroom.

- **QUESTIONNAIRE**

In my research I would like to use a questionnaire as one of the tools to collect information from the educators who did not take part in interviews and observations. The reason is that I will not be able to interview and observe all the staff members. The only way I can get data from other staff members is to use questionnaire. Questionnaire is a good too to collect data from a large number of people. Wilson, (2000) define questionnaire as a set of specially designed questions to which answers are written on a pre-prepared form. It tells you who your audience might be in demographic and psychographic terms. It tells you about your audience's behaviour and lifestyle. It is a way of finding out exactly what your audience knows and need to know about your topic. It is also containing up to date information, which is not available from any other source.

2.6 Proposed work plan

Set out your intended plan of work for the research, indicating important target dates necessary to meet your proposed deadline.

STEPS	DATES
1. Literature review	January 05 – February 28 2005
2. Finalizing instruments	March 01 – March 31 2005
3. Visiting Schools	April 01 – June 30 2005
4. Organizing data	July 01 – July 31 2005
5. Data analysis	August 01 – August 31 2005
6 Hand in my first draft	September 01 2005

SECTION 3: ETHICAL ISSUES

The UKZN Research Ethics Policy applies to all members of staff, graduate and undergraduate students who are involved in research on or off the campuses of University of KwaZulu-Natal. In addition, any person not affiliated with UKZN who wishes to conduct research with UKZN students and / or staff is bound by the same ethics framework. Each member of the University community is responsible for implementing this Policy in relation to scholarly work with which she or he is associated and to avoid any activity which might be considered to be in violation of this Policy.

All students and members of staff must familiarize themselves with AND sign an undertaking to comply with the University's "Code of Conduct for Research".

QUESTION 3.1

Does your study cover research involving:	**YES**	**NO**
Children		√
Persons who are intellectually or mentally impaired		√
Persons who have experienced traumatic or stressful life circumstances		√
Persons who are HIV positive		√
Persons highly dependent on medical care		√
Persons in dependent or unequal relationships		√
Persons in captivity		√
Persons living in particularly vulnerable life circumstances		√

If "Yes", indicate what measures you will take to protect the autonomy of respondents and (where indicated) to prevent social stigmatisation and/or secondary victimisation of respondents. If you are unsure about any of these concepts, please consult your supervisor/ project leader.

QUESTION 3.2

Will data collection involve any of the following:	**YES**	**NO**
Access to confidential information without prior consent of participants		√
Participants being required to commit an act which might diminish self-respect or cause them to experience shame, embarrassment, or regret		√
Participants being exposed to questions which may be experienced as stressful or upsetting, or to procedures which may have unpleasant or harmful side effects		√
The use of stimuli, tasks or procedures which may be experienced as stressful, noxious, or unpleasant		√
Any form of deception		√

If "Yes", explain and justify. Explain, too, what steps you will take to minimise the potential stress/harm.

QUESTION 3.3

Will any of the following instruments be used for purposes of data collection:	YES	NO
Questionnaire	√	
Survey schedule		√
Interview schedule	√	
Psychometric test		√
Other/ equivalent assessment instrument		√

If "Yes", attach copy of research instrument. If data collection involves the use of a psychometric test or equivalent assessment instrument, you are required to provide evidence here that the measure is likely to provide a valid, reliable, and unbiased estimate of the construct being measured. If data collection involves interviews and/or focus groups, please provide a list of the topics to be covered/ kinds of questions to be asked.

QUESTION 3.4

Will the autonomy of participants be protected through the use of an informed consent form, which specifies (in language that respondents will understand):	YES	NO
The nature and purpose/s of the research	√	
The identity and institutional association of the researcher and supervisor/project leader and their contact details	√	
The fact that participation is voluntary	√	
That responses will be treated in a confidential manner	√	
Any limits on confidentiality which may apply	√	
That anonymity will be ensured where appropriate (e.g. coded/ disguised names of participants/ respondents/ institutions)	√	
The fact that participants are free to withdraw from the research at any time without any negative or undesirable consequences to themselves	√	
The nature and limits of any benefits participants may receive as a result of their participation in the research	√	
Is a copy of the informed consent form attached?	√	

If not, this needs to be explained and justified, also the measures to be adopted to ensure that the respondents fully understand the nature of the research and the consent that they are giving.

QUESTION 3.5

Specify what efforts been made or will be made to obtain informed permission for the research from appropriate authorities and gate-keepers (including caretakers or legal guardians in the case of minor children)?		
I will first make sure that I get the permission from the KZN Department of Education first. After that I will go to the schools and ask for permission to conduct my study fro the school principal. There after I will ask for permission from the participants. If they do not want to participate I will respect their decision.		

QUESTION 3.6

How will the research data be secured, stored and/or disposed of? I will store my research data in my memory stick and in my family computer.

QUESTION 3.7

In the subsequent dissemination of your research findings – in the form of the finished thesis, oral presentations, publication etc. – how will anonymity/ confidentiality be protected? In my research I did not use the names of the schools. I referred to them as school number one, two, three and four. I did not use the names of educators. I called them educator one or two.

QUESTION 3.8

Is this research supported by funding that is likely to inform or impact in any way on the design, outcome and dissemination of the research?	YES	NO √

If yes, this needs to be explained and justified.

SECTION 4: FORMALISATION OF THE APPLICATIONAPPLICANT

APPLICANT

I have familiarised myself with the University's Code of Conduct for Research and undertake to comply with it. The information supplied above is correct to the best of my knowledge.

NB: PLEASE ENSURE THAT THE ATTACHED CHECK SHEET IS COMPLETED

....

SIGNATURE OF APPLICANT DATE

SUPERVISOR/PROJECT LEADER

NB: PLEASE ENSURE THAT THE APPLICANT HAS COMPLETED THE ATTACHED CHECK SHEET AND THAT THE FORM IS FORWADED TO YOUR FACULTY RESEARCH COMMITTEE FOR FURTHER ATTENTION

DATE: .....

SIGNATURE OF SUPERVISOR/ PROJECT LEADER :_____

RECOMMENDATION OF FACULTY RESEARCH COMMITTEE/HIGHER DEGREES COMMITTEE

FULL NAME :_____(CHAIRPERSON)_____ DATE : .....

SIGNATURE :_____

RECOMMENDATION OF UNIVERSITY RESEARCH ETHICS COMMITTEE (HUMAN AND SOCIAL SCIENCES)

FULL NAME :_____(CHAIRPERSON)_____ DATE : .....

SIGNATURE :_____

UNIVERSITY OF KWAZULU-NATAL
RESEARCH OFFICE

ETHICAL CLEARANCE : HUMAN AND SOCIAL SCIENCES

CHECK SHEET FOR APPLICATION

	PLEASE TICK
1. Form has been fully completed and all questions have been answered	√
2. Questionnaire attached (where applicable)	√
3. Informed consent document attached (where applicable)	√
4. Approval from relevant authorities obtained (and attached) where research involves the utilization of space, data and/or facilities at other institutions/organisations	√
5. Signature of Supervisor / project leader	√
6. Application forwarded to Faculty Research Committee for recommendation and transmission to the Research Office	√

University of KwaZulu-Natal

Consent Form

Project title: The integration of computer technology into the curriculum.

Aims of the study: The purpose of the study is to explore how computer technology is integrated into the curriculum in previously disadvantaged schools in Umlazi Township.

Researcher: Thulani Basil Mhlongo

Qualifications: Higher Diploma in Education and B Ed. Honours.

Supervisor: Mr S. B. Khoza

Contact number: 083 311 1468

Participants: People who are willing to participate are going to be interviewed. The researcher is going to use individual and group semi-structure interviews. The participants are expected to answer the questions as much as they can. The researcher is going to ask for permission from the participants to use the tape recorder. If the participants do not like the idea of using tape recorder, it will not be used. Their decision will be respected.

The participants are not going to be paid for the data that will be collected from them. The researcher is going to keep the data private and confidential. The data will not be used for any other purposes, except this study. It will be stored in the memory stick. People, who are not willing to participate in this study, will not face any consequences.

All people were made aware that participation in this study is voluntary. The participants are free to withdraw from the study at any time for any reason.

EXAMPLE OF DECLARATION

I.....(full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.

I understand that I am at liberty to withdraw from the project at any time, should I so desire.

SIGNATURE OF PARTICIPANT DATE

.....

NOTE:

Potential subjects should be given time to read, understand and question the information given before giving consent. This should include time out of the presence of the investigator and time to consult friends and/or family.

UNIVERSITY OF
KWAZULU-NATAL

RESEARCH OFFICE (GOVAN MBEKI CENTRE)
WESTVILLE CAMPUS
TELEPHONE NO.: 031 – 2603587
EMAIL : ximbap@ukzn.ac.za

29 JUNE 2006

MR. TB MHLONGO (204001417)
EDUCATION

Dear Mr. Mhlongo

ETHICAL CLEARANCE APPROVAL NUMBER : HSS/06229A

I wish to confirm that ethical clearance has been granted for the following project:

> **"The integration of computer technology into the curriculum in previously disadvantaged high schools in Umlazi"**

Yours faithfully

.....
MS. PHUMELELE XIMBA
RESEARCH OFFICE

PS: The following general condition is applicable to all projects that have been granted ethical clearance:

THE RELEVANT AUTHORITIES SHOULD BE CONTACTED IN ORDER TO OBTAIN THE NECESSARY APPROVAL SHOULD THE RESEARCH INVOLVE UTILIZATION OF SPACE AND/OR FACILITIES AT OTHER INSTITUTIONS/ORGANISATIONS. WHERE QUESTIONNAIRES ARE USED IN THE PROJECT, THE RESEARCHER SHOULD ENSURE THAT THE QUESTIONNAIRE INCLUDES A SECTION AT THE END WHICH SHOULD BE COMPLETED BY THE PARTICIPANT (PRIOR TO THE COMPLETION OF THE QUESTIONNAIRE) INDICATING THAT HE/SHE WAS INFORMED OF THE NATURE AND PURPOSE OF THE PROJECT AND THAT THE INFORMATION GIVEN WILL BE KEPT CONFIDENTIAL.

cc. Faculty Research Office (Derek Buchler)
cc. Supervisor (Mr. BS Khoza)