

**An investigation into the implementation of  
Computer-Assisted Education (CAE) in the  
underprivileged areas of the Eastern Cape:  
A case study of Butterworth High School**

A mini-thesis submitted by

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## Summary

### **An investigation into the implementation of computer-assisted education in the underprivileged areas of the Eastern Cape: A case study of Butterworth High School**

This study investigated the integration of computer-assisted education (CAE) at Butterworth High School. Before 1994, many areas of the Eastern Cape remained neglected as far as education was concerned. However, with the advent of democracy, the new government is giving high priority to education to both the formerly privileged and underprivileged areas. This study investigated the extent to which Butterworth High School has integrated CAE into its school curricula and the problems if any, that are preventing this school from becoming a full-fledged CAE school with their possible solutions.

To appraise the integration of computer-assisted education at Butterworth High School the Evolutionary Model developed by Miller (1997) was adopted. Recommendations for further integration were made.

## Key Words

Computer-assisted education

Computer-assisted instruction

Department For International Development (United Kingdom)

Eastern Cape Department of Education

Evolutionary model

Further Education and Training

Information and Communication Technology

Outcomes-based education

Senior Phase

Underprivileged areas

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## List of Abbreviations

BHS	Butterworth High School
CAE	Computer-Assisted Education
CAI	Computer-Assisted Instruction
DEEP	Digital Education Enhancement Project
DFID	Department For International Development
DoE	Department of Education
FET	Further Education and Training
FP	Foundation Phase
GSN	Global SchoolNet
HE	Higher Education
ICDL	International Computer Driving Licence
ICT	Information and Communication Technology
IFIP	International Federation for Information Processing Working Group
IP	Intermediate Phase
ISDN	Integrated Services Digital Network
IT	Information Technology
MEC	Member of Executive Council
NCS	National Curriculum Statement
NEPAD	New Partnership for Africa's Development
OBE	Outcomes Based Education
PDA	Professional Development Activities
SGB	School Governing Body
SP	Senior Phase

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# Chapter 1 Introduction

## 1.1 Introduction

### 1.1.1 International context

According to Hawkrigde (1990) large numbers of students, teachers and administrators in schools in industrial countries use computers to become aware of the uses and limitations of computers, to learn computer programming, to learn the use of applications programs, and to learn selected topics from school subjects right across the curriculum. Computers are also used in many schools in industrial countries to support managerial and administrative functions, such as record keeping, scheduling and financial accounting.

Already at the end of the 1960s, the use of computer technology in administration and management on the one hand, and scientific and engineering applications on the other, far exceeded direct applications in education (Suppes, 1969). However, if the potential of technology are fully exploited, the character and nature of education during the course of our lifetime will be radically changed for the better.

There is little merit in educating children to become walking encyclopedias. The present society needs problem-solvers who have access both to the information relevant to a problem and to the routines for solving it (Underwood and Underwood, 1990). Machines can remember facts better than people. We should therefore rather rely on machines for the storage of information and rely on people for problem solving. The computer is a powerful tool, which may be used to stimulate and support a number of educational goals.

### 1.1.2 National context

In an attempt to promote the use of computers in South African schools, the Department of Education has launched an investigation into technology-enhanced learning in South Africa (Department of Education, 1996). The subsequent report was aimed at the establishing a coherent policy and strategic direction for technology-enhanced learning and provided an important framework for educational

planners. In 1997, a strategic plan for implementing technology-enhanced learning was published (Department of Education, 1997d). In 2001 the Departments of Education and Communications published a Strategy for Information and Communication Technology in Education (Department of Education and Department of Communication, 2001) while the Department of Education published a draft white paper on e-Education (Department of Education, 2003) aimed at transforming learning and teaching through Information and Communication Technologies in 2003. In line with the national Department of Education's initiatives, the Eastern Cape Department of Education released a provincial strategy for information and communication technology in education (Eastern Cape Department of Education, s.a.)

### **1.1.3 Local context**

The rural town of Butterworth is situated about hundred kilometres to the north of East London, formerly known as the Transkei.

Butterworth High School is doing a sterling work of pioneering the integration of computers into its curricula. The process, however, is fraught with problems and challenges at every level. Examples include the lack of a platform for sharing of skills, inadequacy of funds, lack of staff training and a seeming apathy on the part of the community regarding the support of the computer programme. For the foreseeable future, community access to computer facilities may continue to be a problem.

This school appears to have a good reputation for its quality of teaching and learning, despite its share of challenges. In an attempt to infuse computer-assisted teaching and learning in its curricula, the school has acquired a number of computers. The way in which these computers are used to support teaching in learning needs to be investigated.

## 1.2 Background

The traditional role for teachers has been presenting ready-made information and organising of learning experiences (Davis, Desforjes, Jessel, Somekh, Taylor, Vaughan, 1997). One way in which information technology can be used in the classroom is to take over these presentational and organisational roles. This has implications for both teachers and learners: the computer, by providing an additional or alternative source of knowledge and information, may reduce the dependency of students on the teacher. The aspiration is that this will liberate the teacher's time and enhance the students' repertoire of learning skills, enabling greater student autonomy. This would also allow students to maximise their active role in learning and help to prevent teaching from being construed by teachers as a technical procedure of transmitting knowledge to passive learners. This in turn, allows greater opportunities for teachers and students to engage in the kind of quality communication that generates mindful, deliberate deployment of higher-order thinking processes such as synthesising, interpreting and hypothesising (*ibid.*).

While research studies on the integration of computers in schools in developed countries abound, similar studies in developing countries are fewer, especially for underprivileged areas. This study focuses on the integration of computers at Butterworth High School and attempts to find out how this school manages to integrate computers into its curricula in spite of various challenges.

## 1.3 The aim of the research

The aim of this research is to determine the effectiveness of the use of computers to support teaching and learning at Butterworth High School.

This aim can be refined by the following questions:

- To what extent has CAE been adopted in teaching and learning in BHS?
- What are the problems faced by this school in implementing CAE?
- What suggestions can be made to make CAE at this school more effective?

### 1.3.1 Definition of the basic terms

Term	Definition
Computer-assisted education	Somewhat akin to computer-based education (see below), but acknowledging the fact that a computer forms only part of the entire educational process.
Educational technology	The application of any technology (from a pencil to a personal computer) to teaching and learning.
Evolutionary Model	The evolutionary model of the integration of computer-assisted education consists of five phases, each of which representing a higher type of mental activity, building on and relying on the previous phase (Miller, 1997).
Information and Communication technology (ICT)	The combination of informatics technology with other, related technologies, specifically communication technology.
Internet	A communication network of computers, allowing diffusion of knowledge and sharing of information, experiences and resources at a great speed.
Outcomes-based education (OBE)	An internationally acclaimed educational approach, which starts by defining the outcomes that will be achieved through teaching and learning activities. It aims at equipping learners with knowledge, skills, values and attitudes needed for success after leaving school.
Underprivileged area	This concept refers to a geographic area in which the community has a lower standard of living than enjoined by others in a society.

**Table 1.1 Definition of basic terms**

### 1.3.2 Related research

Author	Research Details	Short Description
Bender, J.	Factors that determine successful computer implementation in schools. Mini-dissertation. M. Ed. (CAI). 1994. University of Pretoria.	The research describes the factors that determine the successful implementation of computers in schools.
Cossa, G.	Introduction of Information and Communication Technologies (ICT) in secondary schools in Mozambique. Mini-dissertation. M. Ed. (CAE). 2002. University of Pretoria.	The research focused on the successful integration of Information and Communication Technology and Internet-based learning in secondary schools in Mozambique.
Miller, P. A.	The integration of Computers at Pinelands High School: a case study. Mini-thesis. M. Ed. (CAE). 1997. University of Pretoria.	The research investigated the successful integration of computer-assisted education at the Pinelands High School.
Mathew, S. K.	An investigation into the implementation of computer-assisted education in outcomes-based education: A case study at Sterling Primary School in East London. Mini-thesis. M. Ed. (CAE). 2004. University of Pretoria.	The integration of computer-assisted education at Sterling Primary School appraised with the Evolutionary Model developed by Miller.

**Table 1.2 Related research**

## 1.4 Research design

### 1.4.1 Field of research

Computer-assisted education refers to the use of computers in teaching and learning. It means using the computer as a tool to teach subject matter, and to promote problem solving and higher order thinking skills (IFIP, 1993).

### 1.4.2 Scope of research

The concept “computer-assisted education” does not refer to notions of computer literacy or computer awareness. Neither does it refer to the learning areas of compu-typing, computer studies or computer science. The term computer-assisted

education is used to refer to the use of the computer as a medium to support a learning goal (Anderson, 1996 in Miller, 1997; Apple Computer, Inc., 1992, in Miller, 1997).

### 1.4.3 Research plan

Various sources were consulted to find literature on computer-assisted education and the integration of CAE in schools. Printed materials such as books, journals, magazines, newspapers, published and unpublished theses, government bulletins, and the Internet were consulted on CAE in schools in general and specifically in schools in the underprivileged areas.

Given the nature of the enquiry, the study is mainly qualitative. Qualitative research is concerned with understanding the social phenomena from the participants' perspective (McMillan & Schumacher, 2001). Understanding is acquired by analysing the many contexts of the participants and by narrating participants' meanings for these situations and events. Participants' meanings include their feelings, beliefs, ideas, thoughts and actions.

An interpretive approach will be employed to analyse the data. According to Burrell and Morgan (1979), an interpretive paradigm views the social world as an emergent social process, which is created by the individuals concerned.

Data collection strategies			
Question	Document analysis	Survey	Interview
1. To what extent CAE has been adopted in teaching and learning process in BHS?	✓		
2. What are the problems faced by this school in implementing CAE?	✓	✓	✓
3. What suggestions can be made to implement CAE at this school?	✓	✓	✓

**Table 1.3 Data Collection Matrix**

#### **1.4.4 Participants of this study**

My research participants are 10 learners from between grades 7 and 11, the computer teacher, the acting HOD of the Computer Department, the Principal and the Chairman of the School Governing Body.

### **1.5 Value of the research**

Since 1994 the Government of South Africa has made education for all sections of society a priority irrespective of whether they are in a privileged or an underprivileged area. Butterworth High School, which was and which still is in an underprivileged rural area, has made a very promising start in its effort to teach learners with the aid of computers. This research aims to show the extent to which Butterworth High School has integrated computer-assisted education in its curricula, to reveal the hindrances to achieving this goal and to suggest strategies for addressing the situation. It is hoped that the recommendations made to this school for further integration of computer-assisted education will also be useful to other schools in other underprivileged areas of the Eastern Cape.

#### **1.5.1 Limitations**

This study focuses on the implementation of computer-assisted education only in the senior phase and the further education and training phase. It does not address this issue in the foundation and intermediate phases.

Since this is a case study, the findings may be only relevant to schools in similar situations as Butterworth High School, and therefore but cannot be generalised.

### **1.6 Structure of the research report**

This mini-thesis is organized into five chapters.

CHAPTER	CONTENTS
1. Introduction	Introduction and statement of the problem
2. Literature review	Defining computer-assisted education and the factors that contribute to the integration of computer-assisted education in schools.
3. Research design	A description of the research strategies and instruments that are used for this research.
4. Research findings	A description of the integration of computer-assisted education at Butterworth High School.
5. Recommendation and conclusion	A summary of the project and recommendations for research.

**Table 1.4    Organization of the thesis**

## Chapter 2 Literature Review

### 2.1 Introduction

This chapter aims at contextualising the study by exploring international, continental, national, provincial and local perspectives. In addition, it provides a synthesis of relevant literature on teaching and learning with technology as a way to deepen understanding of the research questions and to inform subsequent data analysis. Table 2.1 provides a conceptual overview of the issues addressed this chapter. The chapter closes by presenting Miller's (1997) Evolutionary Model of the integration of computer-assisted education into schools, which forms the basis of the analysis in Chapter 4.

<b>Context</b>	<b>Landscape and Background (Section 2.2)</b>	<b>Teaching and Learning with Technology (Section 2.3)</b>
<b>International</b>	Paragraph 2.2.1	
<b>Africa</b>	Paragraph 2.2.2	
<b>South Africa</b>	Paragraph 2.2.3	Paragraph 2.3.1
<b>Eastern Cape</b>	Paragraph 2.2.4	
<b>Butterworth</b>	Paragraph 2.2.5	
<b>Butterworth High School</b>	Paragraph 2.2.6	Paragraph 2.3.2
<b>Evolutionary Model of the Integration of CAE (Section 2.4)</b>		

**Table 2.1 Outline of Literature Review**

### 2.2 Landscape and background

#### 2.2.1 International

Around the world globalisation and the increasingly spread of information and communications technologies (ICTs) have had an immense impact on all spheres of life, including Education (Laudon, Traver & Laudon, 1996). However, due to different levels of development, different countries across the globe have varying levels of capacity to take advantage of ICTs. In general, developed countries such as the

United States of America, countries in West Europe and in the East, are able to harness the potential of ICTs for both economic and social (including educational) development, whereas developing countries in South America and Africa are struggling to embrace the same technologies. The concept “digital divide” is often used to describe this phenomenon (United Nations Development Programme, 2004).

### **2.2.2 Africa**

Africa is a developing continent. The lack of a developed infrastructure for information and communication technologies is widening the gap between Africa and the rest of the world (Department of Education, 2003). In response to this underdevelopment, Africa has adopted a renewal framework, the New Partnership for Africa’s Development or NEPAD, which identifies ICTs as central in the struggle to reduce poverty on the continent. According to the Draft White Paper on e-Education (*ibid.*) ICTs has potential for overcoming barriers of social and geographical isolation, increasing access to information and education, and enabling the poor to participate in the making of decisions that impact on their lives.

### **2.2.3 South Africa**

With the advent of the new democracy in South Africa, the adoption of the new Constitution of the country provides a basis for curriculum transformation and development (Department of Education, 2003). The constitution aims at:

- healing the divisions of the past and establish a society based on democratic values, social justice and fundamental human rights;
- improving the quality of life of all citizens and freeing the potential of each person;
- laying the foundations for a democratic and open society in which government is based on the will of the people and every citizen is equally protected by law; and
- building a united and democratic South Africa, able to take its rightful place as a sovereign state in the family of nations.

The Constitution further states, “everyone has the right ... to further education which the State, through reasonable measures, must make progressively available and accessible”.

However, more than ten years into the new democracy, the legacy of apartheid continues to be felt in the education system (Department of Education, 2002b). During the previous regime, institutions were established along racial lines and saturated with the doctrines of apartheid and entrenched inequalities. Resulting from the unequal distribution of resources, so-called “historically white schools” tend to be well resourced even today, while “historically black schools” tend to be poorly resourced. Presenting one of the most daunting challenges to the new democracy, this situation impacts negatively on the quality of teaching and learning to such an extent that employers and the Higher Education (HE) sector have no confidence in the programmes offered at Further Education and Training (FET) institutions (*ibid.*).

In addition, the way in which the official curriculum is delivered also needs to be addressed. Many teachers regard themselves as the only bearers of knowledge and therefore rely on teaching methods that do not engage learners in active learning. Teachers are often also preoccupied with the race to complete the syllabus in preparation for the examinations resulting in learners’ prior knowledge not being acknowledged sufficiently. The ultimate result is learning experiences that are uninspiring.

#### **2.2.4 Eastern Cape**

During the previous regime the Ciskei and the Transkei functioned as independent states. In 1994 both these states were incorporated in the Eastern Cape, which is commonly regarded as the poorest of South Africa’s nine provinces. Global Insight, an organisation that compiles poverty ratings, reported that 67 percent of Eastern Cape residents lived in poverty (Gerardy, 2003). In addition, this province also has the highest rate of unemployment. Delivering her first policy speech as MEC for Education, Nomsa Jajula said that her budget speech was dedicated to pushing back the frontiers of poverty and to normalise the distribution of resources (Zuzile, 2003).

## 2.2.5 Butterworth

Known to the Africans as Gcuwa, “from the river”, the town of Butterworth is the oldest in the former Transkei. Situated about hundred kilometres to the north of East London (see Figure 2.1), it traces its origin to a Wesleyan mission station established by the Rev W J Shrewsbury in 1827 at the kraal of Hintsu, Paramount Chief of the Gcaleka Xhosa tribe. According to (Erasmus, 1995) the station, named after Joseph Butterworth, treasurer of the Wesleyan Mission Society, was destroyed in the Sixth Frontier War (1834) and the scene of much fighting during the seventh (1846). A Magistrate was stationed there in 1877 and the town laid out in 1880. Municipal status was granted in 1904 (Bulpin, 1970).



**Figure 2.1 Map of Eastern Cape (African Welcome, 2004)**

As a result of the previous government’s policy of industrial decentralization several industries have been established in Butterworth. The modern Transkei Hospital is located on a hill overlooking the town.

According to Van Rensburg (1976) Transkeians, as they are popularly known, are a proud people nurtured on an elaborate set of traditions and customs which have not only stood the test of time, but have also provided true and trusted framework for their national development to sovereign independence. However, a gentile and spontaneous humour and joy of living leaven the pride. It is almost as if custom decrees that among Transkeians there is a time to be solemn and the time to laugh; and at every opportunity the young people will dance and sing.

### **2.2.6 Butterworth High School**

The vision of Butterworth High School is to provide quality education to learners from Grade 0 to Grade 12 in order to uplift and empower them to play a responsible and meaningful role in society, both nationally and internationally. In pursuit of this vision the school strives to encourage parents and community involvement in the school, raise standards for learners at all levels both in and out of school, provide quality education by means of instruction, guidance and facilitation by a core of qualified, dedicated and accountable educators (Butterworth High School, s.a.). The school is committed to providing the necessary knowledge and skills to equip their learners to lead happy, productive and peaceful lives in this country. For this reason the school is committed to computer-assisted education, as providing students with opportunities for acquiring computer-literacy skills, is one of the primary objectives of Butterworth High School. To this end, Butterworth High School plans to introduce Computer Science as an academic subject for Grades 10 to 12 from 2006.

The principal and staff are dedicated to these ideals, striving to give of their best, providing the best opportunities and life experiences and acting in a manner, which is professional and caring.

There are 25 classes comprising 2 classes each for Grades 0 to 11, and one Grade 12 class. On a weekly basis, learners from grades 4 to 12 have to attend compulsory one-hour computer classes. The staff consists of 23 staff members remunerated by the Department of Education and 11 paid by the School Governing Body (E. Snow, 2004). Only two of the 12 non-teaching staff members, the secretary and caretaker,

are remunerated by the Department of Education while ten are paid by the School Governing Body.

## **2.3 Teaching and learning with technology**

### **2.3.1 South Africa**

As far as improving the quality of life of citizens is concerned, e-Education assumes a pivotal role. According to the Draft White Paper on e-Education (Department of Education, 2003), e-Education is about connecting learners and teachers and to provide professional support services and platforms for learning.

#### **2.3.1.1 Current status of Computer-Assisted Education in South African Schools**

The South African education system is under going dramatic changes. The previous education system was ill-suited to the needs of our children. During the last few years, both the government and private organisations have come forward to make our education system a modern one. The government's Draft White Paper on e-Education has highlighted the contributions made by some of the organisations towards our education system (National Department of Education, 2003).

- Telkom Foundation has established Super Centres in more than 1300 schools, providing computers, software applications, Internet connection, monthly subscription and rent free telephone line
- Telkom Foundation, together with Telkom's strategic partner Informative games like Mind Maze and jigsaw puzzles in Encarta Encyclopaedia, has committed over R200 million to support education and training in the areas of ICT, Mathematics and Science
- SENTEC is obliged to provide 500 schools with computer laboratories and teacher development, through licensing obligations
- SCOPE, a Finnish Development Support Project, SchoolNet SA and the South African Institute for Distance Education have developed 11 Teacher Development Modules for introducing ICTs into schools.

- SchoolNet South Africa provides online, mentor-based in-service training for teachers on introducing ICTs into the curriculum and management; and
- INTEL “Teach to the Future” Teacher Development Programme provides teacher training in ICT integration into teaching and learning.

#### 2.3.1.2 The significance of e-Education in South Africa

According to the Draft White Paper on e-Education (Department of Education, 2003) new models of learning are radically changing our concept of education. Education for human development in the learning society requires collaborative learning, and focuses on building knowledge. These changes arrive from shifts in educational goals and from new concepts in learning and knowledge creation.

The Department of Education (*ibid.*) believes that development in ICTs create access to learning opportunity, redress inequalities, improve the quality of learning and teaching and deliver lifelong learning. ICTs can accommodate differences in learning styles and remove barriers to learning by providing expanded opportunities and individualise learning experiences.

ICTs play an important role in the transformation of education and training. ICTs can enhance educational reforms by enabling teachers and learners to move away from traditional approaches to teaching and learning. In a transformed teaching and learning environment, there is a shift from teacher-centred, task-oriented, memory-based education (with technology at the periphery), to an inclusive and integrated practice where learners work collaboratively, develop shared practices, engage in meaningful context and develop creative thinking and problem-solving skills.

Provinces	Schools with computers	Schools with computers for teaching and learning
Eastern Cape	8,8%	4,5%
Free State	25,6%	12,6
Gauteng	88,5%	45,4%
KwaZulu-Natal	16,6%	10,5%
Mpumalanga	22,9%	12,4%
Northern Cape	76,3%	43,3%
North West	30,0%	22,9%
Western Cape	82,0%	56,8%
Limpopo	13,0%	4,9%

**Table 2.2 Table: Computers in Schools, by province (2002)**

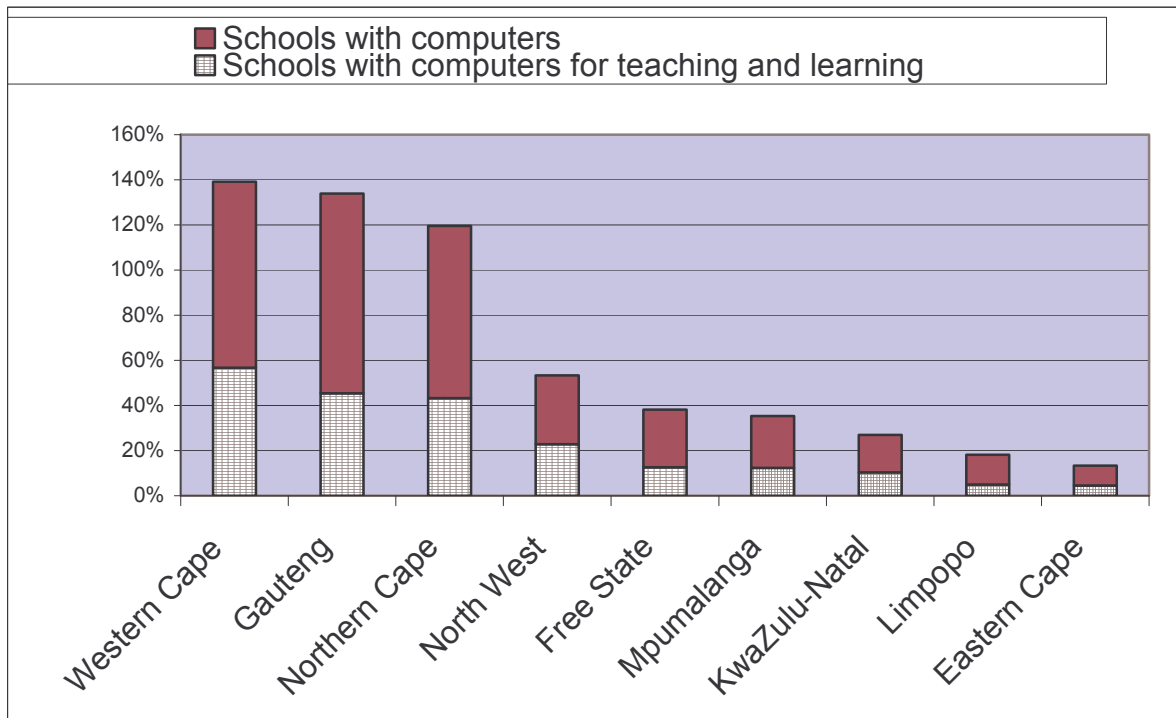
- ICTs yield positive results for learners and teachers. Studies have demonstrated improved learner achievement in:
- Application and production of knowledge for the real world;
- The ability of learners to manage learning; and
- The ability to promote achievement for learners who experience barriers to learning.

ICTs encourage teaching and a learning milieu which accommodates people operating differently, having different learning styles and having culturally diverse perspectives. ICTs embrace inclusive education by providing opportunity, alternative methods of instruction and flexible assessments for learners who experience barriers to learning.

Benefits to the broader society include increased opportunities for life long learning, communication and exchange essential to democratic living and the creation of a pool of globally competitive human resources.

### 2.3.1.3 Schools With Computers

Based on data from the Education Management Information System (Department of Education, Pretoria) and information received from provinces, the following table reflects the distributions of ICTs in schools across the provinces.



**Figure 2.2 Computers in schools (Department of Education, 2002)**

The Draft White Paper (Department of Education, 2003) has also highlighted certain important aspects of the ICTs in South Africa. These are:

- The above reveals that the growth rate of schools that acquired computers between 2000 and 2002 averages 59% and was higher among secondary schools than primary schools. If the same growth rate is maintained over the next two years only 9278 schools will have computers by the end of 2004.
- Despite some extreme variations, schools in Gauteng, Northern Cape and Western Cape have, on average, better ICT infrastructure than schools in Eastern Cape and Limpopo. Schools in free states, KwaZulu-Natal, Mpumalanga and North West hold the middle position.

- E-mail facilities are beginning to be used more extensively in many schools as a management and administrative resource, and also in some cases, as a teaching and learning resource.
- Internet Access is becoming more common, but the use of Internet for teaching and learning purposes is very limited, due to high connectivity and telecommunication costs, lack of local content and examples, and inadequate technical and pedagogical support at local level.
- In both primary and secondary schools, the teaching of basic computer principles and word processing skills forms the most important component in the teaching of computer literacy. Limited integration into teaching and learning is also evident.
- There is a gap in the ability of learners and teachers to use these technologies effectively, to access high-quality and diverse content, to create content of their own, and to communicate, collaborate and integrate ICTs into teaching and learning.
- In order to address the digital divide, the South African Education and Training System has to respond to the pressure and challenges posed by the Information Revolution. It is for this reason that the government has expressed strong commitment to the use of ICTs in education.

According to the Department of Education's Draft White Paper on e-Education, e-Education is about "connecting learners and teachers to each other and to professional support services, and providing platforms for learning" (2003:7). E-Education will connect learners and teachers to better information, ideas and one another via effective combinations of pedagogy and technology.

The challenge is to transcend the mere exchange of information and transform e-Education into a range of learning activities that meet education objectives.

E-Education is more than developing computer literacy and the skills necessary to operate various types of information and communication technologies. It is the ability to:

- Apply ICT skills to access, analyse, evaluate, integrate, present and communicate information;
- Create knowledge and new information by adapting, applying, designing, inventing and authoring information;
- Function in a knowledge society by using appropriate technology and mastering communication and collaboration skills.

E-Education use ICTs as a resource for reorganising schooling, and a tool to assist whole-school development. It includes ICTs as:

- A tool for management and administration;
- A resource for curriculum integration;
- A communication tool;
- A collaborative tool for teachers and learners; and
- A learning environment that advances creativity, communication, collaboration and engagement

The learners will use ICTs to enhance interaction between citizens, governmental organisations and public and elected officials.

These learners will invent new ways of using ICTs to realise the department of education's vision of developing citizens who are critical and active life long learners. The challenge facing our education and training system is to create a learning culture that keeps pace with these changes, and equips people with the knowledge, skills, ideas and values needed for life long learning. Our education system must create graduates who use information effectively and keep abreast of technological advances.

Despite the difficulties that constrain the integration of computer-assisted education into management, teaching and learning, the Department of Education is determined to direct the implementation of a progressive programme for change. Like most parts of the world, the South African education and training system has to respond to the pressures and challenges posed by the information revolution. It is for this

reason that Government has expressed a strong commitment to the use of ICTs in education (Department of Education, 2003b).

The use of ICT and Internet-based learning in secondary education is a global phenomenon. It is in different stages of development in various countries of the world (Cossa, 2002).

### **2.3.2 Butterworth High School**

There are various projects helping schools in the Eastern Cape and in other parts of South Africa to integrate computers in their curricula. The kind assistance varies from donating computers and training teachers to linking schools from different countries. Butterworth High School is involved with the following projects:

- Digital Education Enhancement Project (DEEP);
- SchoolNet, including Thintana;
- The Intel Project and
- The Dinaledi Project.

#### **2.3.2.1 Digital Education Enhancement Project (DEEP)**

Digital Education Enhancement Project is a great help to the schools. The Department For International Development (DFID), United Kingdom, funds DEEP.

There is a partnership between DEEP and:

- the Centre for Research and Development in Teacher Education in the Open University, UK
- the University of Fort Hare, Eastern Cape, South Africa
- the Programme, Planning and Monitoring Unit of the Eastern Cape Ministry of Education

DEEP has come as a blessing to the Eastern Cape because DEEP mostly serves the disadvantaged or the underprivileged communities. DEEP uses ICT to improve

teaching and learning in Numeracy, Science and Literacy. DEEP also provides an initial four day training programme and gives printed and electronic materials. (DEEP – Digital Education Enhancement Project, s.a.)

Butterworth High School has benefited from DEEP in the sense that learners got special training in computers. They were allowed to work on laptop, palmtops and printer/scanner/copier donated by this Project. They also did collaborative work on 'Endangered Animals', where every learner had to contribute. Representatives of the Project used to visit the school from overseas. Students had to do some presentations of their skills. The learners got opportunities to communicate with learners from overseas through video-conferencing and e-mail.

#### 2.3.2.2 Global SchoolNet (GSN)

Global SchoolNet (GSN) is an international network of more than 70 000 online educators who engage in online project-based activities. According to SchoolNet, it has reached more than a million students from 25 000 schools across 100 countries. GSN wants to develop basic and advanced literary and communication skills, create multi-cultural understanding and prepare them for full participation as effective citizens in an increasing global economy.

According to GSN, their main objectives are to:

- Demonstrate how people and information resources on the Internet can be used as a classroom tool for research and as a medium for interactive collaborative learning
- Teach students how to become active learners and information managers
- Develop an online system training and support system for educators, so they can use technology in an effective and appropriate manner in their classrooms
- Demonstrate the most current technologies in both conductivity and network tools and their use for learning

Besides the above, GSN facilitate business, government, schools, higher education and communication partnerships for ongoing collaboration. Global SchoolNet Foundation, 2004)

At Butterworth High School the Thintana I-Learn Project was implemented through SchoolNet.

#### 2.3.2.3 The Thintana project

The Thintana project aims to make educators computer-literate through SchoolNet. The Thintana I-Learn Project operates in Gauteng, North West, Kwa-Zulu Natal, Eastern Cape, Northern Cape, Mpumalanga and the Free State. They equip schools with infrastructure and technical programmes. So far they have equipped 191 schools all over South Africa. Thintana trains trainers in all provinces. They also conduct mentor courses. So far, 141 mentors have completed training. (Thintana i-Learn Project, 2002)

At Butterworth High School, thirty educators went through the course and most of them completed all seven modules of this course. After the course, the educators used computers for preparing materials required for teaching. Butterworth High School was provided with 20 computers.

#### 2.3.2.4 The Intel Project

Intel is an organisation that imparts free teaching and learning resources to learners worldwide. Intel Corporation has invested over \$1 billion worldwide for education initiative. Intel enables the design and delivery of innovative technology solutions. Intel offers classroom tools and resources that integrate technology to better equip the learners for Twenty-First Century skills. Its Interactive Learning provides quality multi-media learning resources free to students and teachers throughout the UK, Ireland and a few other countries emphasising Maths and Science from Grades 7 to 12. It also provides educational technology solutions by giving information on how schools can improve the quality and delivery cost of educational services through these solutions (Intel,s.a.)

At Butterworth High School, the purpose of the Intel Project is to take computers to classrooms and teach academic subjects using computers. It also trains the trainers. Four educators were trained by encouraging them to attend some workshops in 2004. Other educators are going to be trained by these educators.

#### 2.3.2.5 The Dinaledi project

The purpose of the Dinaledi project

As part of this project, the school got twenty computers, a printer and a projector to be used by the learners. This created a great enthusiasm among the learners. They are given basic computer literacy and opportunity to do research and projects using computers.

## **2.4 Evolutionary Model of the integration of computer-assisted education**

### **2.4.1 Integration of computer-assisted education**

The integration of computer-assisted education is neither computer literacy nor computer awareness. It means using the computer where it is the best medium to support the learning goal (Anderson, 1996; Apple Computer, inc, 1992, p.3, in Miller, 1997).

Integrating computer-assisted education implies a move towards a different kind of teaching, a whole-school awareness which looks at the following (IFIP, 1993, p.15, in Miller, 1997):

- Aims of general secondary education
- Meeting new demands of society in students skills
- Reforming the curricula
- Training teachers in new skills
- Internal school organisation
- Hardware provision and maintenance

- Stabilizing of funding policies
- Support by technical staff
- Equity of access for all students
- Software development and provision
- Development and provision of complementary materials
- Copyright policies for software

Miller has developed an Evolutionary Model to measure the extent to which computers have been integrated into a school. Miller combined three different models to develop this Evolutionary model, namely, the Apple Classrooms of Tomorrow (ASCOT) Model, the CAMI Mathematics Model and the Make It Happen! (MIH) Model. Each of these models describes the different phases of the introduction of computer-assisted education. The Evolutionary model has five phases, namely, the Introduction phase, the Entry phase, the Intermediate phase, the Penultimate phase and the creation phase. I have used Miller's Evolutionary model to discuss the integration of computer-assisted education at BHS.

Miller's Evolutionary Model of the integration of computer-assisted education is given below.

Phase	Description
Phase 1 Introduction	In this phase, the technology is introduced into the school. The network system and modems and telephone lines are installed. Time is spent on if they work and how they work. Teachers may spend time trying to teach with computers by doing simple work. Computer use replicates traditional instructional and learning activities. Training of teachers begins with Word Processing. Time is taken to share vision with known participant colleagues. They also take time to share frustrations and successes. Training is given in word processing.
Phase 2 Entry	<p>The computer is used mainly to support classroom instruction by means of drill-and-practice instruction or text-based work. Established teaching methods and activities are supported by computer technology. Teacher interactions are mainly of a technical nature. Technical assistance is given to teachers. Training of educators begins initially in word processing. Stress levels of teachers are kept low with basic skill computer work. Technical assistance is given to students. There is time to share frustrations and successes. Training is given in word processing.</p> <p>Besides the above, technical assistance is given to develop teachers' confidence, develop teachers' use of hardware and to facilitate students' use of computers. Time is also given to evaluate outcomes, and share vision and enthusiasm. Training is given in word processing in subject area.</p>
Phase 3 Intermediate	<p>In this phase the teachers and students use the computer as a tool. The students' computer work is faster and the quality of work is better than before. The role of the teacher changes to become more of a facilitator as opposed to being the focus of the instruction. Classroom interaction with students changes from technical assistance to sharing instructional strategies. Students are motivated. Students peer tutor. There is a move from text-based instruction and drill-and-practice to word processors, databases, spreadsheets and graphics. Teachers observe fellow teachers' classes. Collaboration on instructional topics between teachers. Curriculum is modified to make use of the different technologies.</p> <p>Besides the above, there is time to discuss instructional strategies, permit mentoring between teachers, permit peer observation, and to permit team teaching.</p>

Phase	Description
Phase 4 Penultimate	<p>Here, the teacher's role in the learning process is one of facilitator or collaborator rather than instructor. Students get involved in collaborative and creative project work. The computer packages are used as knowledge-building tools to support a growing constructivist approach to learning. Students are motivated. There is a desire for new technology and better technology. Experimental collaboration between teachers in interdisciplinary project-based learning.</p> <p>Besides the above, time is given to attend conferences and presentations and reflect on evaluation. Training is given in other computer packages in subject area and in teaching with student groups.</p>
Phase 5 Creation	<p>This creation phase is never complete but is an ongoing process as new technologies are constantly being developed. Schools have to decide which new technologies best suit their instructional needs and adapt accordingly. There is active involvement of students. Constructivist approach to learning replaces behaviourist approach. Many different computer packages are used in learning. Students are involved in collaborative and creative project work. For teachers, there is interdisciplinary project-based learning. There is also team teaching.</p> <p>For the general school, there is a desire for new and better technology. The school timetable is rescheduled for team teaching. The curriculum is modified to make use of the different facilities. For the new infrastructure, technical assistance is given to select and source suitable hardware, and select and source suitable software. Time is given to do research on effective ways of teaching, publish teaching experiences, and question the whole methodology of teaching. Training is given in new and innovative technologies.</p>

**Table 2.3 Miller's evolutionary model (1997:18-26)**

## 2.5 Conclusion

Vast changes are taking place in South African schools which are integrating computers into their curricula. e-Education uses ICT as a resource for re-organising schooling. This chapter described the context of the study and the Department of Education's National Curriculum Statements (NCS) (2002) which provide an imperative for education for all children in South Africa, irrespective of their social or economic backgrounds.

The current status of computer-assisted education in South African schools was described to provide a point of reference for comparing the status of computer-assisted education in Butterworth High School. A discussion on the significance of e-Education in South Africa provided a background for revealing the gap between strategy and practice. Miller's (1997) Evolutionary Model is considered as a benchmark for evaluating the success of computer integration in schools.

## Chapter 3 Research Design

### 3.1 Introduction

The aim of this research is to determine the effectiveness of the use of computers to support teaching and learning at Butterworth High School. It addresses the extent to which CAE has been adopted in teaching and learning in BHS as well as the problems faced by this school in implementing CAE. Finally it aims to suggest ways in which CAE at this school can be made more effective.

This chapter describes the research design by locating the research in a interpretative tradition and describing the methodology.

#### 3.1.1 Qualitative and quantitative approaches to research

According to McMillan & Schumacher, (2001), the terms “qualitative” and “quantitative” are used frequently to identify different modes of inquiry or approaches to research. At one level, qualitative and quantitative refer to distinctions about the nature of knowledge: how one understands the world and the ultimate purpose of the research. On another level of discourse, the terms refer to research methods, i.e. the way in which data are collected and analysed, and the type of generalizations and representations derived from the data.

Both qualitative and quantitative research studies are conducted in education. The most obvious distinction between qualitative and quantitative research is the form of data presentation. Quantitative research presents statistical results represented with numbers; qualitative research presents data as a narration with words.

Eisner (1991) states that qualitative studies consider the self as an instrument. The self engages the situation and makes sense of it. This is most often without the aid of an observation schedule; it is not a matter of checking behaviours, but rather of perceiving their presence and interpreting their significance.

Table 3.1 below shows some differences between quantitative and qualitative approaches to research.

Orientation	Quantitative	Qualitative
Assumption about the world	A single reality, i.e., can be measured by an instrument	Multiple realities, e.g., interviews of principal, teachers and students about a social situation
Research purpose	Establish relationships between measured variables	Understanding a social situation from participants' perspectives
Research methods and process	Procedures (sequential steps) are established before study begins	Flexible, changing strategies; design emerges as data are collected
Prototypical study (clearest example)	Experimental design to reduce error and bias	Ethnography using "disciplined subjectivity"
Researcher role	Detached with use of instrument	Prepared person becomes immersed in social situation
Importance of context	Goal of universal context-free generalizations	Goal of detailed context-bound generalizations

**Table 3.1 Quantitative and Qualitative Research Approaches**

Since I was primarily interested in the perceptions of respondents, I found a qualitative description of their experiences the most appropriate for the purpose of this research.

### 3.1.2 Research paradigm

According to Terre Blanche and Durrheim, (1999), paradigms are all-encompassing systems of interrelated practice and thinking that define for researchers the nature of their enquiry along three dimensions: ontology, epistemology and methodology.

**Ontology** specifies the nature of reality that is to be studied, and what can be known about it. **Epistemology** specifies the nature of the relationship between the researcher and what can be known. **Methodology** specifies how the researcher may go about practically studying whatever he or she believes can be known.

Based on different ways of perceiving reality and coming to know that reality, Terre Blanche and Durrheim (1999) distinguished the three paradigms represented in Table 3.2 below. If the researcher believes that what is to be studied consists of a

stable and unchanging reality (e.g., economic laws, cognitive mechanisms, the law of gravity), then he or she can adopt an objective and detached epistemological stance towards that reality, and can employ methodology that relies on control and manipulation of reality. The aim of such research would be to provide an accurate description of the laws and mechanisms that operate in social life. This is the positivist approach.

If on the other hand (*ibid.*), the researcher believes that the reality to be studied consists of people's subjective experiences of the external world, he or he may adopt an inter subjective or interactional epistemological stance toward that reality, and used methodologies, such as interviewing or participant observation, that rely on a subjective relationship between a researcher and subject. This is the interpretive approach, which aims to explain the subjective reasons and meanings that lie behind social action.

If the researcher believes that reality consists of a fluid and variable set of social constructions, she or he may adopt a suspicious and politicised epistemological logical stance, and employ methodologies that allow the researcher to deconstruct versions of reality. This is characteristic of constructionist research (*ibid.*).

	<b>Ontology</b>	<b>Epistemology</b>	<b>Methodology</b>
<b>Positivist</b>	-Stable external reality -Law-like	-Objective -Detached observer	-Experimental -Quantitative -Hypothesis testing
<b>Interpretive</b>	-Internal reality of subjective experience	-Empathetic -Observer intersubjectivity	-Interactional -Interpretative -Qualitative
<b>Constructionist</b>	-Socially constructed reality -Discourse	-Suspicious -Political -Observer constructing versions	-Deconstruction -Textual analysis -Discourse analysis

**Table 3.2    Positivist, interpretive and constructionist paradigms**

Many researchers draw on more than one paradigm, depending on the kind of work they are doing. Many researchers do nevertheless conduct most of their research within a single paradigm, in the same way that artists typically prefer a certain style.

In trying to determine the effectiveness of computers to support teaching and learning at Butterworth High School, I was interested in the perceptions of all the stakeholders. I therefore adopted an inter-subjective or interactional stance towards the reality I was investigating. As a member of the School Governing Body, I was also not able to look at this reality objectively, but had to immerse myself in the social situation.

### **3.2 The aim of the research**

The aim of this research is to determine the effectiveness of the use of computers to support teaching and learning at Butterworth High School.

This aim can be refined by the following questions:

- To what extent has CAE been adopted in teaching and learning in BHS?
- What are the problems faced by this school in implementing CAE?
- What suggestions can be made to make CAE at this school more effective?

### **3.3 Case study methodology**

The case study method will be followed in this study.

According to McMillan & Schumacher (2001), A case study examines a “bounded system” or a case over time in detail, employing multiple sources of data found in the setting. The case may be a program, an event, an activity, or a set of individuals bounded in time and place. I have used this school as a case study because this school appears to be very serious about integrating computers into its curricula. Case studies do not claim to be representative, but the emphasis is on what can be learned from a single case (Tellis, 1997).

### **3.4 Research participants and location of the study**

My study will be about Butterworth High School's CAE programme. My research participants are 10 learners from grades 7-11, the computer teacher, the acting HOD of the Computer Department, the Principal and the Chairman of the School Governing Body.

In this study I investigate how educators and learners are using computers in their teaching and learning processes in various learning areas.

### **3.5 Data collection**

In order to get permission to do my case study on BHS, I approached Mr E. M. Kani, the then District Manager at the Butterworth District office of the Department of Education for permission to conduct the research in schools in the Eastern Cape (see appendices A1 and A2) . Permission was granted on condition that interviews are conducted after school hours (see appendix A3). I initially planned to do my study on two schools in Butterworth, Butterworth High School and Vullivalley High School, but later realised that investigating BHS only would serve the purpose of my study.

Mr. Andries Mentoer, the Principal of Butterworth High School was kind enough to welcome me into his school and assured me of any help that I would need for the purpose of my case study. He introduced me to the Acting HOD of the Computer Department, Ms. Linda Witbooi, the computer teacher Mr. Gopalakrishna Pillai and Mr George Elimu who is a member of the Computer Department. I knew most of the other teachers before, as my own children are students of this school. Getting introduced to the IT Department staff and knowing all the other teachers closely, provided a conducive atmosphere for me to do a case study on this school.

#### **3.5.1 Data collection techniques**

##### **3.5.1.1 Document Analysis**

Various documents were analysed to determine to what extent computer integration had been implemented at BHS. The various documents included the school policy

document, the minutes of the meetings of the school SGB, the school magazine and the school prospectus and other documents concerning BHS.

#### 3.5.1.2 Survey

As data-collection strategy, I used a survey of learners and conducted interviews with officials and staff. The questionnaire (see appendix B4) was administered to 10 learners between grades 7 and 11 as Grade 12 learners were not to be disturbed in their after-school class hours.

#### 3.5.1.3 Semi-structured interviews

Interviews were conducted with the Principal, the Acting HOD of the IT department, the computer teacher and the Chairman of the Governing Body. Interviews were tape recorded with their permission. During the interview, probe questions were asked for further clarification of an answer. Probes were neutral so as not to affect the nature of the response (McMillan & Schumacher).

The questions were a mixture of semi-structured and unstructured questions. Semi-structured questions have no choices from which the respondent selects an answer. Rather, the question is phrased to allow for individual responses. It is an open-ended question but is fairly specific in its intent. Unstructured questions allow the interviewer great latitude in asking broad questions in whatever order seems appropriate (McMillan and Schumacher, 2001).

The principal, the teachers and the chairman of the SGB were asked semi-structured and unstructured questions. This gave me a wide latitude for probing and clarification.

After the questions had been answered, I thanked the respondents and requested them to make any comments regarding the topic or the interview in general. I have found all my respondents to be very co-operative.

The data collection took place at Butterworth High School in the month of June 2004.

## **3.6 Data analysis**

The data was analysed by listening to taped interviews with the principal, the teachers and the chairman of the SGB. Their various answers to the interview schedule and the questionnaire was taken theme-wise and analysed.

### **3.6.1 Validity**

In order to validated this research, I validated the data by triangulating the data received from four members in the school's top administrative and IT Department echelons as suggested by McMillan & Schumacher:

"Researchers use triangulation (Denzin, 1978), which is the cross-validation among data sources, data collection strategies, time periods, and theoretical schemes. To find irregularities in the data, the researcher compares different sources, situations, and methods to see whether the same pattern keeps recurring. A theme of "institutional collaboration," for example, could be crosschecked by comparing data found in artifact collections (minutes, memos, official brochures, letters), informant interviews (project co-directors, teachers, principals), and field observations of project meetings. Researchers sense, however, that even though they only directly observed, heard, or recorded one instance, for some types of analysis, a single incident is meaningful". (2001: 478)

## **3.7 Conclusion**

This chapter deals with quantitative and qualitative approaches to research, the various paradigms, the research, research questions, locations of the study, data collection procedures, data collection techniques and data analysis. The findings of the data analysis are given in Chapter 4.

## **Chapter 4 Research Findings and Synthesis**

### **4.1 Introduction**

In order to determine the factors that impact on the implementation of computer-assisted education in the underprivileged areas of Eastern Cape, in particular in Butterworth High School, this chapter will report on the following three subsidiary questions:

1. To what extent has CAE been adopted in teaching and learning process in BHS?
2. What problems, if any, face this school in implementing CAE?
3. What suggestions can be made to enhance the implementation of CAE at this school?

In this chapter Miller's (1997) Evolutionary Model is used as a benchmark to evaluate and synthesise the data and to report on the current state of implementation of computer-assisted education in this school. The chapter also reports on the support infrastructure for using computers in teaching and learning as that provides a unique perspective on the value that this school places on the use of computers.

#### **4.1.1 School's vision with regards to Computer-Assisted Education**

The Principal has a vision for the school. "In the next two years, we would like to make computer[s] a subject for Butterworth High School not that you just introduce people to". The school will introduce Computer Studies as a subject in the year 2006 so that the learners can graduate their Matric with computer as an optional subject. The school will have more fully equipped computer laboratories so that the learners can make full use of them. On Saturdays and during holidays the computer laboratory will be open until twelve o'clock under the supervision of computer teachers.

According to the principal the school's teaching staff shares this vision. Some members of the teaching staff are keen to complete the ICDL qualification so that

BHS can be registered as an ICDL training centre for the Butterworth District. This will boost the chances of the underprivileged community to gain access to computer training to enable them to secure better jobs. In the present situation, with only 20 computers for students numbering more than 800, it is impossible to implement CAE in classrooms. The principal believes that, once the school offers Computer Studies, as a subject, it would be better positioned to do computer-assisted education. Even now students use computers to do their research for assignments and projects. "In future, if we can get more computers, we will be able to implement CAE without much effort because we do have a computer proficient community of educators and learners".

## **4.2 Responses from the learners**

I interviewed ten learners from grade 7 to grade 11.

The learners of this school are content as they feel that they are at a school where the school has the interests of learners at heart.

Most of the learners are exposed to computers at this school for the first time. The learners feel that they can understand the subjects better if they are taught with the computers. It is because they can get much better examples, pictures and explanations. The learners are however not satisfied that their access to the computer laboratory is restricted to one-hour per week. They feel that this time is not enough for them to learn more and to do all the assignments.

The learners are given access to educational programmes such as EvaluNet E-school, which required the learners to answer questions. After a number of attempts, they are shown the correct answers. In addition, learners use applications such as MS Word, MS Paint, MS PowerPoint as well as various games such as Mind Maze and jigsaw puzzles in Encarta Encyclopaedia. They use MS Word most because this is the one most used for assignments, research etc. They find it interesting to do their work with these applications because they always learn something new of these applications. The learners report that their computer teacher teaches them well and that they also get help from other teachers and friends.

Unfortunately learners are not allowed to access the Internet as this privilege is only allowed for teachers. However, learners are aware of the Internet being very good source of information. The learners also feel that there are not enough programmes available to teach them how to use the computer.

In 2004 fourteen learners participated in the DEEP project at Fort Hare satellite campus in East London (see paragraph 2.3.2.1). They used video conferencing to help them link with other schools in UK. The learners like this project as it gave them a chance to gain more knowledge about education in the other countries.

On the whole, the learners feel that the school is doing a good job by giving them education with the aid of computers. But they strongly feel that the school should get computers in each class, have more software, have more hardware and should teach every subject with computers.

The next two sections (4.3 and 4.4) report on the responses of the principal, the members of the School Governing Body and educators.

### **4.3 Evaluation of the implementation of Computer-Assisted Education at Butterworth High School**

This evaluation of the implementation of Computer-Assisted Education at Butterworth High School is based on Miller's Evolutionary Model of the Integration of Computer-Assisted Education (1997). The five stages in the Evolutionary Model are: Introduction, Entry, Intermediate, Penultimate and Creation.

#### 4.3.1 Phase 1: Introduction

Phase	Description
Phase 1 Introduction	In this phase, the technology is introduced into the school. The network system and modems and telephone lines are installed. Time is spent on if they work and how they work. Teachers may spend time trying to teach with computers by doing simple work. Computer use replicates traditional instructional and learning activities. Training of teachers begins with Word Processing. Time is taken to share vision with known participant colleagues. They also take time to share frustrations and successes. Training is given in word processing.

**Table 4.1 Phase 1: Introduction**

The school fully qualifies to pass this phase. BHS was part of the Thintana Project from the year 2000 (see paragraph 2.3.2.3). The school received 15 computers and accessories, software, printers and an Internet connection as part of this project. The aim of this project was to give computer training for teachers through the Internet. Most of the teachers utilised this opportunity to become computer literate. There were 7 modules in this course that includes computer basics, Word Processing, Worksheets, Presentations and the Internet.

#### 4.3.2 Phase 2: Entry

In this phase, the computer lesson work supports mainly a behaviouristic approach to learning. The teacher needs to develop discipline strategies appropriate for the new classroom dynamics (Miller, 1997).

Phase	Description
Phase 2 Entry	<p>The computer is used mainly to support classroom instruction by means of drill-and-practice instruction or text-based work. Established teaching methods and activities are supported by computer technology. Teacher interactions are mainly of a technical nature. Technical assistance is given to teachers. Training of educators begins initially in word processing. Stress levels of teachers are kept low with basic skill computer work. Technical assistance is given to students. There is time to share frustrations and successes. Training is given in word processing.</p> <p>Besides the above, technical assistance is given to develop teachers' confidence, develop teachers' use of hardware and to facilitate students' use of computers. Time is also given to evaluate outcomes, and share vision and enthusiasm. Training is given in word processing in subject area.</p>

**Table 4.2 Phase 2: Entry**

As part of the Thintana Project, most of the teachers became well versed with the most common computer applications. They begin to use the computers to assist themselves in their regular working areas. Teachers started typing and printing their question papers, assignments and projects for the students using the word processing applications. They also started to use computers to record students' performances.

#### **4.3.3 Phase 3: Intermediate**

In this phase, the teachers and learners use the computer as a tool. Word processors and spreadsheets are used. The learners work becomes faster and of better quality.

Phase	Description
Phase 3 Intermediate	<p>In this phase the teachers and students use the computer as a tool. The students' computer work is faster and the quality of work is better than before. The role of the teacher changes to become more of a facilitator as opposed to being the focus of the instruction. Classroom interaction with students changes from technical assistance to sharing instructional strategies. Students are motivated. Students peer tutor. There is a move from text-based instruction and drill-and-practice to word processors, databases, spreadsheets and graphics. Teachers observe fellow teachers' classes. Collaboration on instructional topics between teachers. Curriculum is modified to make use of the different technologies.</p> <p>Besides the above, there is time to discuss instructional strategies, permit mentoring between teachers, permit peer observation, and to permit team teaching.</p>

**Table 4.3 Phase 3: Intermediate**

BHS is also a part of another project called Dinaledi (see paragraph 2.3.2.5), which is to provide computer training to students. As part of the project, the school received another twenty computers, server, network, a printer, a projector and an ISDN Internet connection. The school governing body appointed a computer teacher. All the students from Grade 4 to Grade 12 were given computer classes, 1 hour per week. The students were encouraged to do their assignments and projects on computer using Word Processor and Worksheets. The introduction of computers to students created a great enthusiasm for learning.

#### **4.3.4 Phase 4: Penultimate**

Many changes occur in this phase. The teacher's role in the learning process is one of facilitator rather than instructor. Students get involved in collaborative and creative project work. The computer packages are used as knowledge building tools to support a growing constructivist approach to learning (Miller, 1997).

Phase	Description
Phase 4 Penultimate	<p>Here, the teacher's role in the learning process is one of facilitator or collaborator rather than instructor. Students get involved in collaborative and creative project work. The computer packages are used as knowledge-building tools to support a growing constructivist approach to learning. Students are motivated. There is a desire for new technology and better technology. Experimental collaboration between teachers in interdisciplinary project-based learning.</p> <p>Besides the above, time is given to attend conferences and presentations and reflect on evaluation. Training is given in other computer packages in subject area and in teaching with student groups.</p>

**Table 4.4 Phase 4: Penultimate**

Butterworth High School has not reached this stage yet as educators at BHS are adequately qualified or trained to use computers as cognitive tools. Although courseware such as *The High School Maths and Science Program*, which can be used to demonstrate complex problems such as chemical reactions using graphics and animations, are available, educators are not trained to use these tools.

Moving towards this phase, the school made software such as EvaluNet E-school available for educators to construct exercises or tests, which will be answered by learners who receive instant feedback and score on their performance. The teacher can evaluate learner performance later. The school also participates in a project called DEEP (see paragraph 2.3.2.1), which is aimed at improving teaching and learning using the information technology. In this project a team of students, who were selected to receive special training, were required to do presentations in specific subjects and interact with students in various countries using teleconferencing. Their performances were monitored frequently.

#### **4.3.5 Phase 5: Creation**

This fifth and final phase can never be completed, but is an ongoing process as new technologies are constantly being developed. The main feature of this phase is that the staff work in collaborative teams. There is a huge skill and knowledge base in a school that find itself in this phase as teachers have gone through the previous four

phases. Students are motivated and they have a desire to learn more. Much of the learning is done in the constructivist mode (Miller, 1997).

Phase	Description
Phase 5 Creation	<p>This creation phase is never complete but is an ongoing process as new technologies are constantly being developed. Schools have to decide which new technologies best suit their instructional needs and adapt accordingly. There is active involvement of students. A constructivist approach to learning replaces behaviourist approach. Many different computer packages are used in learning. Students are involved in collaborative and creative project work. For teachers, there is interdisciplinary project-based learning. There is also team teaching.</p> <p>For the general school, there is a desire for new and better technology. The school timetable is rescheduled for team teaching. The curriculum is modified to make use of the different facilities. For the new infrastructure, technical assistance is given to select and source suitable hardware, and select and source suitable software. Time is given to do research on effective ways of teaching, publish teaching experiences, and question the whole methodology of teaching. Training is given in new and innovative technologies.</p>

**Table 4.5 Phase 5: Creation**

Clearly Butterworth High School has not reach this stage of the integration of computer-assisted education either. However, elements of moving in this direction are visible in the school's participation in of a project called Intel (see paragraph 2.3.2.4), which aims to use computers in classrooms to teach all academic subjects. Although BHS has obstacles in implementing this in the near future, the school is continuing with training for teachers. The school is also planning to develop a website where the students' work can be published. The school has an organised IT department that looks into all aspects of the IT and is always trying to progress by implementing new technologies.

Miller's Evolutionary Model was taken as the yardstick to measure the progress of Butterworth High School in implementing computer-assisted education. The table below provides an overview of BHS in the various stages of progress based on the Evolutionary Model.

Phase	Integration based on the Evolutionary Model
1. Introduction	The school fully qualifies to pass this phase. A computer laboratory was established and teachers were trained.
2. Entry	The teachers begin to use the computers to assist themselves in their regular working areas.
3. Intermediate	A computer teacher was employed. The introduction of computers to students created a great enthusiasm in enhancing learning.
4. Penultimate	Software programs in different academic subjects were introduced. Projects like DEEP promote collaborative learning by allowing students to interact with students in various countries using internet and teleconferencing technologies.
5. Creation	The school is still in the planning stage to achieve phase 5.

**Table 4.6 Level of computer-assisted education at Butterworth High School based on the Miller's model**

#### **4.3.6 Summary**

Butterworth High School has come a long way from having one computer to thirty-five computers. The school administration displays a keen interest in integrating computers into the school environment. The school is already familiarising the learners — from Grade 4 to Grade 12 — in the various uses of computers. More time is given to both educators and learners for individual and collaborative learning. The various projects help the school in achieving goals that it otherwise could not have achieved.

Moving beyond Miller's Evolutionary Model, the level of integration of computer-assisted education into the curriculum at Butterworth High School is also evident in the support infrastructure for computing at the school.

#### **4.4 Support infrastructure**

This section reports on elements of the support infrastructure such as the sharing of skills, decision-making policies, IT Department teaching facilities, financing and staff

training in the use of computers. Taken together, these elements provide evidence of the kind of activities and services that potentially support the integration of computer-assisted education at Butterworth High School.

#### **4.4.1 Sharing of skills**

The computer department has been proactive in assisting staff to use computers in their teaching. Teachers use the computer laboratory on a daily basis after school hours, interacting with each other and the computer teachers. This leads to sharing of knowledge and other computer skills.

The school has only twenty computers and these are kept in the computer laboratory 2 that is used for the training of learners. Learners have one hour per week to work on the computer for which they come to the computer laboratory where they are taught by the one computer teacher. Although learners do not have the opportunity to use computers in their classrooms, teachers do talk about what happens in the computer laboratory and often sit in during their learners' computer classes. In addition, the teachers are requested to design assignments and projects in such a way that it would require learners to do some research during their computer period.

Regular mentoring of teachers in the use of computers adds to the confidence of staff. This can in turn, accelerate the implementation of Computer-Assisted Education at this school. While the computer teacher mentors the general staff on Wednesdays and Fridays, three teachers of BHS, who were enrolled in an International Computer Driving License (ICDL) course in 2004, will also be available to mentor their colleagues.

#### **4.4.2 Decision-making policies**

Butterworth High School has a fully democratic school decision-making policy. The Principal ensures that staff, learners and even non-staff members are represented equally in meetings. Similarly, meetings of the governing body, which are conducted at least once in a term, provides parents and even the co-opted members an equal voice the making of decisions.

The IT Department consists of the Principal, the Deputy Principal and three teaching staff, (including the computer teacher). The three teachers form the core of the computer department. Since they get confronted the problems of the department they are in a position to make the suggestions to other members of the department. If a matter falls within the purview of the three teachers of the IT Department, they make decisions without any consultation. However, if a matter falls outside their purview, they consult with the rest of IT Department.

The Acting HOD of the IT Department is involved in communication doing much of the paper work, logging problems and purchase of additional hardware. Another staff member is in charge of the computer teaching as well as the mentoring of colleagues during and after school hours. A third member of the computer department also assists in teaching the learners and training the teachers. All three of these staff members are responsible for making decisions on behalf of the IT department.

The computer department works very closely with the heads of the departments of the Foundation Phase (FP), the Intermediate Phase (IP), the Senior Phase (SP) and the Further Education and Training (FET) Phase. In developing their curricula for the different phases, the computer staff consult extensively with the general staff with regard to both the content and the timetabling of lessons. According to the HOD of the Computer Department the general staff do not directly inform their decisions, but convey such decisions to their respective Phase HODs. However, the teachers can also discuss their computer needs and suggestions with the computer teachers.

In terms of software, the IT department evaluates software that are potentially useful for teaching. In the past they used to visit other schools in this region to keep abreast of the latest software and technologies.

#### **4.4.3 IT department teaching facilities**

The school has two well-equipped computer laboratories. Laboratory 1 has 15 computers for staff development and for lecturers to use to support their teaching. Teachers use these computers for preparing lesson plans, question papers,

memorandums, assignments and projects and also for recording learners' performance. Laboratory 2 contains 20 computers, which is used to give basic computer literacy training for learners. As soon as they are registered as an ICDL training centre, the school plans to provide all learners with ICDL training.



**Figure 4.1 Teachers and learners in the computer laboratory**

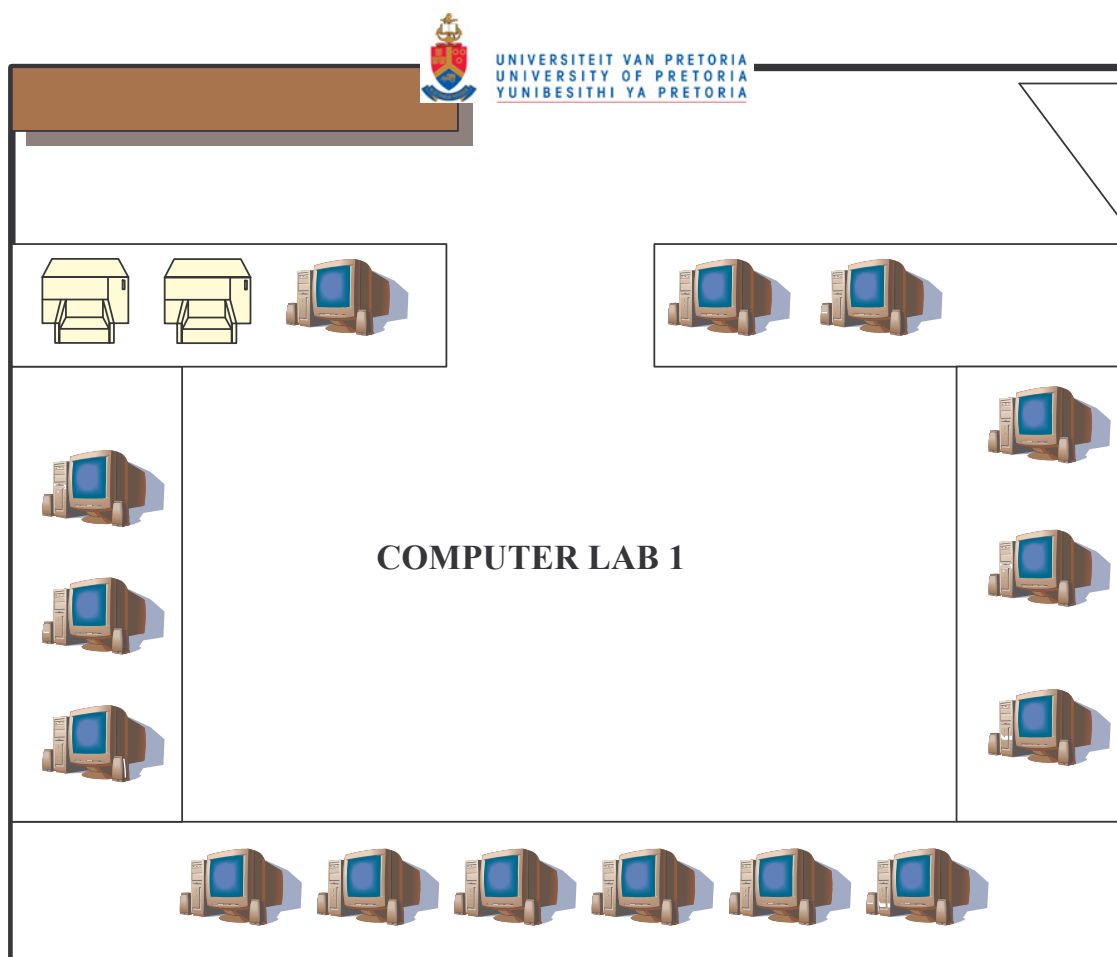
#### 4.4.3.1 Computer Laboratory 1

Laboratory 1 is mainly used for the training of educators. This laboratory has a server and 14 client systems. The network operating system is Windows 2000. There are two types of computers used as client machines, one type Sahara Computers and another type manufactured by Siemens (see Table 4.7). All the computers can access Internet through a 56K modem and a separate telephone line and all of them have access to a laser printer and an HP 750 Scanner–Copier–Printer.

Name	Manufacturer	Processor	Hard Disk	RAM	Numbers
Server	Sahara	Pentium iii	10GB	56 MB	1
Workstation Type 1	Sahara	Pentium	10GB	32 MB	4
Workstation Type 2	Siemens	Pentium	Nil	32 MB	10

**Table 4.7 Hardware specifications of the computers in computer laboratory 1**

The software available in computer laboratory 1 (see Table 4.8) is a mix of proprietary operating systems and productivity tools and freeware.



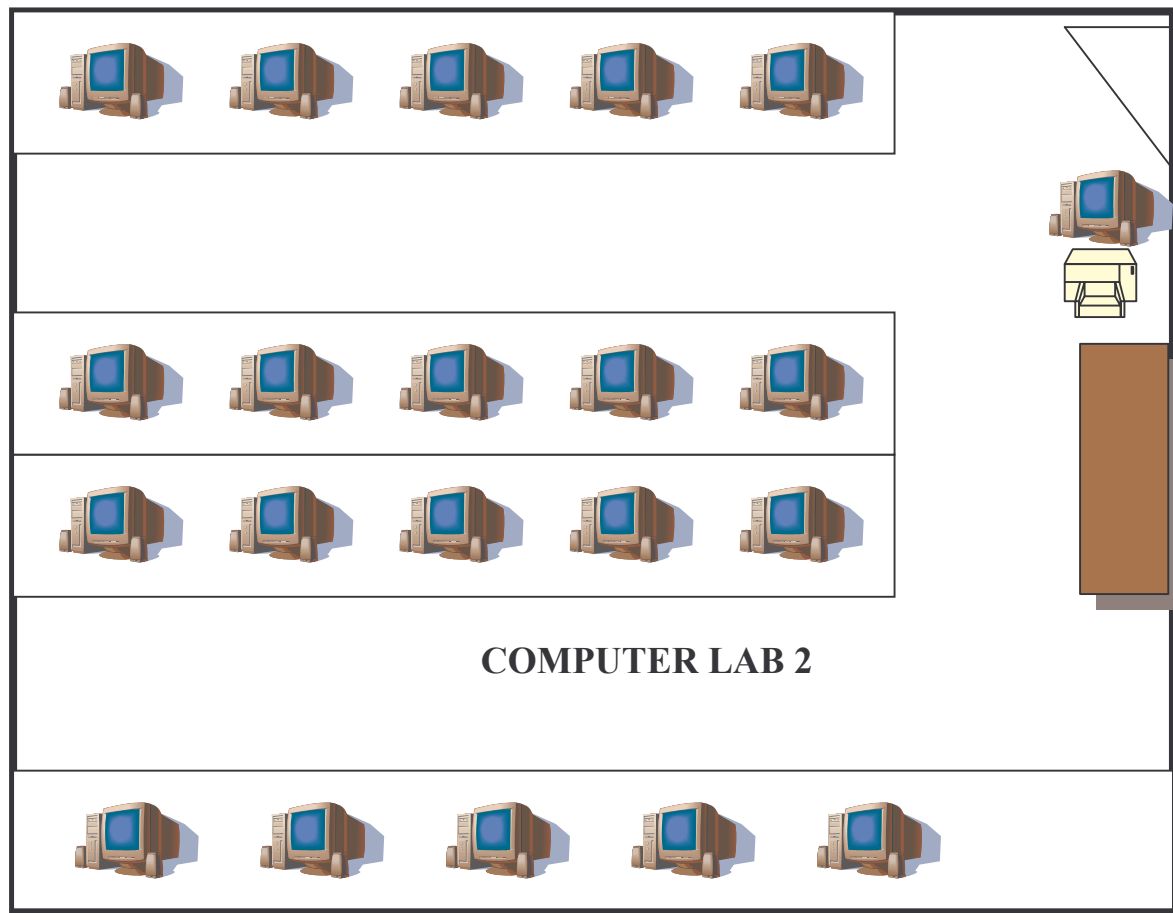
**Figure 4.2 Computer Laboratory 2**

Producer	License	Type of Package
Microsoft Windows 2000	Yes.	Network Operating System
Microsoft Windows 98 me	Yes.	Operating System
Microsoft Office	Yes. For All Computers	Multi Purpose
David Harris	Freeware	Communication
SchoolNet	Freeware	Teachers Training Software for basic computer literacy

**Table 4.8 Software in Computer Laboratory 1**

#### 4.4.3.2 Computer Laboratory 2

Laboratory 2 is used for training students from Grade 4 to Grade 12. This laboratory has a server and 20 workstations. All the computers are manufactured by Pinnacle, use Windows 2000 as operating system and are connected to the Lexmark laser printer and the Internet through and ISDN connection. This laboratory also has an LCD projector.



**Figure 4.3 Computer Laboratory 2**

Name	Manufacturer	Processor	Hard Disk	RAM	Numbers
Server	Pinnacle	Pentium IV	20GB	256 MB	1
Workstation	Pinnacle	Celeron 1200MHz	10GB	120 MB	20

**Table 4.9 Hardware specifications for the computers in Computer laboratory 2**

Application	Producer	License	Type of Package
Windows 2000	Microsoft	Yes. For All Computers	Operating System
Office XP	Microsoft	Yes. For All Computers	Multi Purpose
Encarta Encyclopedia	Microsoft	Yes	Encyclopedia
Career Centre	PACE	Freeware	Career Search

**Table 4.10 Applications software in laboratory 2**

At present the IT department has one computer laboratory for teaching learners. However, the number of computers in that laboratory is not enough to accommodate all learners because the average size of a class is 40. The principal's opinion is that the school must, by next year, have five or at least two more computer laboratories, each able to accommodate twenty or more computers.

The computer laboratories are available to all teachers and learners from Grade 4 to Grade 12 from 7.30 am to 1:40 pm, as per the scheduled timetable. It is compulsory for all learners to attend computer lessons. Those learners desirous of practicing on the computers may stay back at school until 5 pm. During this time learners work on assignments while the educators prepare for their next day's lessons. Teachers are always available to guide the learners. Similarly, the computer teacher is readily available to assist teachers. Since most of teachers are busy during school hours, they prefer to work after school hours.

Learners at this school are encouraged to make use of the computer facilities in order to improve their computer literacy skills. The HOD of the Computer Department reports that the learners are very enthusiastic to come to the computer laboratory. It is worth noting that the laboratory is always full with learners and educators from 2:00 pm to 5:00 pm.

The educators used to receive computer training as part of the Thintana project (see paragraph 2.3.2.3). However, since the project ended in December 2003, there are no current training programs for training the educators.

#### **4.4.4 Staff training in the use of computers**

In 2001, many teachers were sent to the Border Technikon at Butterworth to receive basic computer literacy training. Those who received training through the SchoolNet programme are equipped with all the necessary skills to use end-user applications such as Microsoft Word, Excel, Access, PowerPoint, Internet, e-mail, *et cetera*.

#### 4.4.4.1 In-house computer training

At Butterworth High School, all teachers, including the principal, are undergoing basic computer literacy training in groups of seven, which attends these training sessions on a rotational basis. Two educators train these groups of which their progress is monitored on a daily basis.

#### 4.4.4.2 Extra-mural computer training

A number of teachers are enrolled in graduate and post-graduate studies, including in Information Systems. The Deputy principal of the school had previously undergone computer-based training in the United States sponsored by the Eastern Cape Education Department.

Butterworth High School was part of Thintana project that started in 2002 (see paragraph 2.3.2.3). The aim of the project was to train educators through an organisation called Computer SchoolNet. It comprised of 7 modules of computer literacy studies. They were trained through Internet and e-mail. Educators were given assignments through e-mail and they had to do the assignments and then send it back. Most of the educators completed all 7 modules. This project completed operation by December 2003. As a continuation of this, a project with Intel computers is in the pipeline. At present there are two projects that are going on, i.e.: DEEP and Dinaledi. DEEP is an international project designed to search the ways in which the use of information and communication technologies in the improvement of teaching and learning.

The aim of the Dinaledi project is to improve education in learning areas of: Mathematics, Science and Technology. As a part of the project, they donated 20 computers to the school for the training of students. But there is no specific training program in this project.

The aim of the project is to take computer to the classroom and students are supposed to work on it with projects like 'Endangered Species' and so on. The co-ordinators occasionally make visits to the school and monitor the progress of the students.

#### **4.4.5 Finance**

The school is short of funds. As such, it is not able to buy enough computers or other computer accessories.

The 25 computers at the school have been donated as part of the Dinaledi Project. According to the principal he approached some government organizations and Members of Parliament who are reported to say, "We won't give you buildings, but [with] computers we will support you."

The HOD reports that, "We haven't reached the stage of buying computers for the school." They have to decide how to maintain the computers and how to expand the computer laboratory and budget for more computers. However, since financing is a huge problem, the school does not have money to buy computers.

##### **4.4.5.1 IT department finance for teaching purposes**

Learners from grade 4 to 12 are required to pay R160 a year for providing computer education. The cost of paper, toner, computer software and other accessories are met from this fund which the computer department does not contribute to.

##### **4.4.5.2 Finance for further study by educators**

Some teachers are enrolled for the International Computer Driving License (ICDL) course at their own cost. Unfortunately the School does not have policy for financing further learning for educators, despite the fact that the school will ultimately benefit from their enhanced skills. In the words of the principal, "They are doing it themselves. They pay for themselves."

##### **4.4.5.3 Staff computer-purchase and ownership**

Only 10 out of 34 educators have their own computers at home. However, only 4 of them use their computers to assist them in their teaching process, and they are mostly used only for record keeping purposes.

The staff are unable to purchase computer because the price of the lowest priced computer is more than a month's salary of a Post Level 1 teacher. Most of the teachers are Post Level 1 teachers. The school currently does not have the policy or the finance to loan money to the teachers to buy computers. The Principal agreed that providing staff with personal loans to purchase computers was a good idea as it would provide teachers with an incentive to use computers and that he would take it up to the SGB.

#### **4.4.6 IT department public relations**

The school maintains a cordial relationship with the community by means of letters, advertisements, bulletins, circulating leaflets around shops and conducting meetings to encourage them to be the patrons of BHS. The school informs people what the school intends to do. The parents are made aware of the future plans and activities of the school. In addition, the school organise phase meetings every term and in these meetings, and at various school functions the parents are being made aware that this school plans to establish itself as a computer centre. In addition to the above-mentioned forums, the school's activities are made known to the general public through the daily local English newspaper *DAILY DESPATCH* and the Xhosa newspaper *INDABA*.

The school encourages the public to make use of the computer-training program provided by the school as part of this program. As part of this training program, five members of the community took part in this program and trained in computer literacy at a nominal fee of R300.00 The school looks forward to train more community members as part of the school's computer literacy drive.

#### **4.5 Conclusion**

In this chapter Miller's (1997) Evolutionary Model was used as a benchmark to evaluate the integration of computer-assisted education in Butterworth High School and as a basis of reporting on the infrastructure and facilities available at the school.

## **Chapter 5 Conclusion and Recommendations**

### **5.1 Introduction**

The aim of this project was to investigate the implementation of computer-assisted education at Butterworth High School. The school has made many provisions to improve the quality of teaching and learning but it needs to be said that some hurdles act as a constraint in its path to achieving CAE. Recommendations are made.

### **5.2 Summary of research findings**

#### **5.2.1 The extent to which CAE has been adopted in teaching and learning process in BHS.**

Despite many constraints to the implementation of CAE at Butterworth High School, the school seems to be making a determined effort to expose the teachers and learners to computers. To date, all grades from grade seven to grade twelve have access to the Internet, for example. The introduction of computers in every classroom in every lesson, however, remains a problem.

#### **5.2.2 The problems faced by the school in implementing CAE**

Some identified problems which the School Management Team is aware of and for which tentative steps are being taken to address are listed below.

1. Not enough co-operation from the Department of Education. The school feels that although the DoE is helping the DEEP project in identifying teachers from surrounding schools for training, this is not enough. The department remains non-committed as far as enriching the computer laboratory is concerned. It is the school itself digging deep into its own meagre financial resources to provide for the learners' needs. To implement CAE effectively, the school needs more computers.

2. Inadequacy of the computer laboratory was mentioned by all interviewed. This is indicative of the fact that a lot still needs to be done to upgrade the computer laboratory to satisfactory levels. For example, at the time this research was conducted, an overhead projector had just arrived in the school.
3. There are no projects from the department to give schools enough computers so as to implement CAE. For this reason Butterworth High School experiences a lack of shared skills. It remains a lone player in the field and this makes computer related problem solving more complex than it would otherwise have been.
4. The current computer laboratories are converted traditional classrooms. They had not been designed to meet or serve the needs of a sophisticated computer laboratory. Butterworth High School has a fairly developed building infrastructure but one which was not designed with computers in mind. With the need to install computers in every classroom, comes the issue of costs. Many of these classrooms will need to be altered to meet the security needs of the computers. Currently most of the classrooms have tall windows with no security burglar bars for example.
5. This school is situated in an economically depressed area where unemployment is rife. As such, most of the parents are in no position to provide extra funds to the school, much as they see the need for this. The school's resources, therefore, remain in a perpetual state of need. The purchasing of more computers likewise keeps getting shelved.
6. Much of the community is not conscious enough of the advantages of computer studies so they are not as cooperative with the school in this regard as would be desired. This means that extra funds set aside for computers are often regarded more of a bother than a need, a mindset which in turn, leads to retarded payments.
7. The school's curricula are so compacted that it has proven difficult to extend the learners' interaction time with computers beyond the one hour available per week. Learners do not get enough time in the laboratory to do the assignments

of different subjects and to explore and find out by themselves the solutions to the problems.

8. Currently the school can afford only one computer teacher for the whole school. Clearly this is an untenable situation that calls for immediate redress.
9. Children have to go to the computer laboratory to do their assignments and projects by going to the EvaluNet, searching on the Encarta Encyclopedia and by surfing the net. Unfortunately the existing laboratory can only accommodate a limited number of students at a time, leading to time loss and sometimes a total failure by the learners to do their work, given the time constraints.

As is evident in the following section, solutions have to be multifaceted as the problems themselves are varied in nature.

### **5.3 Suggestions for enhancing the implementation of Computer-Assisted Education at Butterworth High School**

1. Butterworth High School should adapt its IT programme to suit the needs of the community. This would appeal to the parents and remove the experienced problem of non-payment. It is assumed that the programme as it stands now, is of little relevance to the needs of the community.

In order to upgrade the current software, it would be advisable to sell off the current near-obsolete equipment so that the funds accrued thereby are utilised to purchase more appealing programmes. While this may look like a step backwards, it has an in-built capacity to keep the programme current and relevant, though on a smaller scale.

2. There should be a phasing in programme, especially, since some parents may have more than one child in the school — a fact that may be contributing towards non-payment as some parents find it difficult to pay.
3. The school ought to broaden its networking financially. The traditional donors (private sector) from time to time do experience what has been called 'donor-

fatigue'. This was expressed by one of the prominent business people in the town who has made some donations towards the school, though not necessarily towards the IT programme.

The school could be well advised to advertise its IT programme among the surrounding schools. This, it is perceived, would generate the much-needed additional income.

4. Assuming that the financial problems are overcome, it is recommended that the school should hire another IT instructor as the current sole instructor is overburdened and has no peer with whom to share problems, etc.

Short of additional staff, gifted learners should be co-opted in a peer teaching programme. This way, additional interest will be created among the learners. At the same time, parents will be able to visualise the possibilities for their children if they become IT literate.

5. The problem of computer laboratory space could be alleviated cost effectively if the wall between the existing laboratory and an adjoining classroom were removed and the classroom converted or be refurbished to serve as an expanded computer laboratory.
6. The district office of the Department of Education should factorise computer education in their yearly budgetary requirements so that when schools such as Butterworth High School approach them, they are able to offer the support that need.

## **5.4 Recommendations for further research**

The various projects mentioned in this dissertation are doing a wonderful job in reaching out to the schools in the underprivileged areas and lending them a helping hand by educating both their educators and their learners to teach and to learn with the aid of computers. But this help is not reaching many schools that are in the

remote and rural areas. Research must be made as to what must be done so that the benefits of these private organisations can reach these schools.

## **5.5 Conclusion**

BHS has taken an informed decision to implement and integrate CAE in its curricula. The obstacles they face are formidable but not insurmountable. The enthusiasm of the learners, the determination of staff and administration seem to be the raw power that keeps this programme running. These envisage to privileges to be accrued from the use and knowledge of computers has given impetus to the determination to see that programme through. What is happening in this school's CAE programme, with just slight modifications to suit various local conditions could be duplicated in other similarly disadvantaged schools in the Eastern Cape.

Butterworth High is doing a sterling work of pioneering, as it were, the integration of the use of computers into its curricula. The process, however, is fraught with problems or challenges at every level such as the lack of a platform for sharing of skills, inadequacy of funds, staff training and a seeming apathy on the part of the general public regarding the support of the computer programme, and for the foreseeable future, access to computer facilities may continue to be a problem.

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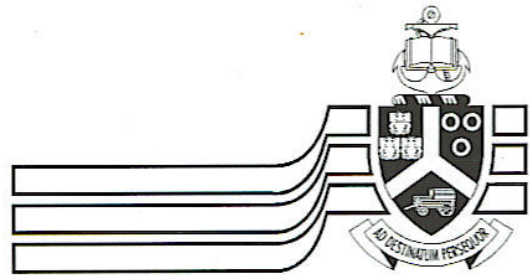
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## Appendix A1: Introduction Letter

2002/04/04



University of Pretoria

Pretoria 0002

**Enquiries:** Prof J.C. Cronjé

Tel (+27 12) 420 4257

Fax (+27 12) 343 5065

Cellular: 082 558 5311

jcronje@up.ac.za

To Whom It May Concern:

### Research on implementation of computers in schools

Messrs E. Alexander and S.K. Mathew are studying towards a Masters' Degree in Computer-Assisted education under my supervision and under the co-supervision of Mr Markus Mostert of Rhodes University.

They are researching factors that contribute to the successful implementation of computers in schools in the Eastern Cape Province of South Africa.

It would be appreciated if they could be given reasonable access to staff and learners of ten schools in the province.

Obviously the Education Department will be consulted before the results are made available, and a copy of the research report will be made available on request.

It is hoped that this research will contribute to the successful implementation of computers not only in the Eastern Cape, but also in the whole of South Africa.

Your participation in our project could be of immense value and will be greatly appreciated.

Best wishes

Johannes Cronjé (Prof)  
Supervisor

## Appendix A2: Letter of Request

P.O. Box 708  
Butterworth 4960

09/07/02

The District Manager  
Dept. of Education and Training  
Butterworth District

Sir

I am a teacher at Ndabankulu SSS. I am doing M.Ed part-time under Pretoria University. As part of my research work, I need to conduct interviews at a few schools that have got computers. Such two schools, under this district, that fulfil my requirements are:

1. Butterworth High School
2. Vullivalley Senior Secondary School

To conduct this interview, I need a permission letter from you. I would indeed be grateful if you could also ask these two schools to assist me in making this interview a success.

I attach here a copy of my Professor's letter.

Thanking you  
Yours faithfully

Eapen Alexander  
Persal no: 52620531  
Cell: 083 959 1585



## Appendix A3: Letter of Approval



Province of the Eastern Cape

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DEPARTMENT OF EDUCATION  
ISEBE LEZEMFUNDO  
DEPARTMENT VAN ONDERWYS  
P/B X 3019, BUTTERWORTH 4960, SOUTH AFRICA

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Reference: Enquiries : E M KANI TEL. 047 4911070 Fax: 047 4910655 Date : 29/07/2002

---

The Principal

*Butterworth High School*

*Butterworth*

.....

**MED RESEARCH WORK PROGRAMME – EAPEN ALEXANDER –  
NDABANKULU S.S.S.**

The above mentioned Educator is currently studying part time towards MED degree at Pretoria University. As part of his studies towards the completion of the degree, he has to do a research work through interviews at schools that have computers.

Kindly allow him to conduct such a research. The interviews to complete the research should not be conducted during school hours.

Thank you,

.....  
DISTRICT MANAGER  
E.M. KANI

## **Appendix B1: Interview Schedule**

### **Principal and Chairman of SGB**

**Robert Xavier**

#### **Chairman SGB & Principal**

What is your opinion about implementing CAE at BHS?

Do you think implementing the CAE will help the learners understand the subject better?

What was the basic objective of BHS to acquire computers? Do you think the objective is being fulfilled?

At present we see that computers in the computer laboratory are not sufficient to teach all learners of a particular class at the same time. When do you think, you can provide computers sufficient enough to teach all learners of a particular class at the same time?

I see that only the computer laboratory has got computers for teaching purposes. When the learners come into the computer laboratory, are they taught other subjects (like maths, science) with the computer or are just taught computer literacy?

Do your teachers have enough knowledge of the computers that they can teach their subjects with the assistance of computers? If not, are the computer department teachers giving them training? During school hours or after school hours? Any problem?

Are the learners allowed to practice in the computer laboratory after school hours?

Are there computer-qualified teachers to teach computers literacy to learners?

Have all the teachers of BHS undergone training in compu-typing/ computer literacy? Where? When? School hours / after hours? For how many hours? Who sponsors?

BHS? Tech? Any other? Is any institution coming to school to train teachers in computer literacy? By Internet? Are the same teachers getting training every year or different teachers?

Finances. Do you feel shortage of finances such that you are not able to buy enough computer and other accessories needed for the school for teaching and for administrative purposes?

How does the school normally acquire computers - buying them or some individual or institution donates them to your school?

Is the school building spacious enough to accommodate more computers and learners? Do you have immediate plans to acquire more computers in order to implement CAE at your school?

Does the school give loans to teachers to buy personal computers?

In your opinion, how many teachers have personal computers at home? Do they show interest to learn more computer skills from the school computer dept.?

Do you have computer-qualified teachers in the computer dept.?

Do they have a say in the school budget meetings when it comes to buying of computers, its accessory and Internet facilities?

Does the computer department have a say with regard to accommodation (of learners and computers), hours in the computer room and design of the computer room?

What role does the Department play in assisting you with computers, advice etc. with regard to compu-typing/ computer literacy/ CAE?

I am given to understand that this school was involved with DEEP, INTRANET etc., in some projects with this school. Please tell me about 'what, where, when, how, regarding number of teachers, learners, software, etc. Give me some informative leaflets, if possible.

What do you think the role of the education Dept. should be with regard to implementing CAE at our school? Computers? Software? Training our teachers? Sending technicians? Sponsoring teachers to study? Giving advice, suggestions?

Is the community willing to co-operate with you in matters relating to: Buying of computers and software? Motivating their kids to study computer skills? Willing to learn CAE on our computers?

How do you involve the larger community in your area in your efforts to get funds for the purchase of computers and related matters?

What is your vision for this school with regard to CAE?

Do you think the teaching staff or just the computer-teaching staff of this school shares this vision? How can you tell?

How do you involve the larger community with regard to realizing this vision of yours with regard to CAE?

Any problem that you like to highlight: problem of this school or problems of the schools in and around this area or problems of the schools in the Eastern Cape.

Your suggestions.

## **Appendix B2: Interview Schedule**

### **Ms Witbooi: Acting HOD Computer Department**

#### **Miss Witbooi**

According to your opinion, what was the basic objective of BHS in buying computers? Do you think this objective is being fulfilled?

I understand that there are 3 computer teaching staff in the Computer Department: Tell me about sharing of skills:

Between members of the Computer Dept.

With the other teaching staff.

What subjects do the Computer Dept. Staff take other than computer literacy?

What do you think is the attitude of the Principal towards the computer department when it comes to making the school decision-making policy? Is he supportive?

What decision-making power does the computer staff have when it comes to making decisions with regard to the computer and computer matters?

Do you think the general staff take an active part when it comes to making decisions with regard to computers?

Do you think Butterworth High School has enough computers to teach all kids from grade 7 to grade 12?

Do you think one hour per week for each class is sufficient for them?

Tell me something about the computer department hardware that you have got for teaching purposes.

According to your opinion, is there sufficient finance provided by the school for the purchase of computers and accessories?

Approximately how many members of staff own personal computers?

Do you think it is a good idea if the school loans money to the general staff for the purchase of their own computers?

How many of the staff do computer training during the day at this school?

What applications are they familiar with? (E-mail, Games, Database, Logo, Databank, Word Processor, Spread Sheet, Presentation, WWW etc.)

Approximately how many teachers take in-house training every day?

Please tell me something about this in-house training.

Who gives them the training?

Who sponsors them?

From what time to what time?

Do you think this training is bearing fruit?

Why do you think so?

Does the school send teachers for extra-mural computer training?

Does the school financially assist them?

Do the learners do group-work when they are in the computer laboratory?

How many kids per group?

How often do the subject departments make use of the computer laboratory?

Do they have their own subject-specific soft ware?

Who gives them training on the packages that they purchase?

Are they using these soft wares in teaching?

Is computer literacy an examination subject or does it stand in isolation to other subjects?

What do you think of the use of computer applications at home by the general staff?

What do you think of the use of computer applications at school by the general staff?

Which applications do they use most?

Why?

What do you think of the use of computer applications at home by the computer staff?

What do you think of the use of computer applications at school by the computer staff?

Do you think the general staff have access to the computer laboratory for suggestions or advices relating to the computer?

Do you think the general staff have access to computer applications in the computer laboratory?

Do you think the general staff are:

Allowed to practice after class hours?

Financially assisted to purchase for home the same software as being used at school?

Provided access to program experts at school when necessary?

Provided with loaned computers for home usages?

Allowed to have a say in the purchase of soft ware needed for the school?

In your school, for what specific purpose do the learners use the computers?

Do you like teaching the learners computers?

Why?

What do the computer department teach the learners with computers?

With what software?

Are the types of soft wares enough?

What all applications do the learners use?

Which applications do they use most?

Why?

Is any technical assistance given to the learners when they are in the laboratory?

Do you think the learners are given time to:

Evaluate outcome?

Share success and failures?

Is technical assistance given to:

Develop teachers' confidence?

Develop teachers' use of hardware?

Facilitate teachers' use of computers?

Do you think the school is:

Involving the community in the school's success and failures?

Offering computer training to the community using the school's facilities?

Do you think the computer department from the private sector needs any help?

Are you getting any help from them now?

Is the Department of Education helping the school with regard to:

Supply of computers?

Supply of software?

Giving technical assistance?

Sending teachers for computer training?

Any other?

What type of help are you expecting from the Department?

According to your opinion, do you think the implementation of computers / CAE will help the learners understand the subject better?

Why?

In your opinion, does your school feel a shortage of finances such that it can't buy enough computers and accessories needed for teaching, learning and for administrative purposes?

I have heard that two or three organizations were involved with this school in enhancing teaching and learning at this school. Please tell me about it.

What is your vision for this school with regard to CAE?

What prevents your school from implementing CAE at this moment in time?

What are the solutions would you like to suggest?

You are requested to make any comments that you would like.

## **Appendix B3: Interview Schedule**

### **Mr Gopalakrishna Pillai G.: Computer Teacher**

I understand that you are the teacher of the Computer Department who is mainly involved in teaching computer literacy to the general teaching staff and the learners;

I understand that some organizations are helping your school to enhance teaching and learning. Please tell me which these organizations are and what they are doing to enhance teaching and learning at BHS.

You said that DEEP made an attempt to start CAE or at least a semblance of it at your school. I would like to know about it.

According to your opinion, what was the basic objective of BHS in buying computers? Do you think this objective is being fulfilled?

Since your school does not have CAE, I am given to understand that, you have made a little improvisation in the teaching method to partially give the effect of CAE. Please tell me about it with an example.

Since you are the person in charge of teaching the learners computer literacy, you will be able to tell me any computer-related problems faced by the learners.

Please tell me the attitude of the following people with regards to computer literacy at school:

General Staff

Students

Parents

What subjects are the two other Computer Staff teaching? Are they teaching with computers? If not, why not?

Do you think the training that the teachers received to familiarize themselves with the computers was enough?

You said the teachers get computer training everyday after the class hours. Tell me about it.

How do the learners take advantage of the computer laboratory during the after-school hours?

Are they involved in playing games, doing computer literacy or surfing the net?

Tell me something about the Computer Department hardware and software you got for teaching purposes.

Are the software subject-specific?

What applications do the general staff at school use most, and why?

How many computer staff do you think have computers at home?

Do you think having computers at home will enhance teaching and learning at school?

What applications do the computer staff use most, and why?

Does the school send teachers for extra mural computer training?

Does the school financially assist them?

There are various reasons as to why this school could not achieve CAE at this time. Could you please tell me the main reasons?

Who do you think is the computer co-ordinator for this school?

What work does that person do at this school as a computer co-ordinator?

What do you think the role of SGB, should be to make BHS a school that delivers CAE?

What is your vision for this school with regard to CAE?

Please make any comments that you wish to make.

## Appendix B4: Questionnaire

### Learners

#### Learners

1. Have you been taught with computers before:
  - When?
  - At this school?
  - At any other school?
6. Have you had any short course in:
  - Compu-typing?
  - Computer literacy?
  - At this school?
  - At any other school? When?
7. At present, what do you do with your school computer?
  - Do compu-typing?
  - Do applications?
  - Do something on the Internet
  - Study
8. How many hours do you spend per week on your school computer?
9. Are you satisfied with the number of hours that you spend on the school computer? Give reasons.
10. Do you think you can understand the subject better if you are taught with the computer? Why?
11. At present, is any subject taught with the computer at this school?

(You may answer this question if the answer to the previous question is *yes*)

12. How much time does it take to teach each subject per week with the aid of a computer?
13. What applications do you think you can do on the computer? (Like Database, E-mail, Games, Graphics, Presentation, Spreadsheet, World Wide Web.) Why?
14. What application do you think you can do best on the computer? Why?
15. What application do you use mostly? Why?
16. Tell me in a few words, the work that you do on your computer with the help of these applications.
17. Do you find such a work interesting? Why?
18. Do you play games on your school computer? Why? What games?
19. Do you go on the Internet? What do you do when you are on the Internet? Play games? Do reference work? Email? How much time are you allowed on the Internet during the after school hours?
20. In your opinion, in what way is Internet beneficial for you at this school?
21. Do you have access to the computer laboratory in the after-school hours? Are you allowed to play games, go on the Internet or do your subject with the aid of a computer in the computer laboratory?
22. Do you think the software available to teach each subject is enough for this school? If yes, give reasons. If no, give reasons.
23. Give the names of a few softwares that you remember.
24. Have you participated in the DEEP project at this school?
25. When was it? For how long were you involved in this project?
26. Which subjects were you taught with computers?
27. Did you like this project? Why?
28. Would you like to have more such programs in the future?

29. Which other projects did you participate in?
30. Do you share your computer skills with your friends? Do you share your excitements and frustrations with them?
31. What is your opinion about the CAE (Computer-Assisted Education) at this school? Do you think more computers are necessary? More software? More computer qualified teachers? More hours in the computer laboratory? Any change in the teaching environment? Why?