

DISSERTATION

**COMPUTER INTEGRATION TEACHING AND LEARNING IN A
MIDDLE SCHOOL**

BY

ABUENG RACHAEL MOLOTSI

Submitted in partial fulfillment of the requirements for the degree

Magister Educationis

In

Computer Integrated Education

In the department of Curriculum Studies

Faculty of Education

University of Pretoria

Supervisor: Dr. C Raseale

October 2007



DECLARATION

I Abueng Rachael Molotsi declare that **COMPUTER INTEGRATION INTO TEACHING AND LEARNING IN A MIDDLE SCHOOL** is my own work and that all sources that have been used or quoted have been specified and acknowledged by means of complete references.

Signature.....

A.R.MOLOTSI

PRETORIA

OCTOBER 2007

ACKNOWLEDGEMENT

There are many people who helped me to make this study a success. I would like to extend my sincere gratitude to the following people:

Dr. C. Raseale for being my supervisor;

my husband Bareng Molotsi, our son Boitshoko, and daughter Kgothatso, whose constant encouragement, persistence and patience has more than anything enabled me to complete my study;

Prof. Cronjé for the professional support and guidance;

my fellow colleagues on M.Ed programme and Eugenia Kafanabo for her motivation and support;

my sister-in law Keneilwe and my sister Gadifele for their encouragement whenever I wanted to give up;

the principal, School Governing Body (SGB), staff and learners of Kgaugelo middle school for their cooperation; and

finally, my thanks to Almighty God who gave me health and strength to survive throughout the study period.

SUMMARY

The rapidly changing technology causes work environment to become more and more complex and schools are among those structures that are affected by this change. Technology has revolutionised the workplace and call for every individual in a workplace to face the challenge and this in turn would improve working skills and productivity.

The study took place at Kgaugelo middle school in the Brits district which is 50km from Pretoria. The school is among those that have already engaged computers in their curriculum to augment teaching and learning.

The purpose of this study was to examine the effectiveness of computer integration into teaching and learning in a middle school. The questions used to address the purpose of the study are listed below:

- What are the critical success factors for effective learning in computer integration in a middle school?
- How does the educators' role contribute towards the effectiveness of computer integration into teaching in a middle school?
- What is anticipated from learners to ensure effective learning in computer integration in a middle school?

The instruments used to gather the data were questionnaires, interviews and observations. Educators and Grades Seven and Eight learners of the school were the target population and the source of information.

The collected data was analysed through descriptive statistic and presented in tables and graphs for better interpretation and understanding.

The results have shown conclusively that most of the learners' responses were in line with the most views provided by the different writers concerning computer integration into teaching and learning. The only aspect which was inadequately done was that the

majority of learners was not as yet at the stage of collecting information and used it valuably.

Again, based on the findings, most of the educators raised the following concerns pertaining to computer integration into teaching and learning:

- lack of formal training and planning;
- difficulties in adopting computer integration;
- lack of facilities and financial assistance to the schools; and
- computer phobia.

The results also show that most of the tasks that were expected to be performed by learners were not effectively carried out. This indicates that there is a great need to give attention to issues that were anticipated from learners to ensure effective learning in computer integration. However, there were only two conclusive matters, that the majority of learners had general computer skills and ability to play computer games.



KEYWORDS

- Educator
- Learner
- Learning
- learner - centered
- Learning outcomes
- Technology Integration
- Collaboration
- Constructivism
- Curriculum



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Chapter 1

Introduction

1.1. Introduction

Education as a whole is a process of transformation and this is caused by the emergence and diffusion of technology in all occupations (Sacchanand, 2000). From the educational perspective, technology is viewed as a means to deliver instruction to learners. These days familiarity with technology is a necessity for most of schools. It has created an opportunity for educators and learners to explore new approaches to teaching and learning. Moreover, it is imperative that schools and all stakeholders take advantage of the use of technology and utilise the opportunity for the betterment of the society. In this study, the two key terms technology and computer, will be used interchangeably because the research focuses on technology integration, which in this case means computer integration within a school setting.

1.2. Background of the study

1.2.1. An overview of the South African Education

The apartheid system in South Africa has for many years, denied most of people access to opportunities to gain information, skills and experience necessary for both social and economic development. After 1994, the new democratic government changed the educational structure, and decided on the system that would redress the imbalances of the past (Show document, n.d.).

The National Qualification Framework (NQF) is a government - initiated intervention structure, which is appropriate to transform and ensure quality education and training throughout the country (Show document, n.d. and Muller, 2003, p.542).The structure has been adopted so that South Africa can be internationally compatible. The NQF together with a new education policy called Curriculum 2005 laid a foundation for equitable

lifelong learning (Kgobe, n.d.). According to Show Document (n.d.), the following are the objectives of NQF:

- to create an integrated national framework for learning achievements;
- to facilitate access to, and mobility and progression within education, training and career paths;
- to enhance the quality of education and training;
- to accelerate the redress of past unfair discrimination in education, training and employment opportunities; and
- to contribute to the full personal development of each learner, as well as the social and economic development of the nation at large.

The NQF is also committed to Outcome Based Education (OBE), because OBE is used as a vehicle to accomplish the paradigm shift revealed in NQF (Department of Education, 2003, p.3). OBE also, encourages a learner - centred and activity-based approach to education as opposed to the traditional teacher - centred or content-based form of education (Muller, 2003, p.544 and Department of Education, 2003, p.3). The approach emphasises the outcomes that are to be attained at the end of a lesson, and is mainly geared towards producing skilled society that will match the 21st century workforce. Once more learners are provided with opportunities to acquire knowledge, skills, values, and attitudes that will reinforce their ability to participate actively in the changing society.

When writing, Muller (2003, p. 542) states that technology must be viewed against the background of the transformation and reform of the education and training sector as a whole. The integration of computers within a classroom situation matches the OBE approach towards teaching and learning. The two teaching and learning approaches, which is OBE and technology integration, are on par in transforming the education system. The new approaches to teaching and learning ought to be implemented at all levels in the National Qualification Framework (NQF) in order to ensure quality and balanced education.

Table 1.1 adapted from Show documents (n.d.) shows all the levels of NQF.
The National Qualification Framework (NQF) levels of qualifications

NQF Level	Band	Qualification Type
8	Higher	Post-doctoral research degrees
7	Education	Doctorates
6	and	Masters degrees
5	Training	Professional Qualifications Honours degrees National first degrees Higher diplomas National diplomas National certificates
Further Education and Training Certificate (FETC)		
4	Further	National certificates
3	Education	
2	and Training	
General Education and Training Certificate (GETC)		
1	General Education and Training	Grade 9 ABET Level 4 <hr/> National certificates

The NQF consists of eight levels of qualifications, grouped into three bands; which are set out below.

Level 1 (General Education and Training or GET band) these are:

Pre-school, Foundation phase

Intermediate phase

Level 2 - 5 (Further Education and Training)

School, college, or trade certificates

Level 6 - 8 (Higher Education and Training or HET band)

Diplomas, occupational certificates

First degrees, higher diplomas

Higher degrees, professionals' qualifications

Doctorates, further research degree

1.3. The purpose of the study

The purpose of this study is to examine the effectiveness of computer integration into teaching and learning in a middle school.

1.4. The main research question

The main research question of this study is:

1.4.1. How effectively do educators and learners integrate computers into teaching and learning in a middle school?

Three questions emanating from the above-mentioned question are also prominent in this study.

- What are the critical success factors for effective learning in computer integration in a middle school?
- How does the educators' role contribute towards the effectiveness of computer integration into teaching and learning in a middle school?
- What is anticipated from learners to ensure effective learning in computer integration in a middle school?

1.5. Rationale

1.5.1. Personal

As an experienced educator one observes so many changes taking place concurrently within education system. Technology is one of them and its pace is extremely fast. One keeps on wondering if it is correctly implemented. Something that prompted the researcher to conduct this research is how quickly technology has advanced and has become a priority in the lives of many, particularly within the education system. The rate at which it has improved, or rather changed from time to time, leaves so many unanswered questions. Now these might include;

- Do implementers cope with such transformation?
- Are they equipped with the necessary information on how to do it?
- Do they benefit from what they are doing?
- Do they regard it as a necessity for enhancing teaching and learning?

1.5.2. Intellectual (Technology advancement in schools)

The rapidly advancing technology has altered the characteristics of the teaching and learning environment, paving the way for the new breed of teachers and learners (Sacchanand, 2000). The use of technology seems to be just one more thing that the educators and learners have to cope with and be acquainted with in teaching and learning. Once more, educators are responsible for producing learners who will be able to participate in the technology-driven society of the 21st century.

Some studies reveal that technology changes teaching methods from teacher - centred to a learner - centred approach, where learners are offered opportunities to make choices and work cooperatively at their own pace to achieve the intended objective (Waxman et al., 2002, p. 2). Bringing computer connectivity to schools is a challenge that educators and learners face. The process needs the support of all the school's stakeholders to encourage computer integration in teaching and learning. Moreover, schools are being

urged to prepare learners with new and technological information, which is a necessity in today's ever-changing technological environment.

Muller (2003, p. 543) points out that, for many schools, it is difficult to follow the trend of rapid technological transformation. A few schools have implemented very minor changes. However, other schools resist change and continue to insist on retaining the traditional system of education, because educators have not been capacitated. Research shows that “technology integration in teaching and learning is not an easy task; it can be challenging, frustrating and expensive” (Roberston and Shortis, 2001). Therefore, various institutions should formulate a plan to adopt the easiest and reasonable approach to expose educators and learners effectively to technology integration into teaching and learning.

1.6. Definitions of terminology

For clarification purposes, certain key words have been defined below.

1.6.1. Educator: According to Mothata (2000, p.59), Oshunbunmi (n.d.), The free Multilingual Dictionary (2007), and The American Heritage (2007) an educator is any person with the responsibility to develop, manage, deliver, encourage, inspire and even serve as facilitator in a learning experience at an education institution. Educators in this study are considered as the change agents who are directly involved in the integration of technology into teaching and learning.

1.6.2. Learner: The term ‘learner’ refers to an individual involved in the acquisition of knowledge or mastery of through experience or study (Mothata, 2000, p. 94; Farlex, n.d.; Blueprint for Interactive Classrooms, 2002; Erudium Glossary, n.d.). The discussion in this study centres on the active participation of learners in integrating the computers in their learning.

1.6.3. Learning: For Collins 111 and O’Brien (2003, p. 201), Audet and Jordan (2005, p.140), Dempsey and Reiser (2002, p 59), and Smith and Ragan (2005, p.96) learning is a cognitive psychological process in which individuals acquire knowledge or skill through

study resulting to a permanent changes in an individual's behavior. In this study, learning is broadly examined, focusing on how technology integration enhances it.

1.6.4. A learner - centred teaching and learning approach, is a new teaching and learning approach whereby a learner is regarded as the focal point for organising and building up information learned in an enquiry based activity. (Leonard, 2002, p.112; Kovalchick and Dawson, 2004, p.405; Dempsey and Reiser, 2002, p.21; Arizona board of regents, 2000). This is a new teaching and learning approach recommended by several writers, and in this study, it plays the major role for effective integration of computer into teaching and learning.

1.6.5. Learning outcome is the specification of what an educator intends the learners to master and reliably demonstrate at the end of a learning activity (Leonard, 2002, p.114; Harvey, 2004; learning outcomes, n.d.; and Wilson, 2001). Learning outcomes play the vital role in this study as they are regarded as the keys to unlock every lesson presentation.

1.6.6. Technology Integration: This refers to the incorporation of all technology tools together with each subject related area of the curriculum to boost student learning and learners' efficiency. (Shelly et al., 2004, p.605; Washington State Educational Technology Plan, 2002; Moore, 2007; Swanson, 2006). The essential aim of this study is to find out how effectively technology is integrated into teaching and learning.

1.6.7. Collaboration occurs when two or more people work together, exchanging knowledge and contributing toward accomplishing a certain goal (Leonard, 2002, p.30; Collab Wiki, 2004; Collaboration - Wikipedia, the free encyclopaedia, 2007; Allessi and Trollip, 2001, p.34). In this study the meaningful computer integration is achieved through pursuing collaborative approach to teaching and learning.

1.6.8. Constructivism is a new method of teaching and learning based on construction of knowledge by individuals through active participation in different learning activities (Gentile and Lalley, 2003, p.170; North Central Region Educational Laboratory, n.d.; Kovalchick and Dawson, 2004, p.165; Dempsey and Reiser, 2002, p.66; McPherson and

Nunes, 2004, p.43; Audet and Jordan, 2005, p.23; Smith and Ragan, 2005, p.19; Alessi and Trollip, 2001, p.17). In this study, the meaningful integration of computers into teaching and learning is done all the way through construction of knowledge during the learning process.

1.6.9. A curriculum constitutes all of the educational experiences or a group of related courses of study offered by a school (Burke and Krey, 2005, p. 341; Smith and Ragan, 2005, p 294; Merriam Webster On line dictionary,n.d.; Web definition of curriculum, n.d.). A curriculum is enhanced or improved through computer usage, in this study, computer integration is mainly applied within a curriculum set work of an institution.

1.7. Learning theories: Constructivism

The following four leading theorists of constructivism were examined and the focus was on how their views can assist educators and learners in computer integration into teaching and learning: John Dewey, Jerome Bruner, Jean Piaget, and Lev Vygotsky (Shelly et al., 2004, p. 47 - 53).

1.8. Theoretical framework (Activity theory)

The theoretical framework for this study was best explained in terms of an activity theory adapted from Jonassen & Rohrer- Murphy, 1999. However the discussion on activity theory is limited to a brief analysis of the interacting components in a typical activity system.

1.9. Literature review

An extensive search of the literature was conducted in order to ascertain the views of previous researchers and writers on the research topic. The review particularly focused on the following;

- searching for critical success factors for effective learning in computer integration in a middle school;

- finding out how educators' roles contribute towards the effectiveness of computer integration into teaching and learning in a middle school; and
- discovering what was anticipated from learners to ensure effective learning in computer integration in a middle school.

1.10. Research Methods and Methodology

1.10.1. Methods

In this study, a combination of both qualitative and quantitative methods was utilised to describe and analyse computer integration into teaching and learning by educators and learners. An example of a case study was used. For the purpose of this research, the instruments which were used to gather information were questionnaires, interviews and observation.

1.10.2 Sample

A target population was Grades Seven and Eight learners of a middle school who studied computer studies as one of their learning areas. Educators also participated because they were the implementers of computer integration into teaching and learning.

1.10. 3. Data collection

A questionnaire, interview and observation techniques were employed to gather data that assisted in examining how effectively integration of computers into teaching and learning in a middle school was achieved.

1.10. 4. Data analysis

The data was analysed through descriptive statistics and the presentation was tabulated in order to present a more detailed and understandable picture.

Table 1.2 Plan of the study

CHAPTER	CONTENT	BRIEF DISCRPTION
1	Introduction	This chapter gives a clear picture of what the researcher intends to do in the whole study.
2	Literature Review	A detailed literature study is reflected in this chapter. It focuses on an overview of what other writers say concerning the subject being studied.
3	Research Methods and Methodology	It contains the methods applied and methodology implemented to gather data.
4	Data Analysis	The chapter involves analysing of the gathered information.
5	Conclusion and Recommendations	Chapter 5 deals with summary of the study and recommendations proposed by the researcher.

Chapter 2

Literature review

2.1. Introduction

The primary focus in this chapter is based on how effectively learners and educators integrate computers into teaching and learning. The most apparent reason for conducting a literature review is that, the researcher should know exactly what previous writers say about the same topic (Silverman, 2005, p.25; Bryman, 2004, p.526, Henning et al., 2004, p.29). The information reviewed is regarded as a helpful tool for setting up the research process (Punch, 2004, p.42). Again, the information is essential to the reader because it gives the framework and background information of the study.

This chapter starts with the explanation of technology integration in order to lay a foundation for understanding the main issue in this study. The discussion proceeds with different writers' opinions pertaining to computer integration into teaching and learning that is, those who are for the idea and those who are not in favour of the idea. It will then be followed by the barriers and the models that show how effectively and meaningfully computers or technology can be integrated into teaching and learning. The summary and conclusion ends the chapter.

2.2. Definition of technology integration

Technology Integration: This refers to the combination of all aspects of technology, such as software and hardware, together with each subject related area of curriculum to enhance student learning and accomplish curriculum goals (Shelly et al., 2004, p. 605).

According to Woodbridge (2004) “**technology integration** means viewing technology as an instructional tool for delivering subject matter in the curriculum already in place.”

For the National Centre for Education Statistics (2003) “**technology integration** is the incorporation of technology resources and technology practices into the daily routines, work, and management of schools.”

Waddoups (2004, p. 2) also defines **technology integration** as the incorporation of technology in lessons to transform learning experiences for learners.

The definitions of technology integration above give an indication direction of what the researcher has to find out in order to respond to the main question set out in Chapter One. In the following paragraphs the researcher begins to unfold the explored information by discussing the views of writers who support computer integration into teaching and learning, and then present the ideas of those who are against the idea.

2.3. The focus on literature review embraces the following three sub - questions listed below.

- What are the critical success factors for effective learning in computer integration in a middle school?
- How does the educators' role contribute towards the effectiveness of computer integration into teaching and learning in a middle school?
- What is anticipated from learners to ensure effective learning in computer integration in a middle school?

2.3.1. What are the critical success factors for effective learning in computer integration?

How do learners succeed in computer integration in learning? In the following paragraphs different opinions are highlighted indicating learners' success in computer integration.

The implementation of computer integration in today's classrooms marks the beginning of transformation of teaching and learning process. This is a challenge to education fraternity and everyone should be ready to face it.

The National Centre for Education Statistics (2003) indicates that computer integration is when learners are able to gather information, analyse, synthesise and assimilate it then make an acceptable presentation of it. Learners at schools are no longer spoon fed with information but have to search for it and use it profitably. The use of technology can be

viewed as a new avenue in which learners can explore information and use it productively.

Research indicates that when technology is meaningfully integrated, it is used as a tool for problem solving, involving learners to take charge of gathering, organising and analysing information. The accumulated discovered information will be applied to find a solution to a problem at hand (Ringstaff and Kelly, 2002, p.5; Bowman, 2004). Learners use internet to browse different search engines in search of relevant information for their projects. They usually get updated information which is not available in their text books.

Computer integration changes educators' belief and roles of teaching, therefore learners' roles in learning also experience a remarkable shift (Machnaik, 2002). Jonassen (2000, p. 24), supports this idea by commenting that when learners integrate computers in learning, their role changes from being receivers, to producers, creators, and senders. However, in traditional teacher- centred teaching and learning approach, learners received knowledge from educators and never participated in class discussions, but now computer integration forces them to participate actively as knowledge seekers.

Again, computer integration changes learners' attitude towards learning. (Protheroe, 2005, p.470). The use of computer as a tool stimulates learning, and learners become interested in their work or rather learning is just a fun to them. Activities in an integrated learning experience are planned in such away to increase interactivity among learners and this promotes their learning satisfaction (Ringstaff and Kelly, 2002, p.9; Protheroe, 2005, p.470; Draude and Brace, n.d.).

In addition, a meaningful use of technology tools inspire learners to learn more and thus encourage school attendance which leads to decreased school absenteeism and school drop-out rates (Vukhoanh, 2006; Ringstaff and Kelly, 2002, p.9; Hale, 2002). School attendance is a necessity because when learners absent themselves from school, they are deprived of information needed to build their future.

Collaborative learning style develops learners' interpersonal skills and team work spirit (Maier and Warren, 2000, p. 16). Learners collaborate with peers, and this encourages

problem - solving, and the development of decision - making. Collaboration is done through sharing and dividing of the work amongst learners. Each of them in a group is tasked with the responsibilities to perform in a given project; thus giving individuals opportunity on the use of computer. In this manner they end up coaching each other rather than competing or ignoring one another, they also help in peer editing (Dias and Atkinson 2001; Alessi and Trollip, 2001, p.34).

Furthermore, if computers are integrated effectively in a learning experiences, learners can become more creative and collaborative than in a learning experience where computers are inaccessible to them (Machnaik,2002). A collaborative learning leads to the improvement of social thinking skills rather than individual thinking skills (Wegerif, 2002). The use of this learning approach encourages learners to communicate their ideas advice and learn from one another and this is accomplished through arguing, discussing and disagreeing about a certain aspect in their computer integrated learning experience.

Additionally, during collaborative learning approach, learners articulate their thoughts as they get along with others (Wegerif, 2002; Future lab, 2002; Machnaik, 2002). They tend to understand the importance of collaboration when dealing with complicated tasks in the context of technology. They also learn how to guide one another, and even their teachers, when a particular technology skill is needed (Vukhoanh, 2006).

Once more, Computers 4 kids (2004) argue that the effectiveness of computer integration is clearly recognised when learners work in groups. As such, knowledge is transferred amongst themselves and the thinking skill is enhanced (Wegerif, 2002). In this manner they work side by side challenging thinking skills of their colleagues and thus creating a learning relationship through mutual care and respect.

Again an integrated learning experience foster the development of learners higher - order thinking and problem solving skills (CARET, 2005; Ringstaff and Kelly, 2002, p.2; Cradler et al., 2002,p.47, Wenglinksy, 2006, p.30; Burns, 2006, p.49), because when learners are presented with a project, they make use of different computer applications and other technology accessories to find a solution. This is through information search,

compare and contrast, agree and disagree, synthesise, analyse, and evaluation of information.

Higher- order thinking skills is also improved by the accessibility of home and school computers (CARET, 2005). Learners who have computers at home perform better than those who are without computers at home. They show improvement in:

- an increase in all writing skills;
- better understanding and broader view of math;
- greater problem-solving and critical thinking skills;
- ability to teach others;
- greater self - confidence and self - esteem; and
- more confidence with computer skills.

Furthermore, accessibility to a variety of computer applications gives learners a wider choice of technological tools which can help to achieve the intended learning outcome. The tools are integrated in different ways and develop higher - order thinking skills which leads to a meaningful learning.

In the research conducted by Tiene and Luft (2001, p. 23) and Apple Classroom of Tomorrow (2005), it was found that learners studied more independently than in a conventional classroom. When studying independently, learners are provided with a learning environment which supports and encourages them to become reflective and confident learners (Maier and Warren, 2000, p. 12). Learning independently also caters for learners' diversity and their unique needs.

Tiene and Luft (2001, p. 23) further comment that through integrated learning experiences learners gain a vast sense of responsibility for their own learning; they are given the opportunity to progress at their own pace and to use their own ideas to handle problems and arrive at certain conclusions.

According to Hannum (2007,p.5); and Mafanga and Pretorius (2003) computer integration familiarises learners with the skills that undoubtedly pave way for better jobs, with satisfying fringe benefits and enjoyable lifestyles. Hedney (2001) and Fisher (2006)

support this view by emphasising that with an acquired computer knowledge skill, learners can work efficiently and effectively within the high - tech environment, which is approaching. Currently technology is a buzz word of every corridor in any organisation, therefore it is crucial that each and every individual should be familiar with the use of a computer.

Technology plays a pivotal role in preparing learners to achieve their goals in a workforce. Research indicates that when a learner become skilled at utilising computer applications such as word processors, spreadsheets, computer- aided drawings, web site development programs, browsing internet, organizing and displaying data, they are definitely preparing themselves to be accommodated in a workplace, as these are regarded as most valued skills for the workforce (Ringstaff and Kelley, 2002; CARET, 2005; Vukhoanh, 2006; Sherry and Jesse, 2000). Computer integration move learners closer to the real life situation, which is in a workforce whereby they will be expected to expose the acquired computer knowledge skills.

The use of technology motivates learners to love the job they hated before (Vukhoanh, 2006; Bowman, 2004; Dias and Atkinson, 2001), and this enables educators to catch learners they otherwise would not have caught. Similarly, in the study conducted by Software and Information Industry Association (SILA), the result showed that technology integration can lead to increased learners motivation (Sivin - Kachala and Bialo, 2000). Motivation is imperative in learning because it gives spark to the learners in order to re-commit them to learning.

Dias and Atkinson (2001) rightly emphasises that the greatest advantage of computer integration into teaching and learning is that “it can be utilised to engage and facilitate the construction of learners knowledge, hence it becomes something that learners learn with not from”. This, according to James (2006) confirms that the use of computers has brought a new way of teaching and learning. Particularly, learning is changed from instruction to construction of knowledge. Jonassen (2000, p. 25) aligns himself with the idea but also comments that using technology as an educational tool, can assist learners to become independent, self - disciplined, and life - long seekers.

Again Salomon (2002, p. 72) advocates that technology is far more tempting to learners as compared to the traditional teaching and learning approach. As a result, learners become more anxious to learn; they seek knowledge and want to learn more and they even remain at school after hours to continue or complete their work.

According to Alessi and Trollip (2001, p.38) constructivist teaching approach allows learners to create their own knowledge during learning process. Machnaik (2002) share the same sentiment and further contends that the new teaching and learning approach influence learners' own personal strengths and competence. Most importantly, learners are offered a chance to discover the areas of interest and pursue their work innovatively.

Learners of the 21st century are becoming increasingly technology- savvy, this is because they have realised that technology is here to stay and that they must use the opportunity so that they fit well as they enter the real world situation (Sherry and Jesse,2000; Draude and Brace, n.d.).

Based on the information highlighted by various writers above, it is clear that data that will be gathered in the next chapter should focus on the following:

- ability to collect information analysis, synthesise and assimilate it, then make an acceptable presentation of it;
- the use of computer helps learners to be self disciplined and knowledge constructors;
- computer integration provides meaningful and effective learning;
- a style of learning e.g. individual and collaborative;
- development of interpersonal skills and teamwork spirit;
- collaboration with peers which encourages problem - solving, decision - making skills and the development of higher- order thinking skills;
- independent learning;
- responsibility for their own learning;
- career preparation (better jobs); and
- participation in their learning.

2.3.2. How does the educators' role contribute towards the effectiveness of computer integration into teaching and learning in a middle school?

Educators, as agents of change, are considered in the section below.

Technology integration in classroom has in one way or another profound influence on how educators present their lessons (Shelly et al., 2004, p. 101; Dias and Atkinson, 2001). Computer integration forces educators to change their way of teaching. Also, the effectiveness of technology is directly influenced by how educators design their instruction, the learning area's content and the choice of relevant technological tool that will help to achieve the learning outcomes (Computers 4 kids 2004; Waddoups, 2004). The design of a lesson, the content, and the choice of a relevant tool for a lesson are the key components for effective integration of computer into teaching and learning.

Moreover, an integrated learning experience is an alternative method applied by educators to present their lessons in an appealing way (Norton and Sprague, 2001, p. 24). The method reduces constrains of educators who always strive to meet learners' educational needs. The method also holds learners' attention thus becoming more involved in learning.

When educators integrate computers in their curriculum, the learning environment becomes empowered and conducive for many learners (Ficek, and Segovia, 2006, p.29). Computer integration is like taking an extra mile to make learning environment more fascinating and pleasant for learners. This is a necessity to help build the 21st century computer savvy nation.

Educators facilitate learning in an integrated learning experience and no longer control it (Richardson, 2006, p.26; Sherry and Jesse, 2000). Learning is more learners - centred and learners are in charge of it, they are no more passive receivers of information or rather entirely dependent upon educators' information. Educators are less directive and learners take a lead by becoming committed to their tasks without being pushed from behind Tiene and Luft, (2001, p. 28). Most importantly, they do a great deal of discovering and searching of information through the use of internet. Educator's duty is to move around

between groups probing and suggesting if the need arises, without dominating class discussions.

Technology integrated learning experience is always geared towards achieving a certain learning outcome. Hedney (2001); Dias and Atkinson (2001); and Shelly et al. (2004, p. 608) emphasise the need to determine the learning outcomes that learners should achieve at the end of a lesson. Educators must correlate the learning experience outcome and the technology tool that will assist in accomplishing it. Hence, the choice of a relevant technological tool is very much imperative. Focusing on learning outcomes makes learning understandable and more fruitful.

Moreover, the ability to choose the relevant computer tools, the choice of time when to integrate resources effectively is the most useful skill in an integrated learning experience (Beaudin and Grigg, n.d.). This is true, because knowledge of how and when to employ the tools should be understood as a means to achieve a certain learning outcome. Therefore it is necessary for educators to acquire such a skill so as to design a lesson having in mind the selection of a relevant tool and the precise time to integrate computers.

Educators give a foundation for learning by providing learners with a relevant material for better understanding what is expected of them. This is called scaffolding. The scaffolding strategies in technology integration include, among others, graphic organisers, note taking, and peer tutoring (Dias and Atkinson, 2001). Gradually, the scaffold is removed until learners are able to do it on their own. The resources definitely help the learner to attain the intended learning outcome.

In addition, educators can also use cognitive technologies such as spreadsheets, graphing programs, concept mapping software; multimedia tools to scaffold learning (Dias and Atkinson 2001). In essence, the uses of multiple computer applications promote effectiveness in the use of computers (CARET, 2005). That is the reason why, it is a necessity from of educators' perspective to know exactly which tools are relevant to accomplish which learning outcomes.

Computer integration should not be seen as a method to replace neither educators nor devaluing their intentions, but should be utilised in a way to improve interaction between educators and learners (Zee, 2004). Similarly, the adoption of computer integration should be alleged by educators as a natural extension of their own power. They need to regard it as a unique artifact to use in order to enhance their teaching and learning skills (Johnson and Maddux, 2006, p.18, Mcfall et al., 2006, p.40).

Futhermore, educators should not be ashamed when they first learn to use technology in their classrooms (Dias and Atkinson, 2001). They have to view technology in the first instance as just another helpful method for developing or improving their profession (Naidoo, 2003). Therefore, they should be prepared to face the challenges brought by technology and discover ways on how to overcome them.

Again, educators should understand that transformation implicates taking risks (Machnaik, 2002). However; they should not be blamed when they are doubtful about implementation. They ask themselves whether effort truly worth it, or whether there will be positive impact in teaching and learning (Machnaik, 2002; Thompson et al., 2003, p.74). Integrating technology into teaching and learning is difficult for most of educators because it requires efforts to learn how to use it and adjust their teaching approach.

Constructivist teaching and learning approach is a new teaching method, which is used by educators to integrate computers effectively into teaching and learning (Machnaik, 2002). In this approach learning experiences are learner- centred with an educator facilitating the learning process (Apple Computer, 2003). The approach encourages team spirit and encourages commitment in learning. Again this teaching and learning approach forces educators to shift from being a dispenser of knowledge to being a guide or facilitator. Technology also offers learners with exponentially reliable more information; thus freeing educators from all knowing responsibilities (Buckenmeyer and Freitas, 2006, p.55).

However, the use of technology in more learner- centred constructive approach is still a conundrum to most of educators (Hofer et al, 2004), because computer application and

other technology accessories require substantial technical and pedagogical support to educators who attempt to integrate computers in their lessons.

The role of educators as addressed by different writers above puts the focus on data gathering, to follow the following pattern:

- provision of guidance to learners;
- facilitating the learning process;
- educators have fewer directives;
- choosing the technology tool which is related to the learning outcome;
- scaffold learning; and
- applying learner- centred method.

2.3.3. What is anticipated from learners to ensure effective learning in computer integration in a middle school? (Research question 3)





Apple Classroom of Tomorrow (2005); Norton and Sprague (2001, p. 27) as well as Shelly et al. (2004, p. 614) recommend that technology can be effective if properly implemented. Primarily, integration of computers and other related technologies enhance learning and broaden learners' competence of utilising the tools. Learners understand the value of engaging tools in their learning. Shelly et al. (2004, p. 104) emphasise that knowledge of computers and other related technologies forms a solid background for technology integration in classroom.


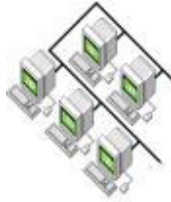

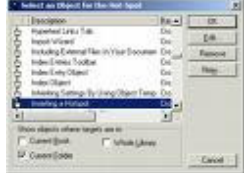

Furthermore, when educators integrate technology in teaching and learning, they should guard against limiting technology tools, but rather choose a variety of technology tools that would benefit learners or assist them to attain the intended learning outcomes (Dias and Atkinson (2001).

Table 2.1 presents factors which repeatedly appear in the reviewed literature as critical elements for meaningful integration of computers and other technology accessories into teaching and learning. Different authors identify them: (Norton and Sprague, 2001, p. 25; Hedney, 2001; Tiene and Luft, 2001, p. 26 - 30; Shelly et al., 2004, p. 614, 611, 615, 629,

606; Dias and Atkinson, 2001; CARET, 2005; Zee, 2004; Ringstaff and Kelley, 2002, p.6; Feldman et al., 2001, p.45; Wang, 2006, p.36; Waddoups, 2004; Lamb, 2004; and Machnaik, 2002).

Table 2.1.Examples of how integration is done.

Technologies	Integration(learning)	
World Wide Web (www).	<p>The www gives learners broad choice in pursuing assignments and projects. The web also provides various chances for discovery and exploratory learning environment. Also learners are able to reach distant places through websites.</p> <p>They can explore enormous educational experiences that are now available as the result of technology. The web also promotes the use of collaborative learning.</p>	
Video cameras	<p>The video cameras encourage creativity and better performance among learners. They also increase problem solving skills.</p>	
PowerPoint	<p>Learners use Power Point to create and present their activities in front of classmates.</p>	
Software applications, multimedia software, reference guide, tutorials,	<p>Learners learn how to follow instructions during the learning process, they are able to review concepts, encouraged to acquire necessary technological skills, how to follow a detailed research and many more.</p> <p>Software helps educator to prepare instructional resources and assessments in such a way to address the</p>	

animations, and simulations.	needs and speeds of individual learner. A rich multimedia environment can also engage various learning styles and skills development simultaneously	
E-mail	Allows learners to collaborate and communicate with peers over large distances throughout the entire world.	
Computers	Increase academic motivation and lessen anxiety among slow learners. The use of computer help to track learner's progress and provide resources that fit the level of a learner.	
Word processor	Greatly improve learners' writing and editing skills.	
hypertext links	This is a simplified efficient method of collecting relevant information. Learners browse through links in search of information.	
desktop	The desktop offers various computer applications that support the analysis and problem solving.	

Computer integration helps to improve teaching and learning styles that were previously neglected in the traditional way of teaching and learning. As indicated above, learners have enormous benefits in enhancing their learning. For Wang (2006, p.36) the use of technologies enhance teaching and learning. The same sentiment is expressed by Shelly et al., 2004, p. 608) and further claim that learning is done in various ways, and learners are motivated to take responsibility for their own learning. One account for the usage of various technological tools is that they amplify a learning environment for the betterment of learners' future.

2.4. The different views presented by other writers concerning computer integration into teaching and learning

Cuban in Becker and Ravitz (2001,p.3) argue that in more than a decade, ever since computers have been used as a tool for learning and a medium of instruction , it is incompatible with the requirements of teaching and learning. He (Cuban) continues by saying that classrooms are packed with many learners. Therefore, this increases accountability and demand for educators to cover the curriculum. In short, Cuban emphasise that it is not easy for educators to integrate computers in their teaching and learning and no one should expect educators to employ this effort.

(Becker and Ravitz, 2001,p.3) say in addition to what Cuban said, computer application that were frustratingly slow or limited 15 years ago are now powerful and provide assistance for learners users. But the new computer applications that have just evolved comprise learning resources that are totally different from the computers of 15 years ago. The point that is driven home is that, computer applications change with time and learners will be unable to catch up with the new developments that are implemented every now and then.

Becker and Ravitz, (2001, p.9) again found in their research that educators who disregarded the use of computers have fairly distinctive teaching philosophies. Those educators do not utilise the learner - centred way of teaching but prefer teacher - centred approach to teaching and learning. Also the results have shown that computers are not

regarded as a central mode of teaching instruction. According to Becker and Ravitz, (2001, p.13) Cuban still maintains his argument concerning computer usage by saying computers do not enhance teaching and learning and also do not increase learners' performance.

Oppenheimer, in Blaisdell (2003), regards computer integration as a wasteful exercise and the rush to be updated with new technological developments as pointless efforts.

He (Oppenheimer) further argues that computer integration in a classroom is beyond learners' comprehension and that public schools cannot afford to be on par with the rapid technological changes that are taking place (Blaisdell, 2003).

Even if computer integration is unsuccessful, in other instances many people still continue to practice it rather than investing in educators. Oppenheimer in the same document comments that the most effective educators ignores latest technological developments and rely on hands - on technology such as pens and paper.

Monke (2006, p.20) also does not support the usage of computers in class as a learning tool. He is against the repeated views of numerous writers who emphasise that computers prepare learners to meet the serious demands of high - tech 21st century. He stresses that computers distance learners from a direct contact with real life situation (21). Everything a child does currently involves computers for example: from talking to a friend, listening to music, and playing games, various activities centres on the use of computers.

Monke, in the same document continues by saying that computers draw learners towards a mechanical way of thinking and acting. To avoid this, schools should assist learners to develop their undeniably human capabilities. In many instances the failure of computer usage is caused by lack of qualities like hope trust, stability, and support (Monke (2006, p.22). He concludes by commenting that the serious demands of the 21st century can be met through the wisdom that grows out of the inner human capabilities.

Hershaw (2006) concurs with Monke's idea of human element. He stresses that learners need a direct human contact in teaching and learning and not the use of computers to

replace educators. Hershaw further argues that educators provide not only instruction to learners but also guide, motivate and encourage learners in learning and this is not possible through the usage of computers. Finally he expresses his dismay by rightly stating that learners differ in their capabilities and educators know exactly how to deal with such uniqueness, in contrast, an animated instructor like computers will never treat learners in the same way.

The interpretation of the researcher, based on the whole issue of computer integration, is that computer integration does not need to be rushed. People who intend to implement it should attempt the following: plan, strategise the implementation and consider the needs of the school. However the study will reveal the precise way of how to do this.

The main question is:

How effectively do teachers and learners integrate computers in teaching and learning in a middle school?

The literature review based on this main question provides a way to answer the above question concentrating on the questions listed below.

- What are the critical success factors for effective learning in computer integration into teaching and learning in a middle school?
- How does the educators' role improve the effectiveness of computer integration into teaching and learning in a middle school?
- What is anticipated from learners to ensure effective learning in computer integration in a middle school?

2.5. The barriers

Research has found that, although some educators are eager to integrate technology in their classrooms, there are several barriers that prevent them from effectively doing so (Anilogic,n.d.). Below is the discussion of these barriers and some strategies on how to overcome them.

Formal training is one of the obstacles faced by educators for successful integration of computer into teaching and learning. (Sivin - Kachala and Bialo, 2000; Reyes, 2005; Cradler et al., 2002, p.51; Glazer et al., 2005, p.58). Most educators had not been taught how to integrate technology in the delivery of their instructions. However, they are expected to translate into practice the vision and the high prospects of technology supporters. In essence, formal training is the key to meaningful integration of computers into teaching and learning more especially that educators are the main contributors to education transformation (Zee, 2004).

Various studies agree to this (Silverstein et al., 2000; Sivin - Kachala and Bialo, 2000) and they emphasise that unless educators are sufficiently and properly trained implementation will have little effect or have no value.

Again studies suggest that formal training should not be a once off thing, regular in-service training is important to keep educators on track with the latest developments of technology integration into teaching and learning (Zee, 2004). Keeping educators abreast with the latest technological developments is inevitable because technology is rapidly taking a new shape now and then.

The underlying principle is that formal training assists educators to effectively integrate computers in their lessons. Here follows the reasons behind educators' formal training, different writers identify them, (Zee, 2004; Anilovic, n.d; Ringstaff and Kelley, 2002, p.13; SEIR*TEC, n.d.);

- formal training will equip educators with a foundation of technological knowledge;
- educators understand how to access and use computers and other technology accessories;
- formal training encourage educators to use technology more frequently in their instructions and this leads to a considerable improvement of learners achievements;
- educators are offered opportunity to develop their capabilities; and

- ability to use technology effectively.

Educators' belief is one other crucial factor which hinders the effective implementation of computer integration into teaching and learning environment (Ringstaff and Kelley, 2002, p.2; Levin and Wadmany, 2006, p.160; Ertmer, 2005, p.30). This can be achieved by reworking educators' belief to break free from traditional teaching style and move towards constructivist teaching approach (Machnaik, 2002). Indeed, it is not an easy task to change peoples' mindset, but educators need to step out of their comfort zones and face the challenges brought by technology.

Researchers examining educators' belief have found that educators who employ more learner - centred approach in teaching and learning engage constructive technology related activities teaching approach (Anilovic, n.d.). However, educators who believe that teacher- centred approach is the best teaching method under all circumstances, even the most excellent formal training on technology will have limited accomplishment. Therefore, technology integration is not an easy thing, only educators who believe that the result of integration will benefit their learners, will eventually face the associate challenge and deal with it (Ringstaff and Kelly, 2002, p.16).

Scheduling of time to access computers is also regarded as the barrier to effective technology integration (Anilovic, n.d.; Lamb, 2004; Leslie, n.d., Ertmer, 2005, p.25). Educators face the demand to integrate computers in their instructions but time allocated is inadequate to integrate computers meaningfully in their instructional activities. This should be considered, so as to nurture enthusiastic children who love learning and would ultimately become life-long learners.

Lack of technology expertise is another inhibiting factor toward meaningful integration of computers into teaching and learning (Woodbridge, 2004; Lamb, 2004; Becker, 2001; Beattie, 2000). Educators should know the software and hardware that are compatible with their teaching goals (Anilovic,n.d.). This would simplify their choice of a relevant tool for a particular lesson. Moreover, technology integration wearies many educators more especially when they are ill equipped with adequate technological knowledge.

Again, lack of technological expertise creates various problems in schools (Woodbridge, 2004). For example, computer integration worries many educators to the extent that good experienced educators leave the classrooms for search of greener pastures. Learners suffer because of unplanned implementation of technologies in schools.

Educators must enjoy the integration of computers or the willingness to learn more how to use it effectively. Planning is yet another obstacle towards effective integration of computers into teaching and learning (Vukhoanh, 2005; Ringstaff and Kelley, 2002, p.20). Planning allows educators to maintain focus and develop clearly standards and goals for technology usage. If it is not well thought - out, educators wont' take pains or rather attempt to integrate computers in their instructions.

Accessibility to computers is yet another barrier noted. According to Ringstaff and Kelly, (2002, p.17) access to computer usage is vital, since even a skilled or experienced educator will not integrate computers effectively in teaching and learning if this is ignored. Butzin (2002) voiced the similar concern that if there are few computers in a classroom, educators are reluctant to allow learners to work collaboratively on computers as this might not yield the expected results. As a result, accessibility to computer usage must be widely spread for full integration to have effect (Johnson and Maddux, 2006, p.15).

Again adequate access means each learner must have a computer as personal belongings, the same way as they have their own notebooks to use (Johnson and Maddux, 2006, p.16). The owner should know what information is captured in the computer, where to find it and how to organise it. However, it is well known that for each learner to have a computer as the owner is beyond the reach of most schools as a result of financial constrains.

Educators who have access to computers at home gain computer skills more than those without computers (Ringstaff and Kelly, 2002, p.20; Cradler et al., 2002, p.52). Educators normally do not have sufficient time to utilise or acquire computer skills at work.

Therefore, those with computers at home learn at their own pace, pursue their own interest and most importantly become comfortable with it.

Another influential factor facing technology integration into teaching and learning is lack of necessary support from all school's stakeholders (Leslie, n.d.). On the one hand educators are pressurised by transformation in education to integrate technology in their teaching; on the other hand they are left alone to their own devices. This causes a lot of frustration to educators and they end up or tend to abandon the new style of teaching thus resort to the traditional teaching style

Once more if educators gain full support from all schools' stakeholders, they may change their teaching approach from teacher - centred to learner - centred, from individual work to group work, and from passive to active learning.(Zee, 2004).

Researchers investigating successful integration of computers have found that technical support is also a barrier to meaningful integration of technology (Ringstaff and Kelly, 2002, p.21; Butzin, 2002). Many educators are ill equipped with technology knowledge, for example, basis such as troubleshooting skills. It is so embarrassing to discontinue with a lesson because computers break in the middle of the lesson and there is no one to rescue the situation. Even educators who like to use computers will stop using them if they are unreliable.

Computer phobia is another obstacle standing in the way of educators to embrace full computer integration (Johnson and Maddux, 2006, p.17; Machnaik, 2002). Educators are facing a mystery, on the one hand they believe that computer integration could assist them to teach and their learners learn. On the other hand they regard this as an experiment and if it fails, their learners' performance will be poor (Johnson and Maddux, 2006, p.17). In much the same way, for many educators technology has been implemented during their career time, hence they are afraid to embrace it because they feel very much uncomfortable with it (Machnaik, 2002). Most of educators do not realise that there is always for the first time, the brave once will always face the technology challenges.

2.6. The following are some of the strategies that can be applied to overcome aforementioned barriers.

First and foremost mentoring is the best weapon that can be used to eradicate the problems (Cradler et al., 2002, p.52). Educators should be mentored by skilled, experienced technology experts, who can model the effective usage of technology. Actually, a strong collegial environment is required so that educators can collaborate with colleagues, share ideas, ask questions and support one another. (Hofer et al., 2004; Becker and Riel, 2000).

Observing other technology savvy educators can be instructive (CARET, 2005). Educators should be encouraged to visit their neighboring schools in a district to gain new ideas and learn how to successfully integrate computers in their lessons.

Participation and collaborating in computer integration professional seminars contribute to improve confidence and motivation in the usage of computers (Becker and Riel, 2000; Cradler et al., 2002, p.52; Seels et. al., 2003, p.91). Schools' stakeholders should be encouraged to organise computer workshops for educators who are willing to integrate computers in their lessons in order to eliminate educators' dissatisfaction of computer integration into teaching and learning.

2.7. The models

The discussion on computer integration in this study is based on the following models of computer integration in schools:

- The Apple Classrooms of Tomorrow (ACOT);
- The Computers Helping Instruction and Learning Development (CHILD) model;
- Collaborative Apprenticeship model in K-5 schools;
- Pierson's model of technology integration (modified);
- Johnson and Liu integration model;
- Cronje's Model;
- Rogers' innovation model

2.7.1. The Apple Classrooms of Tomorrow (ACOT)

The Apple Classrooms of Tomorrow (ACOT) was a 10 - year study project geared at investigating how regularly educators and learners engaged technology in teaching and learning (Ringstaff and Kelly, 2002, p.7; Dias & Atkinson (2001)). The project provided educators and learners with sufficient technology resources to use. The equipments were necessary for full integration to transpire.

During this decade - long study, educators and learners went through a five-stage development process as they learned to integrate technology into their curriculum namely; entry, adoption, adaptation, appropriation, and invention (Dias and Atkinson 2001). Each stage is discussed below.

Entry Phase

During this phase educators were allowed to use text - based materials. The implementation was through traditional teacher - directed activities. This style was employed in order to reduce educators' phobia of technology. Computers were placed at back in the room and used by learners to play games and explore software.

Adoption phase

In this phase educators became anxious to know how to integrate technology into their daily lesson preparations. They began to do self introspection concerning their roles as educators. Teacher - centred method was still in use. Learners were being acclimatised to the use of computers. Again, educators began to learn basic technology troubleshooting skills. The sharing of ideas made them realise that they had common education transformation problem.

Adaptation

This phase was the introduction technology integration into teaching and learning. Educators learned more about how to organise themselves and plan for a computer integrated learning environment. Learners got quickly acquainted with computer

applications and produced more quality work. At the end of this phase educators knew how to integrate technology in their learning experiences and were acquiring other skills to meet the new technological demands.

Appropriation

Educators began to witness and appreciated the new method of teaching and learning. They started to realise the effectiveness of computers in teaching and learning. Again they changed their teaching roles by applying technology straightforward as a tool to achieve their outcomes.

Invention phase

This was regarded as a pinnacle phase. During this phase educators experienced the new instructional method of teaching and began to understand that knowledge is more like something that learners construct and less like something that has to be transferred. At this stage technology was fully integrated and learners worked together in more collaborative learning style.

The results of this longitudinal study are that ACOT learners used inquiry, collaborative, technological, and problem-solving skills which were uncommon to their non - ACOT peers. (Ringstaff and Kelley, 2002, p.7; Vukhoanh, 2006). Educators worked in teams to integrate technology into their teaching curricular framework. In essence, the study was an eye opener to educators and learners more especially educators because they are seen as change agents in education and they had to realise the need to integrate computers in teaching and learning.

2.7.2. The Computers Helping Instruction and Learning Development (CHILD) model

The Computers Helping Instruction and Learning Development (CHILD) model was based on constructivist self-paced teaching and learning approach aligned with integration of technology. The project was aimed at bridging the gap between the

traditional teaching approach and the constructivist teaching and learning approaches. CHILD supplied ample technology resources, training, and instruction to assist educators and learners got the project off the ground.

The CHILD cluster was formulated by three cross-grade classrooms those were K - 2 primary levels and 3 - 5 intermediated levels. Each educator in different grades presented one of the major learning areas which comprised of reading, writing, or mathematics (Butzin, 2002).

Learners took turns in all three cluster classrooms and received instruction in each major subject. Each classroom contained six learning stations namely (Butzin, 2002);

- computer station for learning with instructional software;
- teacher station for small-group tutorials;
- textbook station for written work;
- challenge station for learning in a game like format;
- exploration station for hands-on activities and projects; and
- an imagination station for creative expression .

Learning started with a briefing to the whole group, there after they dispersed to their assigned different stations. They worked independently at their own pace for an hour in each station. After finishing the given tasks they returned to the cluster classroom to receive instruction in science and social studies.

Educators facilitated learning by moving around in the classrooms, interacting with learners and provided guidance where necessary. Learners were actively involved in their work, collaborating with peers and by so doing they practiced constructivist learning approach.

2.7.3. Collaborative Apprenticeship model in K - 5 schools

The collaborative apprenticeship model is divided into four phases namely; introduction, developmental, proficient and mastery phase (Glazer et al., 2005, p.60). A description of each phase follows;

Introduction phase

In the introduction phase an educator - leader modeled how a computer tool could be used in a lesson. Educator - leader then explained to the peer educators the skills and strategies needed to design and create technology integration activities. Educator- leader and peer educator were regarded as partners in implementing computers in teaching and learning

Developmental phase

During this phase the two partners worked together to develop activities for an integrated learning experience. An educator - leader gradually relinquishes responsibility to a peer educator as they moved along in the phase. The coaching continued until a peer educator was left independently to prepare for a rich technology lesson.

Proficient phase

Peer - educator used the acquired technological skills during this phase that was designing technology improved lesson without the guidance of the educator - leader. A peer - educator was then responsible for creating an integrated lesson without continued dependence on a leader. Actually peer- educators worked collaboratively to demonstrate their capabilities by designing technology rich lessons.

Mastery phase

This phase was the beginning of the usage of technology acquired knowledge. Peer-educators started to be confident and independently integrated technology in their lesson preparations.

The implications of the collaborative apprenticeship model

“The implication of the Collaborative Apprenticeship model for technology integration are in three fold” (Glazer et al., 2005, p.63).

- to build the communities of technology practitioners at schools
- develop strong mentorship on technology integration and
- to support and empower educators on technology integration

Once the model is implemented in a school, it assists to build community of technology integration practitioners, which in turn, increase the spirit of mentorship among educators.

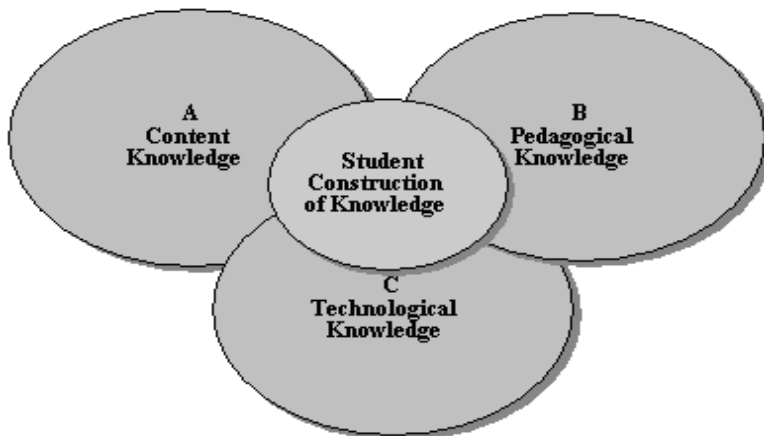
2.7.4 Pierson's model of technology integration (modified).

Pierson's model of technology integration diagram has been modified to include student construction of knowledge.

Pierson's model emphasises the importance of utilising content, technological and pedagogical knowledge effectively to benefit learners. The three components should be efficiently intertwined so as to help learners to construct their own knowledge.

(Woodbridge, 2004)

Chart. 2.1. Pierson's model of technology integration (modified).

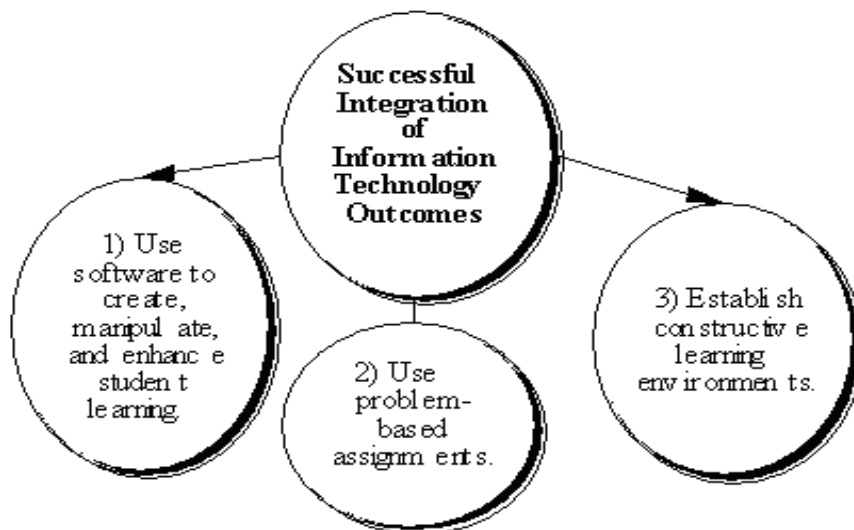


2.7.5 Johnson and Liu integration model

Johnson and Liu model is intended to identify effective and successful technology integration into teaching and learning. The model focuses on teaching educators and learners how to engage technology as an instructional tool.

This model emphasises the use of technology to reinforce learners ‘skills and enhance educators’ lesson designs. Integration of technology for example, in a problem based assignment, force learners to explore, this encourage them to learn independently and find themselves constructing their own knowledge (Woodbridge, 2004).

Chart 2.2. Johnson and Liu integration model



2.7.6. Cronje’s Model

Integration quadrant in Cronje’s model stresses the identification of learning outcomes as the first major step for every lesson preparation, followed by the choice of instructional strategies and technology tool that best can help to achieve the intended learning outcome (Cronje’s, 2000). According to the model, educators should not forget to include learning outcomes in their lesson plans. They should also select a relevant technology tool that would assist learners to attain the intended learning outcome. Learners on the other hand should be made aware of what is expected of them at the end of a lesson.

A similar view is expressed by Dias and Atkinson (2001) when they remark that “in designing a technology-integrated lesson, learning outcomes are like a travel destination, while instructional strategies and technology are like a mode of transportation” used to reach a destination. Computers play diverse roles in an integrated learning experiences, and this depend on the structuring of the curriculum, the identification of learning outcomes by educators and how educators design learning experiences.

Table 2.2 indicates four quadrants of learning process, each quadrant having its own suitable position within teaching and learning environment. Learning in the integration quadrant depends on identifying relevant learning outcome.

Table 2.2 Four quadrants of teaching and learning

Objectivism	10	Instruction	Integration	9	Constructivism
	8				
	7				
	6				
	5				
	4	Chaos	Construction	3	
	2				
	1				
	0				
	0				

2.7.7. Rogers’ diffusion innovation model

Rogers’ diffusion innovation model is included in this study in order to find out the following:

- how educators accept new changes through computer integration into teaching;
- how they cope with the new style of teaching and learning.

Rogers’ Individual Innovativeness theory suggests that “individuals react differently to change based on a stable trait or predisposition” Bailey (2002).The theory is divided into the various ways in which adopters have accepted the new ideas based on their receptive

performance. The process involves new ideas and styles that should be adopted in a working environment (SPDemanche, 2004).

Rogers, in the same document indicates that, it is of no use to force a group of people to adopt new ideas, because the results are usually negative. As a result of different receptive performance, a group of adopters has been divided into five categories; the response differs because some people are more open towards new ideas than others.

Table 2.3 represents the characteristics of each adaptor category (SPDemanche, 2004).

The characteristics of each adaptor category represented in Rogers' Individual Innovativeness theory

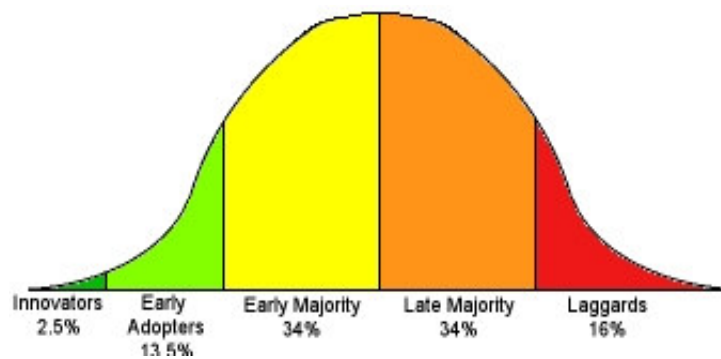
Innovators	Early Adopters	Early Majority	Late Majority	Laggards
2.50%	13.50%	34%	34%	16%
Venturesome, high social participation, risk takers, cosmopolitan.	Respected option leaders, successful role models, higher education, well connected with exposure to mass media, and interpersonal communication channels.	Non-leaders deliberate thinkers, interact with many groups, "linkers" accept ideas more quickly than the average.	Skeptical and cautious but will adopt new ideas due to economic necessity or increasing social pressure.	Traditional prefers "old way," suspicious of innovators and early adapters, feel isolated or alienated from fast moving world.

The model is used to understand the stages that educators go through when they integrate computers into teaching and learning or rather their experiences pertaining to a new style of teaching and learning. This explains that people differ in their mindsets and the adoption of a new circumstance is regarded as a challenge that some of them will be afraid to face.

Through the above-mentioned categories, Rogers formulated an innovation adoption bell shaped curve which indicates “the diffusion or rate of adoption of an innovation as it flows through a population over time” (SPDemanche, 2004).

The diagram below show percentages which represent each category and how people differ in adapting to new ideas and innovations.

Chart 2. 3 Innovation adoption bell



According to Bailey (2002) the adopters pass through five stages of innovation decision process. These are set out below:

- Knowledge = the adopters start to gain some knowledge concerning changes.
- Persuasion = the group is forced to form attitudes through interaction with colleagues.
- Decisions = the adopters have to take a decision whether to accept or reject the changes and continue with implementation of the innovation.
- Implementation = this occurs when the process has been put into practice.
- Confirmation = continuation of the process is justified or rejected, based on whether the innovation is useful and effective.

2.8. Learning theories: Constructivism

Constructivists with their inputs, assist educators and learners to accept educational changes and cater for learners’ diversity (Shelly et al., 2004, p. 666). To address the educational transformation situation, which implies quality education, educators and

learners indeed have to be made aware of contribution made by these theorists. Shelly et al. (2004, p. 666) in the same document state that this knowledge will in turn alleviate educators' stress and assist them to fulfill the difficult tasks of teaching learners from different backgrounds. Integrating learning theories and computers into teaching and learning increases learners' performance and widen their learning spectrum.

Constructivist learning theory emphasises that learning takes place in various ways. The more opportunity is provided, and the more involved learners are, the richer their understanding becomes (Southwest Educational Development Laboratory, 1999).

Research reveals that learning theories enhance learning and increase learners' performance (Shelly et al., 2004, p. 645). Moreover, the choice of learning experience depends entirely on what an educator intends to teach and how that particular educator designs a learning experience.

The following tables contain four educational theorists' comments concerning effective teaching and learning through technology integration, and is coupled with their theoretical implications as well as educators' and learners' roles (Kovalchick and Dawson, 2003, p. 69 and 72; Shelly et al., 2004, p. 64 - 653). The understanding of theories facilitates learning and encourages educators to be creative and apply different teaching styles in their lesson plans.

Table.2.4.The four educational theorists’ comments concerning effective teaching and learning through computer and technology integration

Theorist	Theoretical concept	Learners	Educators
Jerome Bruner	He proposes that learning involves active participation of learners whereby new ideas are formed based on prior knowledge.	Jerome believes that in constructivist learning, learners take responsibility for their learning.	For him the role of the educator is to facilitate the process by encouraging learners to explore and make some enquiries pertaining to the task they are engaged in which.
Jean Piaget	Piaget believes that children and adults differ in their thinking capacity. He also believes that children are active learners and need no motivation from adults.	He believes that learners gain deeper understanding of a topic through investigation and involvement in their study.	According to Piaget the educator’s role is to create a rich learning environment for learners to explore.
Lev Vygotsky	He believes that the social environment of a child can in one way or another affect his/her cognitive development.	Vygotsky believes that learners should work together to explore their ability; come up with different inputs in order to reach consensus. This	For Vygotsky educators’ role is to discover learners’ cognitive development, then build learning experience with that in mind.

		provides them with an in-depth knowledge of a problem at hand.	
John Dewey	Dewey supports learner-centred instruction. He believes that learners should be actively involved in their learning and this would broaden their potentialities.	He believes that learners study by doing and should be permitted the opportunity to construct, explore, create and be directly involved in learning.	Dewey encourages educators to include more demanding activities in their lesson plans and that learners can relate them to real life situations.

2.9. Theoretical framework (Activity theory)

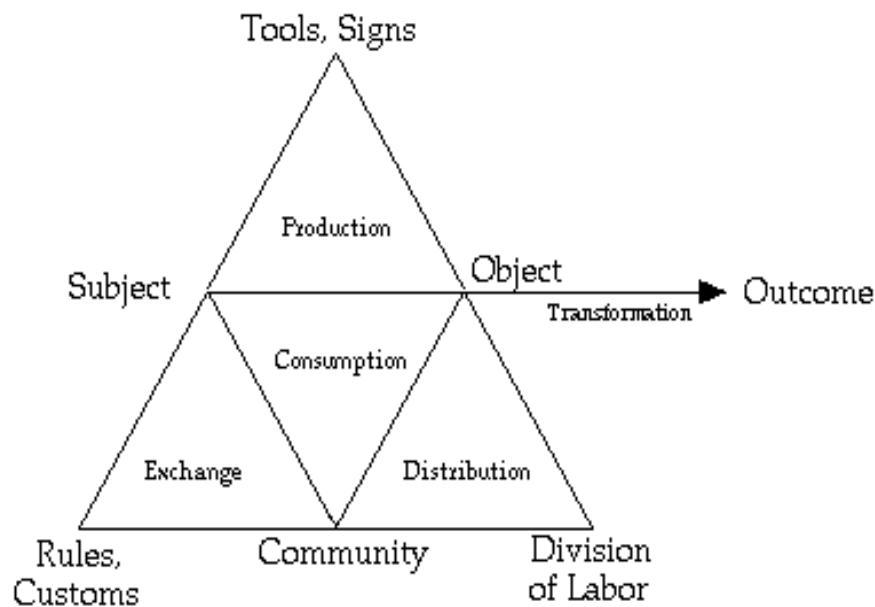
“Activity theory is a form of sociocultural analysis that focuses on the system as the unit of analysis, rather than human behavior or information processing” (Jonassen & Rohrer-Murphy, 1999, p. 61). The focal point in this theory is interaction between human activity and the perceptions within its relevant environmental context. Activity theory suggests that meaningful learning is the result of action and not what happens prior it. It is also meant to provide educators with alternative ways of viewing human thinking, behavior and activity. This is regarded as a necessity when designing an instruction, which is activity orientated (Jonassen & Rohrer- Murphy, 1999, p. 62).

Activity systems are related to activity theory and are referred to as human constructions that are based on group actions (Jonassen & Rohrer- Murphy, 1999, p. 61). They can only be understood inside the context in which they are engaged. Hence when analysing activity system the focus should not only be in learning that take place, but also in other

interacting components that are engaged in a learning process.(Jonassen & Rohrer-Murphy, 1999, p. 62)

Activity system basically consists of four subsystems namely production, distribution, exchange, and consumption. These subsystems include interacting components (subject, tools, object, and division of labor, community, and rules) as shown in chart 2.4 below and will be briefly discussed in the paragraphs that follow.

Chart. 2. 4. Adapted from Jonassen & Rohrer- Murphy, 1999 shows all the interacting components of an activity system.



2.9.1. Components of activity systems

2.9.1.1. Production subsystem

The production subsystem includes a subject, object, tools and signs. (Jonassen, 2000, p.6). The primary focus of the activity systems analysis is the production subsystem, because in the production subsystem the object is transformed into the activity outcome. When analysing the production subsystem the most important thing is to observe the

interaction between the subject and the tools that is how both of them would transform the object into an activity outcome.

If the classroom is examined as activity systems, observation should be on the interaction of the subject (learners) and a tool (for example a computer), one should consider how both of them interact in order to change the object (that is what is to be learned) into the intended activity outcome. Also, look at how the object unfold, and trace the effects that the mediator might have on the nature of the activity and whether these might change the performance abilities and beliefs of the subject.

Tools, signs, and other mediators

Tools are referred to the as means that subjects use to transform the object (Jonassen & Rohrer- Murphy, 1999 p. 64) , for example in a classroom situation, tools can be computers, reporting styles required by the educator, photocopies, pens, or any other mediator that can be used to assists in the achievement of the activity learning outcome.

The subjects

The subject of any activity is a group of individuals that participate in the activity (Jonassen & Rohrer- Murphy, 1999 p. 62; Jonassen, 2000, p.7). In analysing classroom activity learners are regarded as subjects because they perform the tasks (anything they have to learn).

The object

The objects are the artifacts that are acted on by the subject to yield the expected activity learning outcome (Jonassen, 2000, p.7). The subjects interact with the tools during production process and transform the object into the anticipated activity learning outcome. Just as the object is transformed during the production process, the subject may also be transformed by the object (Jonassen & Rohrer- Murphy, 1999 p. 62).This implies that when learners are busy with their tasks, their behavior changes as they begin to grasp information or understand the task at hand and at the end possess the acquired skill through learning.

2.9.1.2. Exchange Subsystem

The exchange subsystem consists of the rules that administer the activity and the community with which the subject interacts (Jonassen, 2000, p.10). In analysing the exchange subsystem, the focal point should be on how the rules and norms of a particular organisation are negotiated.

In a school setting for example, the rules and norms that direct the use of computer laboratory and activities should be well established in order to enable learners to perform their tasks and the proper management of laboratory.

Rules

Rules control procedures and interactions within the activity system for the smooth interaction of components and the achievement of the activity outcome (Jonassen, 2000, p.10; Jonassen & Rohrer- Murphy, 1999 p. 64). In a classroom situation the rules that direct the activity ought to be clearly stipulated so as to allow the interaction of components and the appropriate unfolding of a process.

2.9.1.3. Consumption Subsystem

The consumption subsystem includes the community that supports the subjects (Jonassen, 2000, p.10). It involves the collaboration between the subject and the community. For example, in a classroom activity, the center of attraction is on how the learners interact with the community at large. Also, how the skill or information acquired by learners can be helpful to the entire community and whether the resources are profitably utilised.

The community

The community comprises of one or more people who share the intentions with the subject. . (Jonassen & Rohrer- Murphy, 1999 p. 64). The community lays down the rules and customs that explain how it functions in supportive way to the subject during different activities in the learning process. The community in a school setting is;

educators, parents, education specialists school based, deputy principals and the school managers. What binds the community and learners together is the shared purpose, in other words the sharing of information or rather knowledge gained throughout the whole activity system process bonds all of them.

2.9.1.4. Distribution Subsystem

The distribution subsystem includes division of labor (Jonassen, 2000, p.9). It discusses how work is divided amongst the participants of the activity. In examining the distribution subsystem one should look at how the job is organised . Also, considering the rules that dictate performance and what is expected in relation to production. Again how well unfolds the operating division.

In a classroom setting the focus would be on how tasks are divided amongst group of learners. Also, whether they comply with the procedures that are laid down to complete the given task. The expectations of an educator should also be taken into consideration that is what an educator intends to achieve at the end of an activity.

Division of labour.

The division of labour entails how work is divided among a group of participants (Jonassen, 2000, p.9). Every individual in a group is tasked to do a certain function. All of them are forced to participate in an activity.

2.10. Summary

In this chapter, the literature review centred on the three sub-questions posed in Chapter One.

- What are the critical success factors for effective learning in computer integration into teaching and learning in a middle school?
- How does the educators' role contribute towards the effectiveness of computer integration into teaching and learning in a middle school?

- What is anticipated from learners to ensure effective learning in computer integration in a middle school?

The definition of technology integration started this chapter in order to give clarity on what the study is all about and which suitable information is needed for the study. Differing opinions concerning the same topic and the barriers to effective achievement of computer integration into teaching and learning have been highlighted.

Included in the discussion are the models; The Apple Classrooms of Tomorrow (ACOT), the Computers Helping Instruction and Learning Development (CHILD) model, collaborative apprenticeship model in K-5 school, Pierson's model of technology integration (modified), Johnson and Liu integration model, Cronje's model, and Everett Rogers' Diffusion of Innovations model.

The ACOT model, the CHILD model, collaborative apprenticeship model in K-5 school, Pierson's model of technology integration (modified) and the Johnson and Liu integration model, have one common thread emphasised that is, learning is based on construction of knowledge accomplished through collaborative learning style whilst an educators facilitate the teaching and learning process.

Integration quadrant in Cronje's model pinpoints the importance of identification of learning outcomes in every lesson preparation and this was revealed by several writers.

The researcher also included Everett Rogers' Diffusion of Innovations model to assist in understanding the adoption of computer integration into teaching and learning and find out how far the process has gone.

According to the above mentioned models computer integration mirrors the complete change of education at large. Whoever attempts or employs computers in teaching and learning must consider the models because they may ease the computer frustration stress.

Educational theories, particularly constructivists, were also included in this study to indicate the role played by educators and learners in computer integration into teaching

and learning. Different teaching and learning styles that could be applied during an integrated learning experience were also identified.

An activity theory provides an alternative technique of analysing an integrated learning experience. Hence, it can assist the educators in understanding how to construct an activity oriented learning experience. Rather than focusing only on the acquired knowledge, the activity theory also pays attention to all other discussed interacting components that necessitate the accomplishment of the learning outcome.

11. Conclusion

In conclusion, different views, inputs and comments about computer integration into teaching and learning have been highlighted.

From the teaching and learning perspective, there is a change needed on how educators and learners should function. Learners have capabilities which were ignored in the previous learning methods. Computer integration forces them to expose their gifted skills and rely on them.

When learners are in working situations, they will eventually find themselves facing rapidly a changing technological world, where they are expected to function effectively and efficiently. Most importantly, researches reveal that most desirable work opportunities are related to technology (Mafanga and Pretorius, 2003; Hannum, 2007, p.5). Hence, this is not only about the interest of adopting the new style of teaching and learning, but about the fact that adult life insists on acceptance and implementation of technological transformations.

Educators viewed as the main agents of change, are in the true sense the cornerstones of technological transformation in teaching and learning, because they are the ones who decide how best learners can benefit from it (Shelly et al., 2004, p. 631).

Salomon (2002, p. 71) has a similar opinion but rightly emphasises the importance of technology integration in schools. Schools have no choice but to adapt to the new

educational system because the studies have revealed its value. Research has shown conclusively that technology is a focal point within every organisation and every person should consider.

In the end, the literature reviewed in this chapter has as fully as possible addressed the research questions cited in Chapter One. In the following chapters the truth will be revealed: whether what the writers have highlighted correlates with what is happening at schools.

Chapter 3

Research methodology

3.1. Introduction

This chapter outlines the methodology and the methods that the researcher employed to gather data.

This refers to the following:

- how the researcher has compiled and applied the instruments to collect and validate data; and
- the reasons for the use of the selected techniques.

3.2. Methods and Methodology

According to Cohen et al. (2002, p. 44) method is the approaches or techniques used to collect data. For the purpose of this study, instruments which were used to gather data as indicated in Chapter One are questionnaires, interviews and observation. In this study the researcher wishes to find out how effectively the computer is being integrated into teaching and learning in a middle school. The following paragraphs explain the steps that the researcher had taken to discover this.

3.2.1. Informed consent

Before the commencement of the study, the researcher obtained permission from the principal and the School Governing Body (SGB) of Kgauelo middle school to use the school premises, as well as involving educators and learners. This was done in writing (Appendix 1). The reason for conducting a research in that particular school was explained in a letter and in a discussion with the principal.

The aim of involving educators and learners in this study was to obtain detailed information (experiences) or their inputs concerning computer integration into teaching and learning.

3.2.2. Sampling

The participants consisted of 14 educators, Grades Seven and Eight learners who were randomly selected. This was done through the use of class list which was alphabetically arranged. Every third learner whose name appeared on the list had an opportunity to take part in the study. There were 55 learners in Grade Eight and thus, 19 learners participated in the completion of questionnaires. The Grade Seven learners participated in the observation session and were not randomly selected.

In order to make the participants feel comfortable, confidentiality and anonymity were ensured. They were also provided with support towards understanding the purpose and the importance of the study. This was done to maintain a good rapport for cooperation and commitment.

3.2.3. Data collection

For the purpose of this research, the instruments used to gather data are mentioned at the beginning of this chapter. The collected data would later on, be analysed and interpreted to find out whether the purpose of this study had been achieved. The use of various techniques for data gathering enhances the reliability and validity of the study. In this study, three instruments were employed to address the research questions outlined in Chapter One.

3.2.3.1. Questionnaires

The questionnaire used by a previous researcher was adapted, but some alterations and amendments were incorporated in view of the different environments in which the study took place. Questions were compiled to provide information that answered the questions posed in Chapter One. These are set out below.

- What are the critical success factors for effective learning in computer integration into teaching and learning?

- How does educators' role improve the effectiveness of computer integration into teaching and learning, in a middle school?
- What is anticipated from learners to ensure effective learning in computer integration?

The closed and open ended questions were applied. The closed - ended questions allow for only certain responses, and the analysis of the results is usually carried out easily and effectively. Open - ended questions on the other hand gave the respondents an opportunity to use their own words, express their feelings and expand on the idea if required to do so.

Two types of questionnaires were distributed to the participants, and the one that was directed to the educators was accompanied by an introductory letter as illustrated in Appendix 3.

Educators and learners were allotted plenty of time to complete the questionnaire. Arrangements were made on how and when the completed questionnaires would be collected. The involvement of both parties in the study was essential, as the information needed was expected to yield the anticipated outcomes.

3.2.3.2. Unstructured Interview

An interview provides access to the interviewee's thinking. It enables the subjects to describe their situation and give their perspectives about what is investigated (Stringer, 2004, p. 64). Questions were designed in such a manner that they enabled the interviewee to do most of the talking.

The interviews were conducted with three educators who offered computer studies as a learning area in Grades Seven and Eight focusing on the theme integration of the computer into teaching and learning. The information was video recorded. The method gave the researcher an opportunity to replay the video recorder so as to record a detailed and accurate account of an interview.

3.2.3.3. Observation

Two educators offering computer studies as a learning area were observed, and all presentations were videoed. The essence here was to witness computer integration into teaching and learning at the school.

3.3. Data analysis

The collected rich data was reduced to manageable proportions, thereafter analysed through descriptive statistics and presented in tables and graphs in order to give a clear interpretation.

3.3.1. Validity

Cohen et al. (2002, p. 115) point out the following issues that can be used to minimise invalidity:

- selecting an appropriate methodology for answering the research question;
- selecting appropriate instrumentation for gathering the type of data required;
- using an appropriate sample (e.g. one which is representative, not too small or too large);
- ensuring reliability in terms of stability; and
- selecting appropriate foci to answer the research question.

The above-mentioned information seeks to clarify the necessary precautionary measures that the researcher had to take in order to avoid barriers that might hinder the accomplishment of the purpose of the study.

3.3.2. Reliability

“Reliability in qualitative research can be regarded as a fit between what researchers record as data and what actually occurs in the natural setting that is being researched” (Cohen et al., 2002, p. 117). It is confirmed by this statement that the researcher has to be very careful when recording the collected data, because this might distort the reliability of the study.

3.4. Summary

The main aim in this chapter was to describe how data collection was done, and to identify the participants who provided information regarding the topic. The data analysis also required explanation. The various techniques applied to gather data have also been clearly explained, as well as the procedure undertaken to gather data. Data analysis, which is the core of the next chapter, was also highlighted.

3.5. Conclusion

In conclusion, Cohen et al. (2002, p. 109) make the telling comment that when collecting data, the instruments applied should fairly and comprehensively cover the items that address the question to be investigated. Hence, the researcher must ensure that the questions in Chapter One are researched in Chapter Three. In other words, themes in Chapter Two are fairly represented in the techniques used to collect data in Chapter Three.

Chapter 4

Data analysis

4.1. Introduction

In this chapter, the challenging task of sorting and organising the collected data began. The data was scrutinised and coded for better understanding. The descriptive statistic was used for simpler interpretation of educators' and learners' contributions towards integration of computers into teaching and learning.

The previous chapters, particularly Chapter Two has provided some answers to the main question (**How effectively do educators and learners integrate computers into teaching and learning in a middle school?**) asked in Chapter One. This chapter goes a step further by finding out whether the purpose of this study would be achieved. The purpose of the study was indicated in Chapter One (**to examine the effectiveness of computer integration into teaching and learning in a middle school**).

The analysis begins with educators' interviews and these include the background information concerning computers at the school and computer integration questions. The research then proceeds with the analysis of the techniques used to gather data. The responses are summarised and analysed per question.

4.2. Educators Interview Analysis

Educators were presented with 14 questions related to computer integration into teaching; the first six questions covered the background information about computers and the last eight questions focused purely on the role played by educators in computer integration into teaching and learning (Research question 2).

4.2.1. Background Information

The background information was needed in order to gauge the time frame that is, how long have educators and learners engaged computers in teaching and learning at the

school. Questions were based on computer studies as a learning area which obliged educators to use computers. The availability of computer studies as a learning area prompted integration of computer into teaching and learning. The following questions were asked to determine the degree of computer usage at the school. Questions are followed by a summarised version of the participants' contributions.

- When was computer studies introduced in the school?
- Is it part of the school's curriculum?
- Do you have any prescribed text book?
- Were the computers donated or bought by the school?
- Was there any formal training?
- How do you cope with overcrowding in the computer laboratory?

At the time of the research, computer studies, as part of the curriculum, had been offered for approximately four years as one of the learning areas at the school. The learning area was introduced in the schools without any permission having been granted to the school by the Department of Education to diversify the curriculum. One teacher said "The school did not ask permission to teach the subject, but the school's stakeholders felt that learners should be taught computer literacy".

Educators used different text books for reference. They have drawn up the syllabus which catered for Grade Seven to Nine. They also looked for some other books and materials which could assist them with relevant information for the learning area.

The computers available at the school were bought by the school and some were donated to the school. There was a certain company which piloted computer usage and the school stood a better chance to be contracted to it. The company supplied the school with computers and internet connection, but most unfortunately, when the contract expired everything that belonged to the company was withdrawn. The school had to take over the replacement of the lost computers and also to fund the internet facility.

The staff was trained by the former principal of the school and some of them received training at tertiary institutions. There was a module in the education diploma programme which included computer studies and all training educators were encouraged to do it.

The school's computer laboratory was small and housed only 13 computers. Educators experienced over - crowding problem and they decided to let learners share computers. Those who had computers at home helped and gave those who did not have them, more opportunities to use computers in the computer laboratory.

The school intended to expand the computer laboratory. Their goals were: to have every learner in the computer laboratory using his or her own computer; the internet connected and used by the entire school; and to help the community to become computer literate by allowing them access to school computers.

4.2.2. Computer integration into teaching

The three educators (E1, E2, and E3) from the staff who offered computer studies were interviewed, and particular attention was given to the purpose of the study, which referred to **examine the effectiveness of computer integration into teaching and learning in a middle school.**

The coding was done based on the role of educators in computer integration into teaching (Research question 2). According to Wilkinson (2003, p.78) and de Vos (2002, p.346) coding is regarded as classifying or breaking down data before analysing it. In this case the data gathered was clustered into three groups before analysing it namely; teaching, computer integration and teaching styles. Probing questions were used to source the most detailed information from the interviewees.

Table 4.1 indicates how educators integrated computer into teaching and learning, and is followed by a summarised version of the information discovered in the table (n = 3).

Table.4.1. Integration of computer into teaching and learning

Category	Explanation	Frequency	
4.2.2.1. Teaching	1. Educators gave guidance to learners during an integrated learning experience.	E1, E2, E3.	3
	2. During an integrated lesson educators no longer dominated the teaching and learning process.	E1, E2, E3.	3
	3. Learners were provided with learning materials which enabled them to attain the intended learning outcomes.	E1, E2, E3.	3
4.2.2.2. Computer integration	4. The use of the computer improved educator's lesson design and presentation.	E1, E2, E3.	3
	5. Computer integration enhanced teaching and learning.	E1, E2, E3.	3
4.2.2.3 Teaching styles.	6. Educators designed their lessons focusing on the learning outcomes that they intended to accomplish at the end of a lesson.	E1, E2, E3.	3
	7. The differences between the old system of education and the integrated learning experience.	E1, E3	2
	8. Determination of a teaching style utilised in an integrated learning experience (Learner - centred method).	E1, E2, E3.	3

4.2.2.1. Teaching

The results in the above table show that the three interviewees guided learners during an integrated learning experience. The computer has forced them to change their methods of delivering learning area matter. They no longer dominated a lesson but instead facilitated the teaching and learning process. Once more, they provided learners with materials that would eventually help the learners to achieve the set learning outcomes.

4.2.2.2. Computer integration

According to the result shown in the above table (4.1), the use of computers has improved the participants' lesson design as well as presentation. They all indicated the importance by using the words "a lot, a lot". The response showed clearly that a computer can do wonders for educators' lessons; if only all educators could get exposure to computers usage.

The three educators believed that computer integration enhanced their teaching and learning. One of them expatiated by pointing out that he realised the difference between the time before engaging computers in teaching and learning and after integrating the computer into teaching and learning. The activities involved in a computer integrated lesson, one might say, forced learners to become interested in their work.

4.2.2.3. Teaching styles

The results again in the above table (4.1), illustrate that all the interviewees considered learning outcomes in preparation of integrated learning experiences. One of them commented that "there is no way you can teach without them". This was also confirmed by integration quadrant of Cronje's model which stressed the identification of learning outcomes as the first major step for every lesson preparation.

The two participants believed that there is a difference between the traditional system of education and the integrated learning experience; one did not actually experience any difference between the two approaches. All of them preferred the learner - centred method in an integrated learning experience.

4.3. Learners' Questionnaire Analysis

A random sampling was done by using class list and every third learner in the list stood a chance of participating in the study. There were 55 learners in Grade Eight. Only 19 learners were fortunate to complete the questionnaires. Learners were given enough time to complete the questionnaires. The researcher together with the learners read through the instrument and provided some explanations here and there to avoid any misunderstanding in the completion of the questionnaires.

The statements and questions in the questionnaire were meant to explore the questions below.

- What are the critical success factors for effective learning in computer integration in a middle school?
- What is anticipated from learners to ensure effective learning in computer integration in a middle school?

The following are the questions/statements, followed by graphs and tabulated information, which represent the responses to different questions.

Table 4.2. How long have learners used computers in learning?

Number of learners	Computer Integration(years)
12	2
2	1
2	3
1	8
1	1,6
1	0

The results in the above table indicate that out of nineteen learners 12 of them were in their second year of integrating computer in their learning. Two had one year's experience, another two three years' experience. Only one has eight years of using computers and the other had one year six months experience. The last number one had no computer experience.

Table 4.3.Learners’ age

Age	Learners
10-15	19
16-20	0
20+	0

The table above shows that most of Grade Eight learners were between 10 and 14 years of age. Learners’ age tallied with the age requirements for admission to an ordinary public school stated in the document of Education Labour Relation Council policy handbook for educators (2003, p. B - 62). Therefore, Grade Eight learners were at least 14 years of age as required. Knowledge acceptance in most cases is determined by the age of learners.

Table 4.4.Learners’ gender

Female	Males
12	7

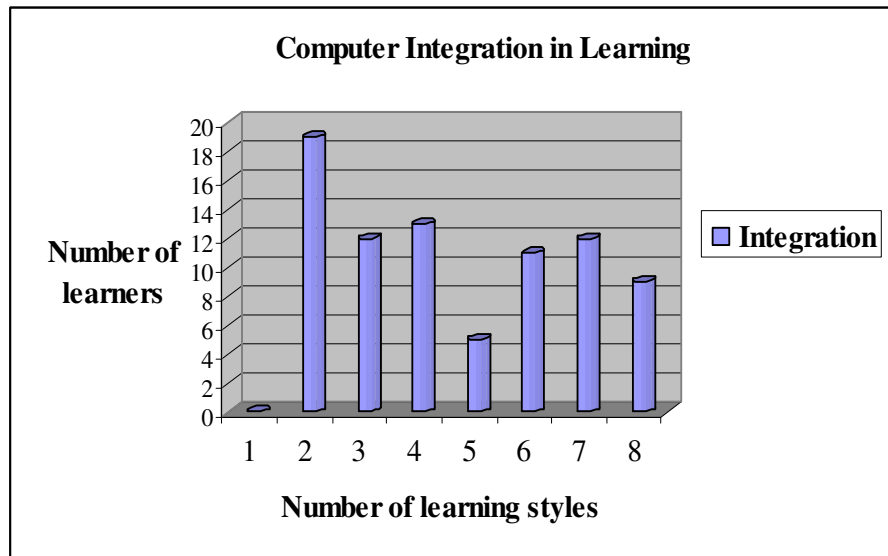
As indicated earlier on in the study, sampling was done through class list and every third learner on the class list stood a chance of participating in the study. The results show that by chance more girls participated in the study than boys.

Table.4.5.How learners described their computer knowledge

Bad	Moderate	Good
1	7	11

Learner’s experience on computer integration into learning was good, even if the school was not so well equipped with computers. The results show an interest on the side of the learners. Seven of them were moderately computer skilled and only one was bad.

Chart 4.1. Illustration of computer integration in learning (Learners).

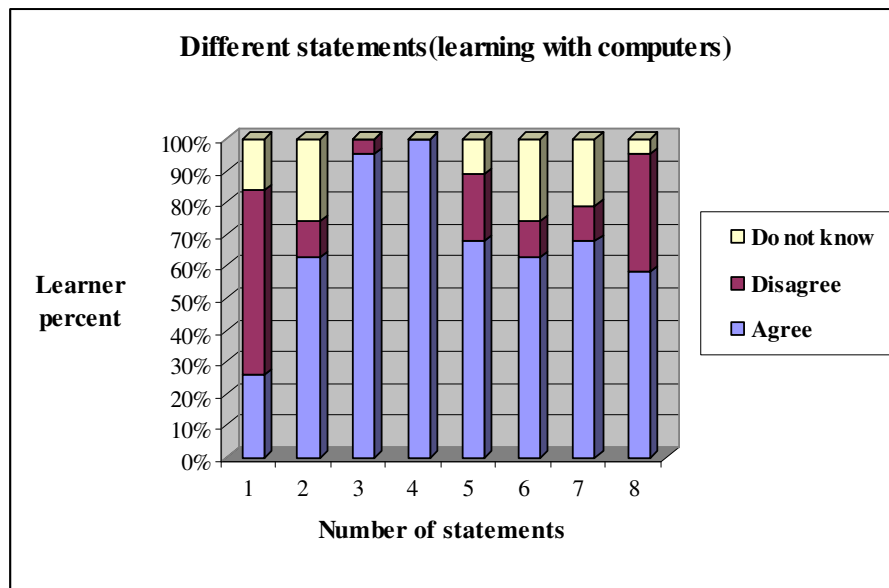


There are eight learning styles indicated in the above graph. This was done to discover the critical success factors for effective learning in computer integration by learners (Research question 1).

The results show that all 19 learners believed that the computer was an essential tool that would enable them to get a better job in the future (learning style 2). Thirteen out of nineteen agreed that when working as a group, they were able to come up with a solution to the problem (learning style 4). Two variables got similar view, that is; 12 learners were able to obtain extra information from the Internet for their tasks and 12 were capable of presenting projects in front of their classmates (learning style 3 and 7). Eleven learners pointed out that they used CD ROM's for variety of information (learning style 6). Another nine communicated with their friends and educators through e - mails. Only five of them had the ability to solve problems by using computers (learning style 5). None of them did not use computer for learning (learning style 1).

Chart 4.2. The representation of different statements concerning learning with computers

The choice in the graph below was made pertaining to what learners agree or disagree with, and what they do not know concerning computer usage.



The graph above shows eight statements which add to the critical success factors for effective learning in computer integration, mentioned in the previous graph. Learners had to respond by ticking the series shown next to the graph.

The results indicate that 100% of learners agreed that group work was fully practised (statement 4). The graph also shows that 95% of learners agreed that working in groups obliged them to expand the range of their capabilities and sharing of ideas (statement 3).

Again, according to the graph, 68% of learners believed that computers would prepare them to serve their community well in future (statement 5). The same percentage specified that the tool brought a meaningful learning in their class (statement 7).

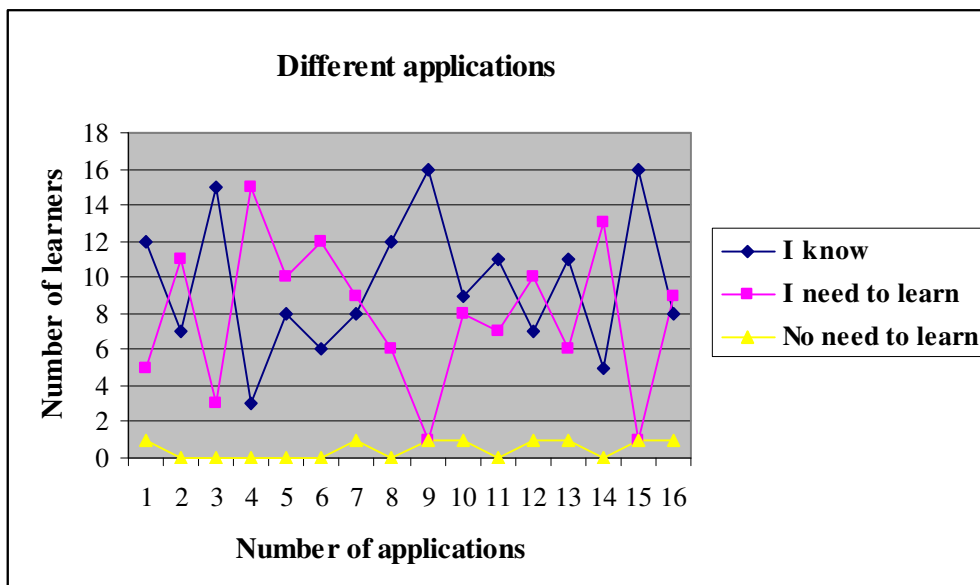
Furthermore, 60% of learners pointed out that the computer helped them to take responsibility for their own work (statement 2). Also, the same percentage agreed that they were not yet able to collect information and use it profitably (statement 6). The

collection of information was mostly done through the internet. These results were affected by the unavailability of internet. As stated earlier on in the interviews conducted with their educators, they had this internet in the past but it had been disconnected due to reasons beyond their control. The resource is needed because it offers support and a wealth of possibilities to educators and learners. About 58% of learners believed that using the computer is a new style of learning (statement 8).

The lowest percentage (26) agreed that the computer forced them to learn by doing. This indicated that full integration of computers in the school had not yet been attained. Hence, learners thought that they were not forced to work hands - on (statement 1).

Chart 4.3. Different applications that learners use in computers

The Information below concerns the use of different applications which learners were able to operate, the one that they knew, the one they needed to learn and the one they disregarded in their learning. There were 16 applications.



The above graph illustrates what is anticipated from learners to ensure effective learning in computer integration (Research question 3).

The highest number of learners which is 16 in the graph indicates that they were fond of playing computer games and equally had general computer skills. The following number 15 shows cooperative learning, which helps learners to develop interpersonal skill and a team spirit.

Again, the graph shows that 12 learners were able to use computers for typing their tasks. Similarly another 12 learners used Power Point to present information in the class. Two 11 numbers, were those who knew how computers work and those who were able to collect information through computer usage. Furthermore the graph indicates that nine learners applied some operating systems in the computer.

Ten or fewer learners indicated the need to learn the following:

- word processing for typing their tasks;
- Power Point for presentation of tasks in front of classmates;
- high technology place because of the need to make best use of technological environment;
- individual learning as learners wished to know how to follow the instruction when given software to study with;
- maintenance of computers which mean they would be able to monitor their tools;
- collaborative learning which lead to construction of knowledge; and
- ability to collect information which would help them gather information for their assignments.

The graph also indicates that learners are interested in acquiring a new skill of learning. Hence the lowest numbers of "no need to learn", in other words there is a need to acquire new skills.

4.4. Educators' Questionnaires Analysis

Out of 18 questionnaires that were distributed among educators, only 14 were returned. This was a satisfactory response, which indicated the positive educational environment prevailing at the school. The researcher was told that some of educators were on study leave because it was the last term of the year. All of them were supposed to have participated in the study, but unfortunately the circumstances did not permit this.

Table 4.6. Educators age range in years

Age	Educators
20-29	4
30-39	4
40-50	5
50 +	1

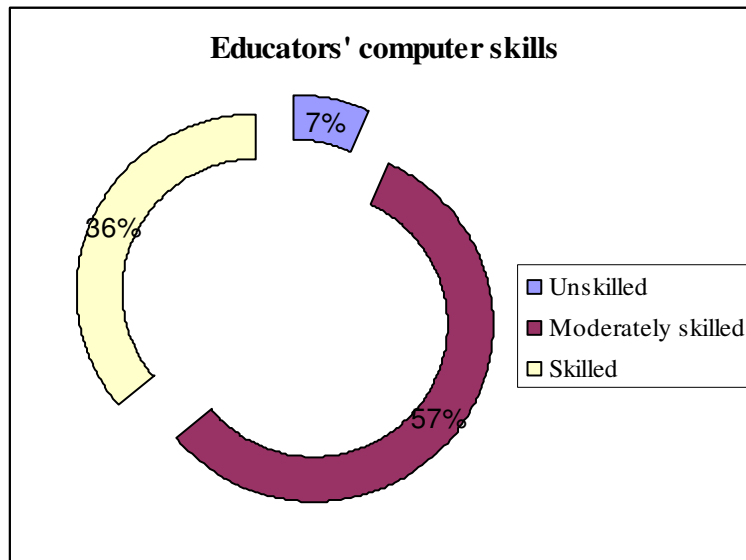
The table above specifies that all ages were fairly represented in the school except one educator who was above 50 years of age. This indicates a combination of experiences of the old and the new systems of education which are Bantu Education and Curriculum 2005. One might ask a question, what influence that had in the study. Computer integration is regarded as one of the contentious issues brought by the new education systems namely: the Revised National Curriculum Statement (RNCS) and the National Curriculum statement (NCS). Thus, age variation is one other contributory factor which will help in understanding the adoption of computer integration into teaching and learning in the school.

Table 4.7. Educators' gender

Male	Female
3	11

No random sampling was done as happened in the case of Grade Eight learners. All educators who were present at the school when the field work was done contributed to the study. The results from the above table reveal that there are more female than male educators who participated in the study.

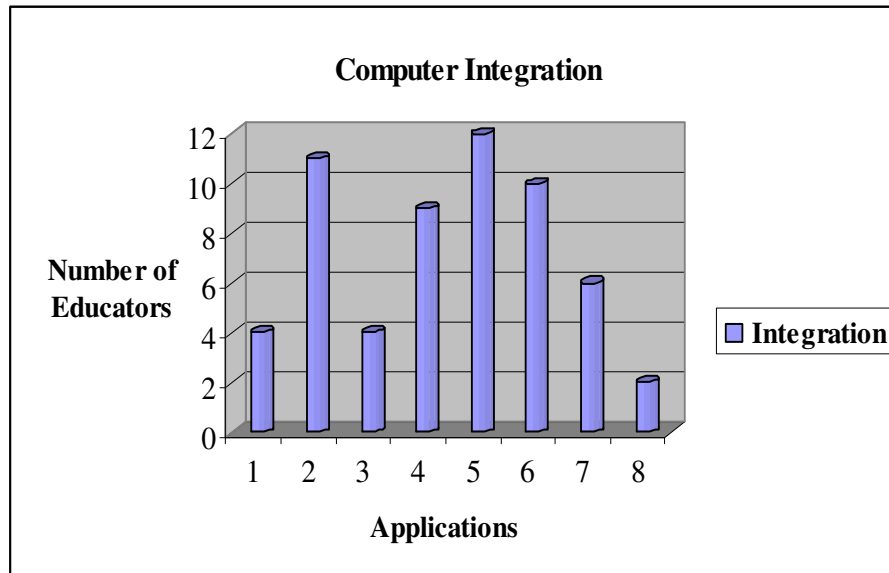
Chart 4.4. Illustration of educators' computer skills



Based on the results identified by the above graph, one can see that 57% of educators were moderately computer skilled; about 36% of them were competent and 7% unskilled. The results show willingness from the educators' perspective because, although they had not been formally computer literacy trained, they, at least in one way or another took pains to become computer literate.

The following responses 4.4.4 to 4.4.7 are related to the role played by educators in computer integration into teaching (Research question 2).

Chart 4.5. Illustration of how educators integrate computers into teaching



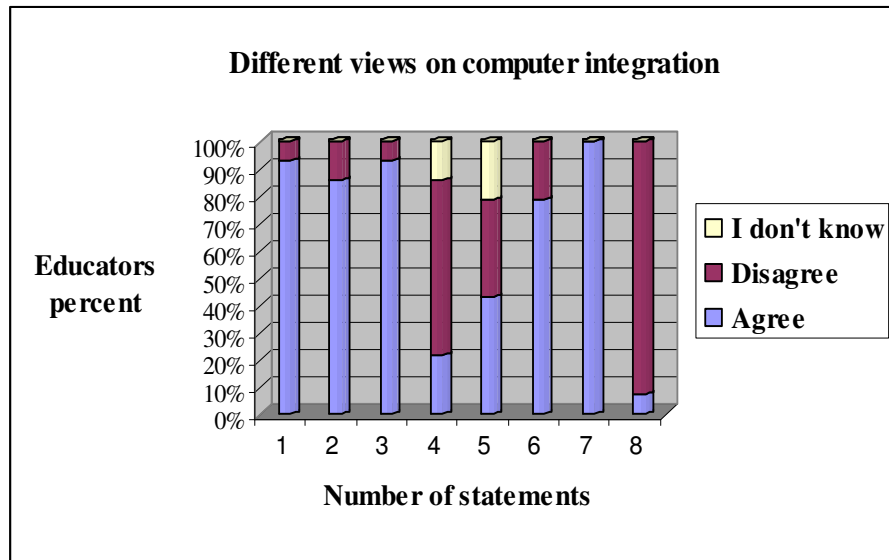
There were eight applications presented to the educators from which they had to make their choices by ticking in a relevant box.

The table reveals that 12 out of 14 educators used computers to work out marks (application 5). This was followed by 11 educators who used computers for drill and practice (application 2). At least 10 of them used CD ROM's for extra reference (application 6).

Again, nine educators used computers for recording information and preparing worksheets (application 4). Six educators were able to search for information using computers (application 7). Only four educators did not understand the use of computers in teaching (application 1). The same number of educators specified that they did not use computers in their lesson preparations (application 3). Two of them used computer to communicate with their colleagues (application 8).

Chart 4.6. Different views on computer integration

For this following question, educators were requested to indicate their choices by ticking agree, disagree, or do not know.



Eight statements were presented and educators had to choose by ticking one of the series shown next to the graph.

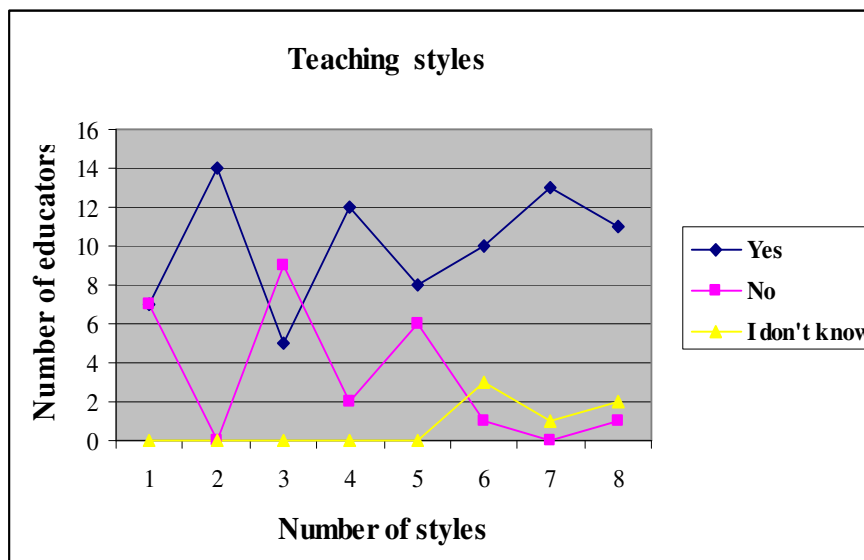
The results show 100% of educators who agreed that integration of computers into teaching improved their teaching styles (statement 7). The 89% of educators again agreed that the use of computers motivates learners (statement 1); a similar percentage pointed out that an integrated learning experience deals with more material than the traditional method (statement 3).

About 85% of educators supported the notion that computer integrated learning experience is more effective than the traditional method of instruction (statement 2). Furthermore, 71% believed that computer obliged them to make comprehensive lesson preparations and to ensure good presentation (statement 6). Again, 40% confidently said that computers would never replace them in teaching and learning in the classroom (statement 5).

The results also show that most of educators believed that computer integration would be forever in teaching and learning and not a passing fad, which is 21% , (statement 4).Lastly, 7% agreed that computer usage is meant for highly gifted learners (statement 8).

Chart 4.7.Educators’ teaching styles

In this question educators responded by ticking a yes, no or I don’t know in relevant boxes. They were supplied with eight statements regarding their teaching styles in an integrated learning experience.

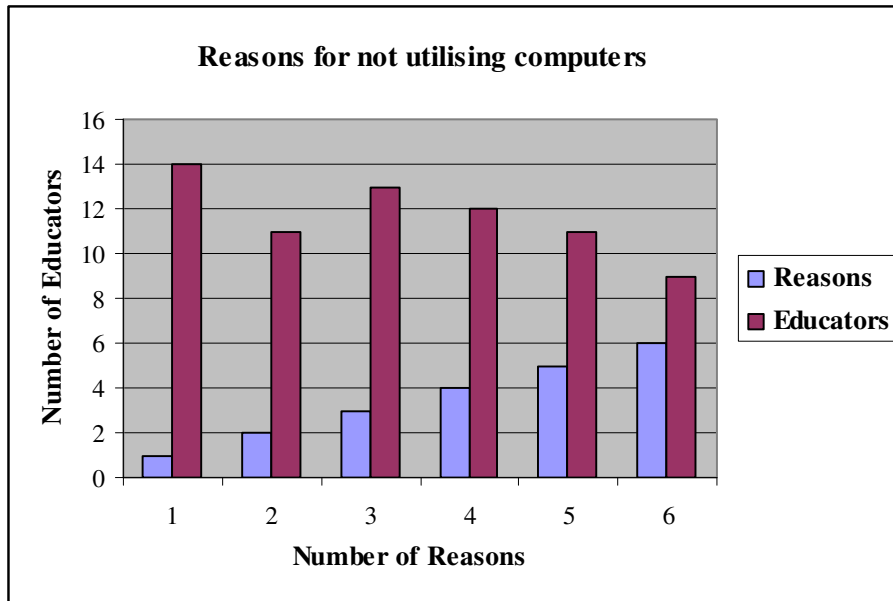


The graph indicates that all educators (14) applied learner - centred method as an approach to teaching (style 2). Thirteen educators, except one provided guidance to learners during computer integrated learning experiences (style 7). Furthermore, 12 of them facilitated an integrated lesson (style 4), and 11 practised scaffolding during an integrated learning experience (style 8).

Again 10 educators were able to choose a computer accessory which was related to the intended learning outcome (style 6). Eight out of 14 believed that computers encouraged and improved learners’ school attendance (style 5). Seven believed that group work was effective in a computer integrated lesson (style 1), but another seven was against the

idea of group work, as they thought that it was not effective. Only five of them agreed that they no longer strove to motivate learners or tried to meet their needs because computers helped them by motivating and catered for their different needs (style 3).

Chart 4.8. Educators' reasons for not utilising computers



The above graph is in line with Rogers' diffusion innovation model which clarifies the adoption of technological innovations in teaching styles. Educators were provided with six reasons that were regarded as stumbling blocks to the adoption of a new teaching style.

The graph indicates that 14 educators declared that lack of training retarded their progress of computer usage (reason 1). Thirteen educators had the perception that the computer was difficult to adopt (reason 3). Again 12 educators blamed lack of facilities and financial assistance to schools (reason 4). Two reasons were given by 11 educators (reason 2 and 5). These are the fear of computers (computer phobia) and lack of planning. The lowest number of educators (reason 6) said there was lack of motivation and enthusiasm.

4.5. Observation

This was done to assure the researcher that computer integration into teaching and learning was implemented at the school. The focal point was on the role of educators in computer integration into teaching and learning (Research question 2).

There were three grades, two Grade Sevens and one Grade Eight. Two educators shared the two Grade Sevens and one educator taught the Grade Eight learners. The entire presentation was recorded. Educators had overcrowded grades, therefore, the two Grade Seven educators decided to share periods, so that particular attention could be given to all learners. Both educators worked together in one period and the time - table was structured in a way that would accommodate both in such periods.

The school computer laboratory had 13 computers, and this aggravated their overcrowding problem in the computer laboratory. Learners had to share one computer and those who had computers at their homes had to allow those who did not have computers at their homes ample time to learn the use of computers.

Learners were given an activity to perform. The activity was repeated because of the learners' poor performance. Educators gave learners clarity on what was expected of them. They were instructed to switch on the computers and open up MS word and type a friendly letter. The instruction was to format the whole document so that it would be an acceptable friendly letter. Learners performed the activity in groups arguing, sharing ideas on how to do it. They also rotated the use of computers.

While the activity was underway, the educators moved around to ensure progress and to respond to questions from learners when the need arose. At the end of the activity, the remedial work was done to make the learners aware of their mistakes. The interpretation of the document also took place.

At some stage, when the activity was going on, the researcher went to different groups to guarantee computer integration into teaching and learning.

The following checklist was used.

Table 4.8. Checklist for observation

Computer integration	Yes	No
• Provision of guidance to learners.	X	
• Facilitating the learning process.	X	
• Choose technology tool which is related to the learning outcome.	X	
• Scaffold learning.	X	
• Apply learner - centred method.	X	

The table above shows educators' commitment to integrating computer into teaching and learning. Educators fulfilled their role as far as computer integration is concerned (Research question 2).

4.6. Summary

In this chapter the collected data was analysed through descriptive statistics and presented in tables and graphs for comprehensible interpretation. The next chapter will present the summary with recommendations and conclusion.

Chapter 5

Summary, Recommendations and Conclusion

5.1. Introduction

The main focus in this chapter is to provide a conclusion, and to reflect on the entire study in relation to its purpose and the questions mentioned in Chapter One. This will include: a summary of the previous chapters, a summarised version of the findings compared to the literature review, the barriers, models, recommendations, the limitations of the study and a concluding remark.

5.2. The purpose of the study

The purpose of this study was to examine the effectiveness of computer integration into teaching and learning in a middle school.

5.3. The main question of this study was;

5.3.1. How effectively do educators and learners integrate computers into teaching and learning in a middle school?

There were also three complementary questions derived from the above-mentioned main question. These are set out below:

- What are the critical success factors for effective learning in computer integration into teaching and learning in a middle school?
- How does the educators' role contribute towards the effectiveness of computer integration into teaching and learning in a middle school?
- What is anticipated from learners to ensure effective learning in computer integration in a middle school?

Below are a short review of previous chapters and the findings pertaining to the questions asked. The barriers, models, recommendations, limitations of the study and concluding remarks make up the last parts of this chapter.

5.4. Summary of the previous chapters

5.4.1. Chapter 1

Chapter One started this study by giving a framework of what was to happen throughout the entire study. This chapter started with the background information concerning South African education. The South African education was reviewed, especially as it has undergone many changes and still continues to change. Computer usage forms part of these changes and is taking a lead because of its' speedy rate of changing.

The new education system intends to redress the imbalances of the past apartheid education by providing an improved quality education to all South Africans. "The main objective is to build digital and information literacy so that all learners become competent in using technology to contribute to an innovative and developing South African society" (Government gazette, 2004, p. 19). The new teaching and learning system will open up new learning opportunities for South Africans not otherwise possible as provided by the traditional system.

Chapter One also included the purpose of the study, this was important as it reflected why the researcher believes that this study is worth doing. The purpose of the study was followed by the questions which helped to get the study off the ground. The methodology was also included as this was a vehicle used to answer questions raised in Chapter One.

The rationale formed part of this chapter since it provided information about what motivated the researcher to undertake such a study. The definitions of the key terms also formed part of this chapter for the simple reason that the readers can understand the context in which the words are used. The last part of this chapter contained information about how the subsequent chapters would be organised.

5.4.2. Chapter 2

The definition of technology integration started the chapter in order to give clarity on what the study is all about and which suitable information is needed for the study.

This chapter also uncovered the main issues pointed out by different writers concerning computer integration into teaching and learning and these were those who are in favour of the idea and those who are not in favour of the idea. The information revealed, centred on the three sub - questions mentioned earlier on in this chapter.

Furthermore, the literature review included the barriers which are regarded as stumbling blocks hindering the effective achievement of computer integration into teaching and learning.

Again included in the discussion were the models namely; the Apple Classrooms of Tomorrow (ACOT), the Computers Helping Instruction and Learning Development (CHILD) model, collaborative apprenticeship model in K-5 school, Pierson's model of technology integration (modified), Johnson and Liu integration model, Cronje's model, and Everett Rogers' Diffusion of Innovations model.

The ACOT model, the CHILD model, collaborative apprenticeship model in K - 5 school, Pierson's model of technology integration (modified) and the Johnson and Liu integration model, emphasised one common thread that is learning which is based on construction of knowledge and is accomplished through collaborative learning style whilst educators facilitate the teaching and learning process.

Cronje's model has been part of this study because its integration quadrant emphasised the importance of identifying learning outcomes for every lesson preparation. Rogers' diffusion innovation model was also significant in this study because it helped to assess the level of educators' competency in the use of computers.

Educational theories, particularly constructivists, were included in this chapter to indicate the role played by educators and learners in computer integration into teaching and learning. Different teaching and learning styles that could be applied during an integrated

learning experience were also identified. Also, an activity theory was included in this study because it best explained to educators how to design an activity based instruction.

5.4.3. Chapter 3

In this chapter, a clear outline of how the field work was conducted is provided. The following aspects were covered:

- description of target population used to gather data;
- the instruments that facilitated research;
- research design;
- data gathering procedures; and
- data analysis.

5.4.4. Chapter 4

In this chapter the collected data was analysed through descriptive statistics and presented in tables and graphs for comprehensible interpretation. The findings were elaborated on in relation to the responses made by the participants.

5.5. Discussion of findings

The research techniques used to gather data in this research were questionnaires unstructured interviews and observations. The primary focus within the three techniques was related to how effectively do educators and learners integrate computers into teaching and learning in a middle school.

The following are the summarised version of the main findings of the literature provided by different writers in Chapter Two. This will be followed by a comparison between the views made by different writers and the results found in Chapter Four. The discussions of findings focus on the questions raised in Chapter One.

5.5.1. The critical success factor for effective learning in computer integration included:

- ability to collect information analyses, synthesise and assimilate it, then make an acceptable presentation of it;
- the use of computer helps learners to be self disciplined and knowledge constructors;
- computer integration provides meaningful and effective learning;
- a style of learning e.g. individual and cooperative;
- development of interpersonal skills and teamwork spirit;
- collaboration with peers which encourages problem - solving, decision - making skills and the development of higher order thinking skills;
- independent learning;
- responsibility for their own learning;
- career preparation (better jobs); and
- participation in their learning.

The study has found that most of the learners' responses were in line with the most views provided by the different writers and listed above.

The only aspect which was inadequately done was that the majority of learners was not as yet at the stage of collecting information and used it valuably. This could be, since the internet contract at the school was not renewed upon expiry as stated by the interviewees in Chapter Four. As a result, learners lost touch with the skill of collecting information using different search engines. This profoundly had affected the effective integration of computers into teaching and learning.

At the time of research, the site manager indicated that the process of reconnecting the internet was in the pipeline. Learners at the school were already acquainted with the use of the internet and if the reconnection was not done as quickly as possible this would have adverse effect on their learning.

The following table and paragraphs provide the findings concerning research question 2 mentioned below. There were three interviewees; three educators were observed and 14 educators responded to the questionnaires.

5.5.2. How does the educators' role contribute towards the effectiveness of computer integration into teaching and learning in a middle school?

Table 5 .1 Comparison of three instruments

Educators' roles	Interview	Observation	Questionnaires	Results
1. Provision of guidance to learners.	3	3	Thirteen educators provided guidance to learners during computer integrated learning experience.	100%; 100% and 93%
2. Facilitating the learning process.	3	3	Twelve educators facilitated an integrated lesson experience.	100%; 100% and 86%
3. Choose technology tool which is related to the learning outcome.	3	3	Again ten educators were able to choose a computer accessory which was related to the intended learning outcome.	100%, 100% and 71%
4. Scaffold learning.	3	3	Eleven practiced scaffolding during an integrated learning experience.	100%; 100% and 71%

5. Application of learner-centred method	3	3	The results indicate that all educators applied learner-centred method as an approach to teaching and learning in an integrated learning experience.	100%; 100% and 100%
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It is clear from the table above that the three instruments produced almost the same results concerning the educators' role towards the effectiveness of computer integration into teaching and learning. The slight difference which appears between questionnaires and other two instruments is caused by the fact that there were more respondents in questionnaires than in two other instruments. However, in the opinion of the researcher this would not hamper the validity of the study, because the researcher had an appropriate focus on the question asked.

Furthermore, the results show that most of the educators aligned themselves with the following concerns pertaining to computer integration into teaching and learning:

- lack of formal training;
- difficulties in adopting computer integration;
- lack of facilities and financial assistance to the schools; and
- computer phobia and lack of planning.

All these matters raised above need to be attended to before it is too late for meaningful integration of computers into teaching and learning.

Generally, it is the best of times and the worst of times to be an educator (Lamb, 2006), because each and every emerging educational opportunities places an educator as the significant device with which to change learners' learning lives. Without any doubt this is true; however different educators handle changes differently. In a very real way,

educators need to adapt and adopt any new educational developments if they want to survive and keep pace with new methods of teaching and learning.

5.5.3. What is anticipated from learners to ensure effective learning in computer integration?

According to the findings, most of the tasks that were expected to be performed by learners were not effectively performed. This indicates that there is a great need to give attention to issues that were anticipated from learners to ensure effective learning in computer integration. However, there were only two conclusive matters, that the majority of learners had general computer skills and ability to play computer games.

The school faces the challenge of maintaining the matters listed below in order to achieve what was anticipated from learners to ensure effective learning in computer integration.

Learners should be able to:

- create and make Power Point presentation in the class;
- use software to learn;
- communicate through e - mails;
- find their way through search engines (internet and hypertext links);
- use a video camera to increase their problem solving skills;
- use word processor to write and edit their work; and
- use desktop which offers them various computer applications that support the analysis and problem solving.

The performance and achievement of learners in an integrated learning experience depends entirely on an educator's knowledge of computer usage. The results mentioned above clearly support the issue of educators' training as one of the main contributory factors, as far as effective integration of computer into teaching and learning is concerned. Educators are expected to be the best at monitoring and planning an integrated learning experience. They are the ones who can bring about the achievements anticipated from learners to ensure effective integration of computer into teaching and learning. The

results show a need for the school to revisit a plan on how to deal with the above-mentioned matters.

Various authors in Chapter Two have identified what was anticipated from learners for effective computer integration into teaching and learning. (Norton and Sprague, 2001, p. 25; Hedney, 2001; Tiene and Luft, 2001, p. 26-30; Shelly et al., 2004, p. 614, 611, 615, 629, 606; Dias and Atkinson, 2001; Patricia et al., 2005, p.295; CARET,2005; Zee, 2004; Ringstaff and Kelley, 2002, p.6; Feldman et al.,2001,p.45; Wang, 2006,p.36; Waddoups,2004; Lamb, 2004; Machnaik, 2002).

5.6. The barriers

In the field work, the interviewees indicated that they did not receive formal training instead their former principal helped them to acquire computer knowledge skills. Educators' formal training is regarded as one of the cornerstones for meaningful integration of computer into teaching and learning. This is also referenced to in Chapter Two by Zee (2004); Silverstein et al. (2000) ; Sivin - Kachala and Bialo(2000); and Reyes (2005) who emphasised that educators' formal training is one of the most important requirements for effective integration of computer into teaching and learning, otherwise the implementation efforts will have little effect or be worthless. Significantly, as mentioned earlier on in this chapter, the performance and achievement of learners in an integrated learning experience is truly dependent on an educator's computer knowledge skills.

In arguing the above view, several authors in Chapter Two maintained that educators' formal training is indispensable for effective integration of computers in teaching and learning. Formal training could also assist educators in the following modes; (Zee, 2004; Anillogic, n.d; Ringstaff and Kelley, 2002, p.13; SEIR*TEC, n.d.; and Becker, and Ravitz, 2001);

- formal training will equip educators with a foundation of technological knowledge;

- educators understand how to access and use computers and other technology accessories;
- formal training encourage educators to use technology more frequently in their instructions and this leads to a considerable improvement of learners achievements;
- educators are offered opportunity to develop their capabilities; and
- ability to use technology effectively.

5.7. The models

As mentioned earlier on in this chapter, the ACOT model, the CHILD model, collaborative apprenticeship model in K - 5 school, Pierson's model of technology integration (modified) and the Johnson and Liu integration model, emphasise one common thread that is learning which is based on construction of knowledge and is accomplished through collaborative learning style whilst educators facilitate the teaching and learning process.

The results of this study indicate that computer integration at the school has not yet reached the stage of knowledge construction. This could be true from the accessibility to computers usage point of view. Learners had to share computers and did not get enough chance to fully integrate computers in their learning, as they would have wished.

Ringstaff and Kelly (2002, p.17); Butzin (2002); and Johnson and Maddux (2006, p.15) in Chapter Two indicated that access to the use of computers is very imperative , because if learners share computers , educators become reluctant to apply collaborative style of teaching and learning, as a result full integration of computers into teaching and learning would not be achieved.

Cronje's model played a role in this study because its integration quadrant emphasised the identification of learning outcome for every lesson preparation. It was also confirmed by the interviewees, when field work was done, that learning outcomes are indispensable for every learning experience. Dias and Atkinson (2001) also made a telling comment in

Chapter Two that learning outcomes guide educators of the route to take in order to reach their destinations in teaching and learning process

Rogers' diffusion innovation model was included in this study in order to find out the following:

- how educators accept new changes through computer integration into teaching;
- how they cope with the new style of teaching and learning.

According to Roger's innovation model, educators at the school where the study took place still have to pass through five stages of innovation decision process identified by Bailey (2002) and discussed in Chapter Two. These are listed below:

1. Knowledge = the adopters start to gain some knowledge concerning changes.
2. Persuasion = the group is forced to form attitudes through interaction with colleagues.
3. Decisions = the adopters have to take a decision whether to accept or reject the changes and continue with implementation of the innovation.
4. Implementation = this occurs when the process is initiated.
5. Confirmation = involving continuation of the process is justified or rejected based on whether the innovation is useful and effective.

Moreover, educators armed with the computer knowledge skill would definitely integrate computers into their teaching and eventually accept the new style of teaching in their own ways following the stages indicated in Rogers' innovation model.

5.8. Learning theories: Constructivism

Kovalchick and Dawson (2003, p. 69 and 72), as well as Shelly et al. (2004, p. 647 - 653) commended about the roles played by both educators and learners in an integrated learning experience. The four theorists namely: Jerome Bruner, Jean Piaget, Lev Vygotsky, John Dewey have one common principle, in Chapter Two proposed that learners should actively participate in their learning. Again, they went on recommending that in an integrated learning experience, learners use collaborative learning style to

achieve a learning outcome. Various writers in Chapter Two have repeatedly voiced this learning style as vital to successful integration of computer into teaching and learning (Machnaik, 2002; Wegerif, 2002; Future lab, 2002 Vukhoanh, 2006). Each and every learner is obliged to participate in learning since they are each tasked to perform a certain duty in their learning. As a result, they take responsibility of their own learning.

From educators' perspective point of view, the theorists emphasise that their role in an integrated learning experience is to facilitate teaching and learning. This was also confirmed by writers Richardson (2006, p.26) and Sherry and Jesse (2000) in Chapter Two, that the new teaching and learning process do not anymore regard educators as the only source of information, but educators assist by making the process easier that is by facilitating the teaching and learning . The results of this study clearly support the views expressed by four educational theorists regarding computer integration into teaching and learning.

Furthermore, educators are regarded as the critical elements for the successful integration of computers into teaching and learning. Therefore, they really have to be work shopped or updated with the latest technological developments so that they do not doubt their ability to perform or practice computer integration into teaching and learning. Moreover, educators ought to become better at integrating computers into teaching and learning, because they are seen as change agents in the education system at large.

5.9. Theoretical framework (Activity theory)

The activity system for computer integration in the middle school includes the following:

- Tools = these were 13 computers available in the school's computer laboratory. Learners used them to complete their given task.
- Subjects = the subjects were Grade Eight learners and were instructed to format an informal letter.
- Object = this was an informal letter that the Grade Eight learners had to transform.

- Rules = The rules concerned the school policy on integration of computers, rules for managing computer laboratory and the rules that directed learners to achieve the activity learning outcome.
- Community = The community involved were educators, parents, education specialists school based, deputy principal and the school manager.
- Division of labour = this concerned how work was distributed within a group. Each learner had a role to play and as a result the learners collaborated to attain the intended learning outcome.

An activity theory can help educators to understand how to design a computer integrated learning experience. It guides educators not to focus primarily on the object that is information they prepare to teach learners but should also consider all other interacting activity components mentioned above.

5.10. Recommendations

Recommendations are based on the following:

- the critical success factors for effective learning in computer integration;
- the educators' roles in contributing towards the effectiveness of computer integration into teaching and learning; and
- those things which are anticipated from learners to ensure effective learning in computer integration in a middle school.

5.10.1. The critical success factors for effective learning in computer integration

For the effective integration of the computer into teaching and learning to take place, the internet should be reconnected at the school as soon as possible. The internet is regarded as the most important computer accessory tool which can help learners and educators to extent their horizons in order to achieve their learning outcomes. The school requires internet reconnection so that their plan of computer integration into teaching and learning could come to fruition. More so, this will enhance teaching and learning at the school and learners' performance as well will be improved.

5.10.2. The educators' roles in contributing towards the effectiveness of computer integration into teaching and learning

The results of this study have shown that educators at the school are seriously committed to following the trend of integrating computer into teaching and learning. Even though there were some challenges identified in this study which prevented them from attaining effective integration of computers into teaching and learning.

The school should empower educators with computer knowledge skills that would address the barriers to effective computer integration into teaching and learning. Like for instance workshops and continuous in-service training by experts could assist to ease educators' frustrations of computer usage. Essentially, a strong collegial environment is recommended by writers (Hofer et al., 2004; Becker and Riel, 2000; Cradler et al., 2002, p.52) that educators can collaborate with colleagues, share ideas, ask questions and support one another.

Again, observing other technology savvy educators is another strategy that can complement meaningful integration of computers into teaching and learning (CARET, 2005). Educators should be advised to visit their neighboring schools in a district so as to gain new ideas and learn how they can successfully integrate computers in their lessons.

The school should also organise the resources that would give educators a broad choice of computer integration into teaching and learning. Multiple means of delivery can assist educators to effectively integrate computers in their lessons. Similarly, the key to the success integration of computer into teaching and learning is putting all the pieces together in order to achieve the intended learning outcome. The efforts would inevitably provide educators with a wide spectrum of possibilities concerning computer usage.

5.10.3. What is anticipated from learners to ensure effective learning in computer integration in a middle school?

This, as has been repeatedly mentioned earlier on, depends entirely on the educators' computer knowledge skills. If educators are well equipped with the skill, they will

undoubtedly guide learners in using computers, for example, create and make use of Power Point presentation in front of their classmates use software to learn, communicate through e - mails, or find their way through search engines (internet and hypertext links). As stated in the previous paragraphs, this issue also necessitates educators' attendance at computer workshop to avoid losing touch with the trend of computer integration into teaching and learning.

Research shows that “technology integration into teaching and learning is not an easy task; it can be challenging, frustrating and expensive” (Roberston and Shortis, 2001). For schools like Kgaugelo, those who are committed to following the trend of integrating computer into teaching and learning should not give up but keep up the good work. In the near future, as the system of education is being transformed, Computer Application Technology is one of the learning areas offered in the National Curriculum Statement (NCS) in the Further Education and Training (FET) band. For them this will be a step ahead and they will never regret, since they will be amongst the brave schools that are not afraid to face challenges within education fraternity.

5.11. Recommendation for further research

The focus of the study could be broadened up by targeting several middle schools, so that different outcomes could be accomplished and compared. The level at which integration has taken place would also be clearly identified. This would in turn, help those schools to assess their progress in computer integration into teaching and learning and subsequently, some improvements in their computer integration into teaching and learning could be made.

5.12. Limitations of the study

The study took place towards the end of the year, which is a crucial time of the year. Other educators were absent from school because it was the examination period for their private studies. The researcher could have involved many educators and this could have yielded extra information.

The researcher targeted Grade Nine learners, but instead, the target population was the Grade Seven and Eight learners. The researcher targeted Grade Nine learners as they were more mature in computer literacy and Grade Nine is the exit grade in a General Education and Training band. The researcher missed them because their computer lesson was the next day and the researcher was unable to come on that day because the agreed time limit had expired.

The researcher utilised a previous researcher's questionnaires for gathering data. Although there were some amendments incorporated for a different environment, the questionnaire channeled the researcher to follow a predetermined direction. In my opinion as a researcher, a researcher should do extensive reading for the preparation of the techniques structure that would be employed for data collection.

5.13. Concluding remarks

This study set out to find out how effectively the computer is being integrated into teaching and learning in a middle school. The study revealed in particular the critical success factors for effective learning in computer integration into teaching and learning; the educators' role in contributing towards the effectiveness of computer integration into teaching and learning and what was anticipated from learners to ensure effective learning in computer integration in a middle school.

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Appendices

Appendix 1

A letter to APO Manager

Box 92396
Boordfontein
0201
3 September 2005

The APO Manager
Brits APO
Ga-Rankuwa

Dear Sir

Application to conduct a Research at Kgaugelo Middle School within the Brits district

I hereby request permission to conduct a research at Kgaugelo Middle School in Ga-Rankuwa. I am studying for my Masters (Med.) Computer Integrated Education (CIE), at the University of Pretoria. To complete my degree I need to do practical research, hence my request.

The research topic for my Masters degree is about the integration of the computer into teaching and learning. I have selected Kgaugelo Middle School because I think the school will definitely provide me with information I need for my thesis. The information will also help to analyse and address the state of computer integration in the school.

Hoping my request will be considered. Thanking you in anticipation.

Yours faithfully

A.R. Molotsi (Mrs.)
Signed.....

Enquiries: Abueng Rachael Molotsi

Tel: (012) 2511098 (w)

: (012) 5464679 (H)

: 0723589662

Appendix 2

A letter to the Principal and the School Governing Body (SGB) of Kgaugelo Middle School

Box 92396
Boordfontein
0201
3 September 2005

The Principal and the School Governing Body (SGB)
Kgaugelo Middle School
P.O.Box 63
Ga-Rankuwa
0208

Dear Sir/ Madam

An application to conduct a research in your school

I hereby make a humble request to conduct a research in your school. I am studying for my Master's degree (Med.) Computer Integrated Education (CIE) at the University of Pretoria. To complete my degree I need to do practical research, hence my request.

My Research topic for my thesis is computer integration into teaching and learning. Your school will help me to collect information concerning two questions:

- How do teachers use computers in teaching; and
- How do learners use computers in learning?

The result will help to analyse and address the state of computer integration in the school. I will give the school a copy of my research upon completion of my degree (that is after it has been reviewed by my supervisor).

Your positive response in this regard will be highly appreciated. Thanking you in anticipation.

Yours faithfully

A.R.Molotsi. (Mrs.)
Signed.....

Enquiries: Abueng Rachael Molotsi
Tel: (012) 2511098 (w)
: (012) 5464679 (h)
: 0723589662

Appendix 3

An introductory letter to educators of Kgaugelo Middle School

Box 92396
Boordfontein
0201
3 September 2005

To whom it may concern

I am a student at the University of Pretoria. I am conducting research on how computers are used in a classroom. You are humbly requested to complete the attached questionnaire concerning computer integration into teaching and learning in your school.

The information you provide will help to analyse and address the state of computer integration in the school.

I would appreciate if you complete the questionnaire and submit it to your head of department on or before Thursday the 13th September 2005. If you need some clarity about the questionnaire, please do not hesitate to contact me.

Your response in this regard will be highly appreciated and thank you for your cooperation.

Yours faithfully

A.R.Molotsi. (Mrs.)

Signed.....

Enq: Abueng Rachael Molotsi

Tel: (012) 2511098 (w)

: (012) 5464679 (h)

: 0723589662

Appendix 4

The following questionnaire was adapted from that of the previous researcher on almost the same topic, but amendments have been made to suit situation where the research took place.

Educators' Questionnaire									
<p><u>Computer integration into teaching and learning at Kgaugelo Middle School</u></p> <p>Please complete this questionnaire on the current state of the use of computer technology in Kgaugelo Middle School. The information you will provide will be helpful in reviewing the state of computer integration at your school.</p> <p>Please respond by putting a tick in a relevant box or write an answer in the space provided.</p> <p>1. How long have you been an educator?</p> <p>2. What grade do you teach?</p> <p>3. To which grade do you teach computer studies?</p> <p>4. What is your age range in years?</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tbody> <tr> <td style="padding: 5px;">20–29</td> <td style="padding: 5px; text-align: center;">1</td> </tr> <tr> <td style="padding: 5px;">30–39</td> <td style="padding: 5px; text-align: center;">2</td> </tr> <tr> <td style="padding: 5px;">40–50</td> <td style="padding: 5px; text-align: center;">3</td> </tr> <tr> <td style="padding: 5px;">50+</td> <td style="padding: 5px; text-align: center;">4</td> </tr> </tbody> </table>		20–29	1	30–39	2	40–50	3	50+	4
20–29	1								
30–39	2								
40–50	3								
50+	4								



5. Sex

Male	1
Female	2

6. How would you describe your computer skills?

Unskilled	1
Moderately skilled	2
Competent	3

7. How do you integrate the computer into your teaching? (Tick as many as are applicable)

I do not use computers for my teaching.	1
For drills and practice sessions.	2
For my lesson plan.	3
For information sheets, worksheets, etc.	4



To work out my marks.	5
To get extra information for my lessons from CD ROM's.	6
To get extra information for my lessons from the Internet.	7
To communicate with other teachers (e-mail).	8

8. Read the following statements carefully and indicate your choice by putting a tick in a relevant box.

1 = Agree, 2 = Disagree, 3 = I don't know

The use of computers in teaching motivates learners.	1	2	3
Computer integrated learning experience is more effective than the traditional method of instruction.	1	2	3
An integrated learning experience covers more material than that which the traditional method would allow.	1	2	3
Computer integrated education is a passing fad (short period).	1	2	3
Computer will gradually replace teachers.	1	2	3



The use of computers in teaching forces teachers to plan their lessons more carefully.	1	2	3
The computer integrated method improves my teaching styles.	1	2	3
Computer integrated lessons are only suitable for use in teaching highly gifted or challenged students.	1	2	3

9. Read the following statements carefully and indicate your choice by putting a tick in a relevant box.

1 = Yes, 2 = No, 3 = I don't know

Is group work effective in a computer integrated lesson?	1	2	3
I use the learner-centred method in my teaching.	1	2	3
By using a computer in my class, I no longer strive to motivate learners or try to meet their needs.	1	2	3
I facilitate the learning process.	1	2	3
The use of computers encourages school attendance among learners.	1	2	3



Are you able to choose computer accessory which is related to the learning outcomes of a lesson? (e.g. the Internet, Word, etc.).	1	2	3
I always provide guidance to my learners during computer integrated lessons.	1	2	3
Do you sometimes help learners to achieve the learning outcome by giving them relevant material to complete their work? (Scaffolding)	1	2	3

10. What do you think are the reasons why some teachers DO NOT utilise computers in their teaching?

(Tick as many as are applicable)

Lack of training and knowledge.	1
Fear of computer integration in teaching.	2
Perception that the computer is difficult to adopt.	3
Lack of facilities and financial assistance.	4
Lack of planning from the side of school.	5
Lack of motivation and enthusiasm.	6
Other (Please specify)	



.....

11. What is the most suitable time for in-service training on the use of the computer in the classroom?

(Tick only one)

An occasional whole afternoon during term.	1
Week-long course during school holidays.	2
One evening per week.	3
Saturday mornings.	4
One afternoon per week.	5

12. Tick your choice next to each statement by using the following:

1 = I have a working knowledge of this application.

2 = I need a training session in the use of this application.

3 = I have no need of this application.

Word processing (e.g. Create teaching materials and tests).	1	2	3
Spreadsheets (e.g. Excel).	1	2	3



Databases (e.g. Access).	1	2	3
Microsoft Outlook Express (e.g. E-mail or enhancing communication).	1	2	3
World wide websites (e.g. Internet, source of information).	1	2	3
CD ROM (e.g. drill and practice exercises).	1	2	3
PowerPoint (e.g. presentation of a lesson.).	1	2	3
Computer games.	1	2	3
Operating systems (e.g. Windows).	1	2	3
Maintenance/How a computer works.	1	2	3
Subject-specific applications (e.g. software for teaching).	1	2	3
How the computer fits into the curriculum/my learning area.	1	2	3
Web-page design.	1	2	3
Administration (e.g. record student marks).	1	2	3



Programming.	1	2	3
Keyboard/Typing skills.	1	2	3
General computer skills.	1	2	3

13. Do you have a computer at home?

Yes	1
No	2

Thank you for your valuable input.

Appendix 5

Learners' Questionnaire

Learners' Questionnaire									
<p>Computer integration into teaching and learning in Kgaugelo Middle School.</p> <p>Please complete this questionnaire on the current state of the use of computers in Kgaugelo Middle School. The information you will provide will be helpful in reviewing the state of computer integration at your school.</p> <p>Please respond by putting a tick in a relevant box or write an answer in the space provided.</p> <p>1. How long have you used the computer in learning?</p> <p>2. In which grade are you?</p> <p>3. How old are you?</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tbody> <tr> <td style="padding: 5px;">10–15</td> <td style="padding: 5px; text-align: center;">1</td> </tr> <tr> <td style="padding: 5px;">16–20</td> <td style="padding: 5px; text-align: center;">2</td> </tr> <tr> <td style="padding: 5px;">20+</td> <td style="padding: 5px; text-align: center;">3</td> </tr> <tr> <td style="padding: 5px;"> </td> <td style="padding: 5px;"> </td> </tr> </tbody> </table>		10–15	1	16–20	2	20+	3		
10–15	1								
16–20	2								
20+	3								



5. Sex

Female	1
Male	2

6. How would you describe your knowledge of computer?

Bad	1
Moderate	2
Good	3

7. How do you use the computer in your learning? (Tick as many as are applicable)

I do not use computers for my learning.	1
Knowledge of the computer will help me to get a better job in future.	2
I am able to do a presentation of my project in front of my classmates.	3



As a group we can take a decision and come up with a solution.	4
I am able to solve problems with the help of computer.	5
To get extra information for learning from CD ROM's (software).	6
I can get extra information for my assignments from the Internet.	7
To communicate with my teachers and friends.	8
Others (Please specify).....9	

8. Read the following statements carefully and indicate your choice by putting a tick in a relevant box.

1 = Agree, 2 = Disagree, 3 = I don't know

The computer forces you to learn by doing.	1	2	3
The computer helps you to take responsibility for your own learning.	1	2	3
Do you share ideas with other learners?	1	2	3
Are you given a chance to work in groups?	1	2	3



Do you believe that computers can prepare you to work well in a society?	1	2	3
Are you able to collect information for the task given and use it correctly?	1	2	3
Do you think the computer has brought meaningful learning in your classroom?	1	2	3
Do you think using a computer is a new style of learning?	1	2	3

11. Tick your choice next to each statement by using the following:

1 = I know how to use this application.

2 = I need to learn how to use this application.

3 = I don't need this application.

Word processing (e.g. types my assignment and project).	1	2	3
Spreadsheets (e.g. Excel the use of four operations: that is, addition, subtraction, multiplication and division).	1	2	3
Cooperative learning (learning in groups).	1	2	3
Microsoft Outlook Express (e.g. E-mail for communicating with friends and teachers).	1	2	3



Ability to work well in a high technology place.	1	2	3
World wide websites (e.g. Internet, look for information for your tasks).	1	2	3
Construction of knowledge.	1	2	3
PowerPoint (e.g. presentation of my tasks).	1	2	3
Computer games.	1	2	3
Operating systems (e.g. Windows).	1	2	3
Maintenance/How a computer works.	1	2	3
Individualised learning (e.g. uses software and follow instructions to learn).	1	2	3
Ability to collect information and use it correctly.	1	2	3
Web-page design.	1	2	3
Collaborate with classmates (Solve problems together, taking decision together).	1	2	3
General computer skills.	1	2	3



12. Do you have a computer at home?

Yes	1
No	2

Thank you for your valuable input.

Appendix 6

Educators' Interviews

Background information

Main questions	Possible probe questions	Reasons for asking
1. When was the subject computer studies introduced in the school?		To determine time frame (the existence of learning area).
2. Is it part of the school's curriculum?	If "yes," then ask Do you have any prescribed book or syllabus for the learning area? If "no," then ask Why are you offering it?	To find out whether the learning area was included in the school curriculum and why they were offering it.
3. Do you have any prescribed text book?		To determine the availability of resources.
4. Were computers donated or bought by the school?		
5. Was there any formal training given?	If "yes," then say Could you please explain? If "no," then ask. How did you acquire computer skills?	To determine competency in the use of computers.
6. How do you cope with overcrowding in the computer lab?		To find out how they cope with many learners and fewer computers in the computer lab.

