A CONCEPTUAL FRAMEWORK

FOR IMPLEMENTING

E-EDUCATION IN KWAZULU-NATAL

BY

HEMDUTH RUGBEER

Submitted in accordance with the requirements for the

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ABSTRACT

A CONCEPTUAL FRAMEWORK

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This is a dissertation presented on the development of e-education in KwaZulu-Natal, beginning with the dawn of the e-education process, covering its development and rate of penetration in previously disadvantaged rural, urban and township areas.
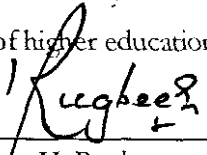
The study investigates the problem of applying Information Communication Technologies (ICTs[1]) in education in the context of KwaZulu-Natal. The first part of the study reviews theories and literature relevant to understanding and defining e-education and the nature and scope of e-education worldwide. Subsequent chapters describe the construction of a survey instrument employed to measure and evaluate the extent of e-education in KwaZulu Natal, and the findings of the survey.

Penultimate chapters blend the insights gained from this literature review to interpret the results, obtained through the quantitative research methodology, to describe a set of conclusions and recommendations in the context of applying Information Communication Technologies in the formal learning environment in KwaZulu-Natal.

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[1] This is an accepted form for the plural of ICT as identified in the following websites: http://education.qld.gov.au/ictsforlearning, http://www.kit.nl/frameset.asp?/specials/html/it_icts_and_development.asp&fmr=1&. and http://www.i4donline.net/issue/march04/education.htm.

ETHICAL STATEMENT BY RESEARCHER

With the signature below I, Hemduth Rugbeer, hereby declare that the work that I present in this dissertation is based on my own research, and that I have not submitted this dissertation to any other institution of higher education to obtain an academic qualification.

_____
H. Rugbeer

<u>16 January 2005</u>
Date

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ACKNOWLEDGMENTS

The author wishes to express sincere appreciation to:

WRITING CONVENTIONS

The following conventions are used in this study:

o   The abbreviated Harvard style of referencing in this study, for example Wellman (1992: 108), meaning Wellman 1992, page 108.

o   When websites are too large, they are placed as a footnote, for example Dhakal, (2004: website[2]).

o   When reporting current events from the print media the name of the publication is presented, followed by the date of publication in brackets as in (Natal Mercury, 25/2/98).

o   Illustrative graphics, tables and graphs are all given as Figures 1 – 35 in their chronological sequence of appearance.

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[2]   http://66.102.11.104/search?q=cache:_7R6wVMKMbqcJ:www.aptsec.org/seminar/meeting-2002/digital-op/ICT-08-Mr.Dhakal-Nepal.ppt+e-education+mobile+education+in+india+nepal&hl=en&ie=UTF-8),

Chapter 1

STATEMENT OF PROBLEMS AND RESEARCH PROCEDURE

THE RATIONALE FOR THE PRESENT STUDY

This study focuses on the conceptual and technological requirements for the successful introduction of e-learning in public schools in KwaZulu-Natal. The introduction of e-learning cannot be merely seen as a process of delivering education via electronic means. The use of a variety of complementary forms of e-learning requires that the nature of education be re-conceptualised. There is anecdotal evidence that there is an attitude among some educationists and educators that the virtual nature of electronic forms of education undermines the learning process because it removes education delivery from "the real world" of the classroom by relocating it in "the virtual world." Therefore, evidence will be presented in this chapter that the electronic delivery of education is based on sound cognitive principles, and that it in fact enhances the ability of learners to master knowledge that is directly applicable to existence in their immediate environments.

From time to time new technologies emerge that completely and permanently change the course of the development of humankind, among others the ways in which learners are educated. According to Klopper (2002:278) such technologies emerge in response to the increasing complexity of human culture. "New forms of communication will from time to time emerge in a culture to give expression to the increasing complexity of that culture." Klopper for instance notes that writing systems evolved soon after hunter-gatherer nomads settled down in pastoral communities about 10, 000 years ago. This evolved as a response to the greater demands of larger numbers of people that lived in such settlements. Also, in the 20th century electronic forms of communication like the telegraph, telephony, radio, television and the Internet have emerged and evolved, and are presently converging in response to the increasing cultural complexity of present-day global culture. Klopper argues that progression from hunter-gather nomadic economies to pastoral-agricultural settlement economies to industrial economies to present-day global knowledge economies provides the impetus for the emergence of new forms of communication. This was essential to cope with the increasing complexity of human culture in each successive phase.

Research, reported by Diamond (1999:49), indicates that the first human pastoral settlements formed in an area called the Fertile Triangle. This is an area in the Northern

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Mediterranean climatic zone, which stretches between present-day Israel in the West, and Iraq and Iran in the East. Humans in that region mastered the skills of domesticating certain plants and animals. According to Diamond this new knowledge about food domestication within the span of a few hundred years spread from the Fertile Triangle throughout the Northern Mediterranean climatic zone, all the way from the West to the Iberian Peninsula (present-day France, Portugal and Spain) to China in the East. It is no coincidence that writing systems first emerged in the Fertile Triangle, soon to be followed by writing systems in other settlements across the Northern Mediterranean zone.

According to Klopper (2002), early forms of electronic communication (the telegraph and radio) emerged towards the end of the 19th Century, followed by computer-mediated communication as a global phenomenon, as another coping response to the present-day complexity of global human culture. e-Learning is one of the computer mediated manifestations of global electronic communication.

When this research project was conceptualised in 2002 the intended focus was "The Development of e-Learning in KwaZulu-Natal". When this research project was initially designed it was with the intention of narrowly focussing on the communication aspects of e-learning in individual schools in KwaZulu-Natal as a strategy to complement teaching in the classroom. However, the South African Government's 2003 White Paper on the introduction of e-education in South African schools by 2013, has de facto changed the education landscape. It requires research that needs to establish what e-learning entails, how it relates to e-education and its role in relation to other forms of education delivery within a networked e-education environment. Consequently, the scope of this project has been broadened to incorporate e-education as proposed in the 2003 White Paper.

STATEMENT OF PROBLEMS TO BE ANALYSED

The research process began in June 2002, aiming to undertake a survey into the status of Information Communication Technology (ICT) in previously disadvantaged communities in KwaZulu-Natal. The primary aim of the study is to examine the nature and scope of ICT integration in these communities. By examining what ICT resources are presently being used in their schools, the way in which they are being used and the methods employed to sustain their use, a representation of ICTs permeation in these communities was uncovered.

Factors, which restrict or enhance the use of ICTs in these communities, are identified. The present situation with regard to ICT integration at schools is evaluated. The situation of ICT integration is evaluated in schools in the context of the Draft White Paper on e-Education of September (2003: http://www.school.za/research/uwc-epu/screen/). The findings and recommendations may be used to provide insights into considerations around the creation of equity, facilitating quality in the use of ICTs and identifying key areas for strategic implementation of e-education policy goals.

Problems, which relate to the feasibility of introduction of e-education in KwaZulu-Natal public schools, are technical as well as human related. The technical related problem could be subdivided into hardware and software infrastructure in the forms of networks. The human related problems relate to the competencies and the attitudes of learners, teachers, and school management teams, governing bodies at particular schools in the urban as well as rural areas. It furthermore relates to the competencies and the attitudes of educationists who are bureaucrats at circuit, district and regional offices in the KwaZulu-Natal Department of Education. It also relates to the degree of synchronism that can be achieved by the provincial education departments who can play a role in efficient delivery of information. It also relates to the extent to which there is an overall concept plan for the roles that mass communication in the form of television transmission, the use of individual electronic communication for teacher directed and self directed electronic learning will compliment teaching in the classroom. There should be an overall plan to overcome the problem of teacher training and retraining to prepare the teachers for applying electronic learning in the classroom.

Arrays of problems relating to the implementation of e-education in KwaZulu-Natal have been identified. These would include the following Problems:

- o Technical problems which would include hardware, software and network infrastructure;

- o Education delivery problems such as directed and self-directed study;

- o Education Management Issues;

- o Communication problems.

It is not possible to address all the problems relating to the implementation of e-education in this study. A group of ten of the author's colleagues is addressing some of these issues at the University of KwaZulu-Natal.

This research project focuses on providing a principal analysis for electronic learning and electronic education. It is based on the conceptual basis of how humans learn and represent knowledge in their minds. Further, it examines how existing, emerging and converging instruments of electronic communication can be used to introduce electronic learning in KwaZulu-Natal urban and rural schools in a sustainable way.

CRITICAL QUESTIONS TO BE ANSWERED

Problem 1: What is e-learning?

The concept of e-learning is explained in chapter 2. e-Learning and its association with learning is further examined in chapter 3 and 4.

Problem 2: What is e-education?

All aspects of e-education are analysed in chapter 4. The application and development of e-education is also examined in chapter 6.

Problem 3: What forms of Information Communication Technologies exist in previously disadvantaged schools?

Solutions to these problems are investigated in chapters 4, 6 and 9.

Problem 4: What impact does Information Communication Technologies have on learning?

The impact of Information Communication Technologies on learning is examined in chapters 4, 6 and 9.

Problem 5: What forms of e-learning exist in disadvantaged schools?

The extent of e-learning in disadvantaged schools in KwaZulu Natal is evaluated in chapters 9 and 10

Problem 6: What advantages do schools that offer e-learning hold for learners in those schools?

The impact of e-learning on learner progress is evaluated in chapters 9 and 10.

Problem 7: How relevant is e-learning to our learners?

This survey focuses on whether Information Communication Technologies can enhance leaning and improve learner achievement for all learners. The relevance of e-learning is examined in chapters 4, 9 and 10.

Problem 8: Can e-learning increase productivity in the teaching and learning environment?

The author examines the challenges of access during formal school periods and outside normal school hours in remote areas. Further analysis of the productivity of e-learning are studied in chapters 4, 5 and 10.

Problem 9: What difficulties exist in implementing e-learning in resource disadvantaged schools?

In chapter 9 and 10, the author identifies schools that do not implement any form of e-learning and establishes problems that are present in its implementation.

AIMS

The aims of this dissertation are:

(a) To work out what forms of e-learning exist in disadvantaged schools;

(b) To determine advantages of e-learning in schools that offer e-learning to learners;

(c) To determine the relevance of e-learning to learners;

(d) To determine how e-learning can increase the productivity of teachers and learners;

(e) To determine what difficulties exist in implementing e-learning in the lower socio-economic schools.

RESEARCH PROCEDURE

The project combines qualitative and quantitative forms of research. The qualitative aspect relates to the development of a conceptual theoretical framework for e-education, based on a comprehensive literature review of current and completed research about e-education in South Africa and abroad. It looks specifically at current innovations in the information communication technology that are required to introduce e-education in KwaZulu-Natal public schools. The quantitative aspect of the study relates to an exploratory survey[3] conducted among 266 learners of previously disadvantaged schools in rural and urban communities of KwaZulu-Natal to determine

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o The resources available in the public schools that they attended;

o The resources available in the communities where they lived;

o The resources available in their homes;

o The perceptions of the learners about the desirability of e-education;

o The perceptions of the learners about their parents' attitudes towards e-education;

o The perceptions of the learners about the South African Government's responsibilities towards the provision of e-education;

o Preliminary recommendations regarding the introduction of e-education in KZN public schools, based on the findings of this study.

NATURE OF LITERATURE SURVEYS TO BE CONDUCTED

The literature survey of this project will be conducted in two phases. The first phase is an initial exploratory survey to determine what aspects of the problems regarding the introduction of e-education in South African public schools have already been addressed in order to ensure that ongoing or completed research is not being duplicated.

The second phase of the survey will entail an in depth, multi-disciplinary critical analysis of current research regarding the conceptual basis of learning and e-learning. It also entails the relationship between e-learning and e-education, and technical and psycho-social aspects of introducing e-education in under-serviced South African urban and rural communities. The analysis is based on the practical experience gained with the introduction of e-education in countries like India, Malaysia, Nepal and Brazil.

For the initial survey a Nexus[4] search has already been conducted to determine the nature and extent of research in South Africa regarding e-education and e-learning. The search revealed that there is no ongoing or completed research in South Africa regarding e-education or e-learning in KwaZulu-Natal, but that some research is in progress, or has been completed regarding e-learning at South African tertiary institutions. The researcher has taken these facts into cognisance when he formulated the research problem for this study.

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[4] Nexus database system: http://stardata.nrf.ac.za/forms/nexuslogin.html

OVERVIEW

In the last section of this chapter the researcher provides the reader with a brief overview of what is to be encountered in the chapters that follow.

In chapter 2, the author defines and discusses the key concepts used in this study. Concepts such as *Broadband* are explained. The reader is also introduced to new concepts that have evolved from new technology.

An in-depth analysis of the theoretical grounding for e-education is provided in Chapter 3. This chapter deals with the pertinent concepts of communication and learning, the relationship between these concepts, and how they form the basis for e-education. The chapter is divided into three parts

- o Theories of Learning, Which Relate To Communication and E-Education

- o Theories of Representation, Which Relate To Communication and E-Education

Chapter 4 deals with communication and learning. This chapter is divided into the following sections:

- o Communication

- o Communication and Technology

- o Communication In e-Education

- o Communication and e-Education: beyond Shannon and Mersham

The properties of mobile devices, which impact on the rate of assimilation of mLearning into these communities, are also investigated. Further, the author calculates how mLearning can change the work situation of education.

The nature of virtual socialisation and its association with learning is discussed in Chapter 5. The similarities and differences in physical and virtual associations (relations), as well as their impact on learning styles are studied. Furthermore, simulated learning environments are also explored. The author also discusses the concept of e-education and new Information Communication Technologies and its relation to teaching and learning. This chapter examines why and how ICTs can be used to enhance teaching and learning.

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In chapter 6 the author examines approaches to e-education and attitudes of education authorities, principals, teachers and learners to e-education in the following countries:

o India

o Nepal

o Brazil and Latin America

o United States of America

o Malaysia

o Europe

In chapter 7 the author examines the draft proposal (by Department of Education and Culture: 2003) for the introducing of Information Communication Technology into South African Schools. The proposal includes the purpose of ICTs in schools, government's response to the growing digital divide and the various stages for its introduction into our schools. The draft paper also suggests guidelines for implementation and maintenance of ICTs.

The research fieldwork is outlined in Chapter 8. The use of SPSS as a statistical tool is explained and how it was used to analyse and interpret results of the quantitative study of this project.

By using a series of bar graphs, pie charts and correlation tables the results of the research are presented and interpreted in Chapter 9.

The conclusions of the research and recommendations with regard to e-education in KZN are provided in Chapter 10.

CONCLUSION

The problems that exist with regard to e-education in KwaZulu-Natal are stated in the first section of this chapter. Thereafter the aims of this research are stated, and the research methodology, which is used to find solutions to these problems, is indicated in order to fulfil the aims of this research.

DEFINITION OF TERMS

INTRODUCTION

The key concepts relating to this research concerning e-education are defined in this chapter. The purpose of this chapter is to introduce the main concepts that are necessary to understand the analysis of e-education. In general, the definition of concepts relates to those aspects of cognition and communication that deal with how e-education can be used as forms of electronic communication with the intention of improving teaching and learning.

BROADBAND

In general terms broadband is the latest in high speed Internet access technology, delivering access at speeds hundreds of times faster than a Dial-up modem can provide.

According to EarthWeb-Connect (2001: http://www.earthweb-connect.com/whatsbroad band.htm), broadband is the non-specific term for high-speed digital Internet access including Digital Subscriber Lines (DSL) and the brand new satellite Internet connection. DSL technology is an always-on Internet connection that uses available ordinary copper phone line for both your phone service and a high-speed Internet connection. You can surf the Web and talk on the phone at the same time over your existing phone line, without having to install a new one. DSL takes the existing voice cables that connect customer premises to the company and turns them into a high-speed digital link to the Internet. DSL is a new technology perfect for all aspects of Internet use.

Satellite Internet technology is much the same as DSL except it uses a satellite dish instead of telephone wires to connect to the Internet, which enables anyone, regardless of their distance from the telephone company, to get high speed digital Internet access.

Digital Subscriber Line (DSL) technology uses ordinary copper telephone wire to transmit data at broadband speeds of up to 7+ Mbps. This is the same wire that is already installed in hundreds of millions of homes and businesses throughout the world. DSL is an "always-on" service, meaning you don't need to dial-in every time you want to connect to the Internet. In many cases DSL solves the bottleneck problems often associated with the "last mile" - the link between the end-user and their network service provider. Before DSL became available, this

link was achieved by using dial-up analogue modems with speeds ranging up to 56 Kbps and ISDN[5] with speeds up to 124 Kbps

According to Main (2004: http://www.ovum.com/), it cannot yet be said that voice over broadband has entered the mainstream, because overall market penetration is still around 1-2%.

According to Freeman (2004: BBC News), broadband is available but it is patchy. Rural areas tend to give people the quality of life they are looking for, but these are just the places they cannot get the broadband communications enabled.

According to Pearson (2004: BBC News), many rural communities have already been campaigning to bring broadband to their locality. This demonstrates the demand for the service and having it available to every household in Northern Ireland will ensure that a rural/urban divide does not open up. This is very good news for rural families and rural businesses. The government is keen to promote its take-up, saying use of broadband could produce £4.7bn in productivity and cost savings for small and medium-sized businesses in the UK.

3G WIRELESS NETWORKS

According to Dunne (2004: http://www.darwinmag.com/learn/curve/column.html? ArticleID=182), 3G wireless networks are capable of transferring data at speeds of up to 384Kbps. Average speeds for 3G networks will range from high-speed or broadband mobile Internet access, and in the future 3G networks are expected to reach speeds of more than 2Mbps. 3G technologies are turning cellular phones and other mobile devices into multimedia players, making it possible to download music and video clips.

BACKBONE

According to the Draft White Paper on e-education 2003 a backbone holds a network (or several networks) together. It is the main (or trunk) line in a network. All other networks and computers are attached to this backbone. In South Africa, the State Information Technology Agency (SITA) maintains the backbone for government departments. According to

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[5] Integrated Services Digital Network (ISDN) is a digital telephone service that provides fast, accurate data transmission over existing copper telephone wiring.

Webopaedia, (2004: http://www.webopedia.com/TERM/B/bus.html), a backbone is the central cable that connects all devices on a local area network

BANDWIDTH

The Draft White Paper on e-education 2003 describes bandwidth as the capacity of a transmission channel to move data between locations.

According to Webopaedia (2004:http://www.webopedia.com/TERM/b/bandwidth.html), bandwidth is the amount of data that can be transmitted in a fixed amount of time. For digital devices, the bandwidth is usually expressed in bits per second (bps) or bytes per second. For analogue devices, the bandwidth is expressed in cycles per second, or Hertz (Hz).

Bandwidth posed a problem for Internet users in South Africa during the initial stages of Internet introduction. During the course of 2002, great strides were taken to improve bandwidth size. Telkom now provides a faster Internet service using a wider bandwidth. Wider bandwidth means that it will be faster and easier to download information or graphic material.

CD-ROM

Compact disc, (read-only-memory) is a round disk (CD) that is designed to store computer data in the form of text and graphics, as well as sound (Draft White Paper on e-education 2003).

According to Webopaedia (2004: http://www.webopedia.com/TERM/c/compact_disc.html), a compact disc is a polycarbonate compound with one or more metal layers capable of storing digital information. The most prevalent types of compact discs are those used by the music industry to store digital recordings and CD-ROMs used to store computer data. Both of these types of compact disc are read-only, which means that once the data has been recorded onto them, they can only be read, or played.

COGNITION

According to The East Campus (2004: http://www.bhc.edu/EastCampus/leeb /psy101/psy101ch07/tsld003.htm), cognition is the intellectual processes through which information is obtained, transformed, stored, retrieved, and used. Cognition is an active process that is, for better or worse, affected by our cognitive abilities/skills. A "concept" is the basic unit of cognition.

The American neurologist Paul MacLean is a supporter of "micro genesis", the view that the structure of our brain mirrors its evolution over the ages. MacLean (2000: http://www.thymos.com/mind/maclean.html), believes that our head contains not one but three brains: a "triune" brain. The elegance of MacLean's model is that it neatly separates mechanical behaviour, emotional behaviour and rational behaviour. It shows how they arose chronologically and for what purpose and it shows how they coexist and complement each other. They constitute three steps towards modern "intelligence".

COMMUNICATION

According to Barker and Gaut (2000: 5), the communication process is the process in which two or more elements of a system interact in order to achieve a desired goal or outcome. De Beer 1998: 8 explains that the purpose of communication can be found in the human need to discover, to relate, to persuade and to play. Graphical representations of the communication process, found in standard textbooks (e.g. Mersham and Skinner (1999: 7-10)), identify the main elements involved in a communication event. These are the originating/sending communicator, the receiving communicator, the message, the communication codes, and the medium through which the message is transmitted. The Mersham and Skinner model stresses the importance of the expression of the message and the interpretation by the recipient. It also focuses on the necessary coding within the medium chosen. These are key concerns of educators.

INTRAPERSONAL COMMUNICATION

According to Mersham and Skinner (1999: 89), intrapersonal communication occurs when an individual sends and receives a message internally, that is, when a person communicates with himself or herself. Mersham and Skinner further assert that we all have imaginary conversations in our minds. Only one person participates in intrapersonal communication, and that is the self.

A person is able to express and interpret his/her own messages in order to make sense of the world. This process takes place while a person is communicating in all other settings. Intrapersonal communication is the basis of communication in all other contexts and occurs in all communication acts.

The ascription of meaning in intrapersonal communication is an important part of ones ability to act as communicators. Intrapersonal communication is a prerequisite for all

communication. Self-awareness, self-acceptance and self-actualisation arise in the process of intrapersonal communication.

INTERPERSONAL COMMUNICATION

The most common form of daily communication is interpersonal—that is, face-to-face, at the same time and in the same place. According to Mersham and Skinner (1999: 90), interpersonal communication occurs between people in a face-to-face situation. They are able to see each other and observe facial expressions and other non-verbal behaviour while they are exchanging verbal images.

The most basic form of interpersonal communication is a *dyad* (an encounter or conversation between two people). Some dyads exist over a long period of time, as in a marriage or partnership. Communicating well in a dyad requires good conversational skills.

Communication may also occur in small groups, such as families, clubs, religious groups, friendship groups, or work groups. Most small-group interaction involves fewer than ten people, and the communicators need the same communication skills as in a dyadic conversation.

Interpersonal communication occurs with larger groups as well, such as when a speaker gives a talk to a large crowd (a political candidate giving a speech at a campaign rally, or a teacher lecturing to a large class). However, the audience can respond in only limited ways (such as with applause, nodding, whistles, boos, or silence). The speaker usually wants to be persuasive or informative, so the words chosen and the style of delivery or performance are very important. A speaker who wants to reach an even larger audience than the people who can physically hear the speech in one place would use *information communication technology* or media to get the message across distance and even time.

DIDACTIC TRIANGLE

The didactic triangle refers to the communication relationship between teacher, learner and learning material. It shows that there exits a unique relationship between the teacher and learner, learner and subject matter and teacher and subject matter.
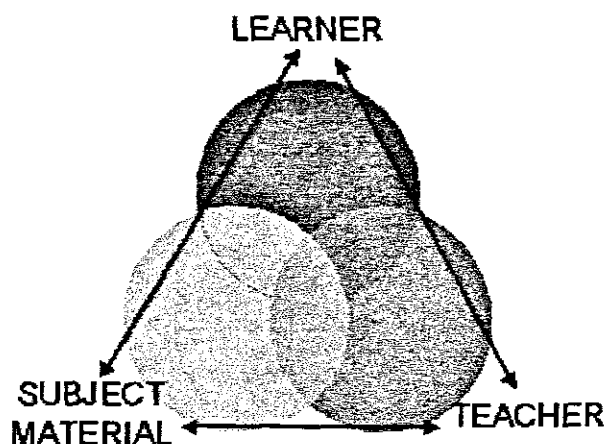
Figure 1: The Didactic Triangle

With aid of the didactic triangle, the pedagogical relation between the teacher and learner can be examined. The core of didactics is outlined as the teacher's relation to another relation, that between the learner and subject.

According to Shulman (1987: 8-9), the didactic triangle is usually drawn with teacher, learner and content as its end points (refer to figure 1). There are, however, numerous variations depending on how the points are understood in a larger context where the societal factors are probed.

Although the didactic triangle should be treated as a whole, it is nearly impossible in practice, therefore, it is usually analysed in pairs. The most usual approach is to take the relation between the teacher and the learners as a starting point. When this relation is seen as a pedagogical relation it brings with it certain special meanings. In the pedagogical relation the teacher has something that the learner not yet has. Shulman considers the relationship between teacher and subject matter inflexible. In the relation between the teacher and the content the teacher's competence in content is in focus. To be a teacher s/he should have something that the learners do not have. In the area of content knowledge this means sufficient academic or professional studies. In principle the competence of the teacher is never too high. The traditional understanding of content in the didactic triangle has meant discipline-based content.

The learner's relation to the subjects (or more generally to the content) is the key to didactic understanding. The content is defined in the curriculum as subjects and other content. The whole instructional process aims at achieving the aims and goals stated in the curriculum. Most of the outcomes from the teaching-studying-learning process are learning results but

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behaviour changes through one's own free will on impulse of the activities in the instructional process. Learning and other desirable changes, or more generally said the defined development of a learner's personality, are the primary purpose of the teaching-studying-learning process.

It is a well-known fact that teaching in itself does not necessarily imply learning. Rather, teaching is a kind of action that is aimed at pupils' learning or other kinds of outcomes without any guarantee on the teacher's part (Smith (1987: 11-15)). If we describe the activities of the teacher as teaching, we would prefer to call the activities of the learners as studying (Uljens (1997:34-43)). It is this studying we can see and observe in the instructional process. In other words, the relation between the learner and the content is visible as studying, doing something in order to achieve the aims and goals in the curriculum. The invisible part of this relation may be learning and other consequences of the instructional process. Learning is taking place in a learner's mind and in order to learn the learner is expected to do something, to study. The teacher is able to control or guide studying. The most important determinant in the teaching-studying-learning process is the learner and his/her achieving the aims and goals of the curriculum. The teacher's task is to try to guide this relation. First, there is a relation between the learner and the content. This is manifest as studying and latent as learning and other changes. Secondly, the teacher has a relation to the relation between the learner and the content. In other words, the teacher has a relation to studying and at the same time this relation is also to the learning and other changes. That very relation may be called a didactic relation. It is important to notice that the didactic relation means a relation to another relation.

To emphasise the importance of the didactic relation it may be brought out that concentrating on the content makes the teacher an expert and concentrating on a learner makes the teacher a caretaker of the pedagogical relation. To concentrate on the relation between the learner and the content or on studying is, however, the core of a teacher's profession.

Although it is true that the didactic triangle is an abstract construct it is always situated in some context. The question is how much of these outer conditions should be explicitly stated and how much of it belong to that context where the triangle is situated. In school didactics the instructional process is always guided by some curriculum and the relations to larger societal determinants are defined through it. Teaching is currently a broader concept which also occurs outside schools. Further, didactics is not limited to schools.

SOCIAL INFLUENCE

Gass and Seiter (2003: 127) reveal that families, peer groups, workplaces, even classrooms exert strong pressure on their members to behave in certain ways. Peer groups act as powerful persuasive force. Gass and Seiter (2003: 130) explain that we have a desire to be right and we conform to a group because we think the group may be correct. At other times when we know that the group is wrong, we may conform so that we gain rewards (e.g., liking) and avoid punishment (e.g., scorn) that are associated with agreement and disagreement.

PERSUASION

Gass and Seiter (2003: 34) describe persuasion as the attempt to influence another person's beliefs, attitudes, or actions through communication. People use communication in order to persuade others to think in the way that they do or to act in the way that they do. Dimbleby (1991: 16) show that persuasion is more common than we may realise and is not confined to flamboyant examples of advertising. One may want to persuade someone to loan one some money, or join one's drama group, or help one with repairing one's car. It is true that the word persuasion has a certain sense of manipulation – to get what one wants. In this sense we are all manipulators everyday.

COMPLIANCE GAINING

Gass and Seiter (2003: 236) illustrate that compliance gaining generally focuses on persuasion aimed at getting others to do some thing or to act in a certain way. Compliance gaining research primarily focuses on changing behaviour. Studies on compliance gaining have concentrated on influence in interpersonal, face-to-face contexts rather than one to many contexts. Gass and Seiter (2003: 244) add that regardless of the type of power that is at work, one thing remains clear: power affects compliance gaining behaviour.

DIGITAL ENCODING

Mersham and Skinner (2001a: 18) states that all information and communication can be digitally encoded, whether it is text, voice, pictures, sound or video. Digitisation refers to the conversion of analogue information – whether audio, visual or textual – into the computer readable format of 1s and 0s. This digitally formatted information can be easily accessed by a variety of digital devices, not just computer as we commonly think of them. This is because the digital chip can now be placed in any appliance or object, turning it into a communicating

device. Digitisations makes communications from persons to machines, between machines, and even from machines to persons, appear as easy as it is between persons who are in close physical proximity to each other.

DIGITAL LITERACY

Digital literacy refers to the ability to appreciate the potential of ICTs to support innovation in industrial, business, learning and creative processes. Learners and educators need to have the confidence, skills and discrimination to adopt ICTs in appropriate ways. Digital literacy is seen as a "life skill" in the same category as literacy and numeracy (Draft White Paper on e-education: 2003).

E-LEARNING

Kurtus, (2000: http://www.school-for-champions.com/elearning/whatis.htm), describes e-learning as a range of instructional authoring that can be delivered through a CD-ROM, over the LAN, or on the Internet. It includes Computer-Based Training (CBT), Electronic Performance Support Systems (EPSS) and Web-Based Training (WBT), as well as distance learning. e-Learning is flexible learning using ICT resources, tools and applications, focusing on interaction among teachers, learners, and the online environment, and on collaborative learning. e-Learning usually refers to structured and managed learning experiences, and may involve the use of Internet, CD-ROM, software, other media and telecommunications (Draft White Paper on e-education: 2003).

According to Grimes (2002: http://www.cisco.com/global/ZA/solutions/ent/bus_solutions/elhome.shtml), if wireless communication is still in its infancy, wireless e-learning is in an embryonic stage. Delivery of e-learning content to wireless handheld devices such as Internet-enabled cellular phones, personal digital assistants, and even mobile computers is ready to take corporations by storm. The principal advantage of using a wireless device for e-learning is sheer convenience. A centrally located knowledgebase is essential, and a wireless device makes such access possible virtually anywhere. Also, a wireless device can increase productivity by allowing learners to engage in learning at any time of the day or night.

According to Frankola (2001:14), people attending a lecture remember only 5% of what they heard. e-Learning can do much better through stimulations, probing discussions and practising skills.

The e-learning industry is moving towards a future in which the most important product is not a course, but learning objects (small chunks of instruction that take about 15 to 20 minutes of study. They are easy to revise and update so learning becomes much more topical and relevant. Instructors can mix and match learning objects to create a course. E-learners can create their own courses by deciding which learning objects they need for learning a particular skill. As learners take responsibility for their learning, the traditional concept of the prescribed course should become less relevant, and with it, the drop out rate. Engaging and satisfying the e-learner will continue to be crucial.

ELECTRONIC COMMUNICATION

The Electronic Communication Policy (2000: http://www.ucop.edu/ ucophome/policies/ec/html/ecppolicy appendixA definitions.htm), defines electronic communication as any communication that is broadcast, created, sent, forwarded, replied to, transmitted, stored, held, copied, downloaded, displayed, viewed, read, or printed by one or several electronic communications systems or services. For purposes of this research, an electronic file that has not been transmitted is not electronic communication.

ELECTRONIC WHITE BOARD

According to Computer Hope (2004: http://www.computerhope.com /jargon/e/elecwb.htm), an electronic white board is a hardware device that is similar to a white board found in schools and businesses that transmit information written on a white board to a computer or multiple computers.

A software program that resembles a white board found in schools and businesses however is used through the computer. Users can type/draw on the electronic whiteboard and commonly have the data being written down displayed on multiple computers.

E-MAIL

Mackinnon (2003: 18) describes electronic mail as a form of communication whereby messages are sent via the Internet. This is a quick, efficient and cheap communication method – the cost is the same as that of a local telephone call. E-Mail evolved to integrate e-learning. It offers a personal channel of communication between tutor and learner.

GLOBAL VILLAGE

A village is normally a community of people who are familiar or vaguely familiar with each other. The concept of a village is normally associated with a small community. A global village

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gives the idea that all people in the world have the ability to be connected to each other. This is possible because of the World Wide Web, which is created by the Internet. The global village will then suggest that because of Internet connection people across continents have the ability to associate with each other.

INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs)

Information and communication technology refer to the mechanisms which are used for distributing messages, including postal systems, radio and television broadcasting companies, telephone, satellite and computer networks used to handle information and aid communication (Google definition, 2004: http://dictionary .reference.com/search?q=information+and+communication+technology&r=67).

ICT represent the union of information technology and communication technology. ICTs are the combination of hardware, software and means of communication that brings people together and that enable the processing, management and exchange of data, information and knowledge in order to expand the range of human capabilities (Draft White Paper on e-education 2003).

According to Kenny et al (2001: http://www.worldbank.org/ poverty/strategies/chapters/ict/ict.htm), ICTs are increasingly central in the effort to escape poverty. ICTs provide access to information that can create earnings opportunities, improve access to basic services, or increase the impact of education and health interventions. ICTs also give the poor a voice to demand government support and reform. Recent advances in ICT can also provide people with sensory disabilities an effective channel to access information and communicate efficiently with the rest of society.

INFORMATION LITERACY

Information literacy is the ability to locate, evaluate, manipulate, manage and communicate information from different sources. As learners become increasingly information-literate, they develop skills in discrimination, interpretation and critical analysis. ICTs offer opportunities for higher-order thinking and creativity in processing, constructing and conveying knowledge (Draft White Paper on e-education: 2003).

INTERACTIVE WEBSITES

Interactive websites provide standards-based cross-curricular web resources designed to enhance online learning opportunities. These sites interact with the user usually through either

a text-based or graphical user interface. Interactive websites enable real-time communication and/or transactions between the user and the website (Draft White Paper on e-education: 2003).

INFORMATIONAL WEBSITES

Informational Websites are websites that present information only and do not allow for any interactivity or transactions (Draft White Paper on e-education 2003).

SYNCHRONIC COMMUNICATION

According to The Free Dictionary (2004: http://www.thefreedictionary.com/), synchronous refers to that which occurs or exists at the same time or having the same period or phase.

Synchronous digital communication pertains to a transmission technique that requires a common clock signal (a timing reference) between the communicating devices in order to coordinate their transmissions.

According to Numminen (2004: http://www.uta.fi/laitokset/fill/english/onp/ 2000rn.htm), synchronic communication, for example chatting (writing) on the net, usually motivates the learner, because the communication is spontaneous in the same way as it is in oral communication. This spontaneity makes it possible for the persons communicating to give and receive immediate response and feedback.

Another clear advantage of synchronic communication is the fact that more learners take part in the conversation compared to ordinary classroom conversation exercises. When the conversation takes place on the screen, the learners usually feel that they have more time to consider their answers. Moreover, the learners are freed from "stepping on the stage". In other words, they feel it is easier to take part in the conversation, because they can do that without having everybody looking at them. However, there is always the risk that in bigger chat groups the learners with lower language skills do not have enough time to read the responses on the screen and therefore are unable to take part in the conversation. Also, one might be a bit sceptical as to how a chat room could be organized in a language classroom in such a way that it would really serve educational purposes. The informal style of the conversation may lead the learners to discuss themes quite different from those given by the teacher. On the other hand, if the main goal of a chat room is to encourage the learners to communicate then a chat room might be an effective tool.

ASYNCHRONIC COMMUNICATION

According to The Free Dictionary (2004:http://www.thefreedictionary.com/), asynchronous refers to that which does not occur or exist at the same time or having the same period or phase.

Asynchronous digital communication pertains to a transmission technique that does not require a common clock between the communicating devices.

Probably the most well known form of asynchronic communication is e-mail. Other possibilities of asynchronic written communication are, for example, newsgroups and bulletin boards.

As an example of asynchronic written communication, Numminen (2004: http://www.uta.fi/laitokset/fil1/english/onp/ 2000m.htm), mentions a study conducted by Seppo Tella, in which he observed one-school semester Finnish senior secondary school learners and their e-mail correspondence with learners in different countries. Tella stated that compared to traditional classrooms, the teaching in these groups were more learner-oriented. Moreover, the learners began to help each other in reading, understanding and writing texts. They started to adapt features of process writing without being especially guided to do so. They rewrote their texts several times in order to end up with as comprehensible and grammatically correct text as possible, which could then be sent to their English speaking friends. In addition to that, the learners used a variety of different genres, including some not normally practised that much in language classes. Besides narrative and descriptive genres, the learners used personal, expressive and argumentative genres. The quality of the texts improved significantly and Tella argues that this is due to the fact that writing to a foreign learner motivated the learners much more than writing merely for a grade.

Compared to synchronic written communication, asychronic communication has one clear advantage and that is the fact that it gives the learner more time to consider and prepare his/her answer. In other words, there is not such time pressure when writing e-mail as there is when one takes part in a chat conversation. Therefore, synchronic communication like e-mail for example, can be a very useful tool when trying to encourage the shyer or less advanced learners to take part in communication. E-mail allows them plenty of time to prepare their answers before sending them and to process the responses received.

INTERNET

According to Challoner (2002: 35), the prefix 'inter' means between and 'net' refers to something that is linked in various directions. Think of many spiders and webs that are linked to each other – that could then be called a network. The Internet consists of thousands of computers all over the world that is connected to each other. It is a set of networks across which text, graphics, pictures, and even sound can be transported. Mackinnon 2003: 18 explains that it is possible to sit at a computer that is connected to the World Wide Web and access information from all over the world.

According to Resnick (1997:106-108), the Internet is often called a global village, suggesting a huge but close-knit community that shares common values and experiences. The metaphor is misleading. Many cultures coexist on the Internet and at times clash. In its public spaces, people interact commercially and socially with strangers as well as with acquaintances and friends. The city is a more apt metaphor, with its suggestion of unlimited opportunities and myriad dangers.

INTERNET SERVICE PROVIDER (ISP)

An Internet service provider is a company or organisation that provides a user with a connection to the Internet (Draft White Paper on e-education 2003).

KNOWLEDGE MANAGEMENT

The Brint Institute (1994-2004: http://www.kmnetwork.com/kmdefs.htm), explains that Knowledge Management caters to the important issues of organizational adjustment, survival, and competence in the face of escalating environmental change. Mersham and Skinner (2001a: 137) state that today we live in an information society in an information age, also called the Digital Age. Knowledge Management is based on recognition that an organisation's people, and the knowledge that they have, are central to success in the Digital age.

Mersham and Skinner (2001a: 137), further define knowledge management as the discipline of capturing knowledge-based competencies, and storing and diffusing them in order to add value to a business. Knowledge management seeks to set up a technique whereby the implied knowledge of a member of an organisation is externalised into precise knowledge that is accessible through an information technology system

LOCAL AREA NETWORK (LAN)

A local area network is computers and other devices that are spread over a limited area and that interact through a common platform (Draft White Paper on e-education: 2003).

NETWORK INFRASTRUCTURE

The physical plant of wires, switches, routers, hubs, satellites, broadcast towers, dishes and other hardware that allows communications signals to be delivered across networks (Draft White Paper on e-education: 2003).

NETWORK SECURITY

Any effort made to protect a network from danger, risk of loss or unauthorised access; in other words, to make the network safe from intruders, errors and other threats (Draft White Paper on e-education: 2003).

ONLINE LEARNING

Online learning refers more specifically to the use of the Internet and associated web-based applications as the delivery medium for the learning experience (Draft White Paper on e-education: 2003).

ONLINE BOOKS

Online books are electronic books, which can be downloaded from the Internet or used while a person is connected to the Internet. These books (or magazines) may be in html or portable document format[6] (PDF) format. As examples the author refers to an electronic book by Suler in chapter 5 and the online version of the Scientific American magazine in various chapters on this dissertation. Probably as an advantage, online books are easily and constantly updated to reflect new changes or ideas. This reflects the ephemeral nature of the Internet.

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[6] PDF is the file format for representing documents in a manner that is independent of the original application software, hardware, and operating system used to create those documents. A PDF file can describe documents containing any combination of text, graphics, and images in a device-independent and resolution independent format. These documents can be one page or thousands of pages, very simple or extremely complex with a rich use of fonts, graphics, colour, and images.

PORTAL

According to The Free Dictionary (2004: http://www.thefreedictionary.com/), a portal is a website which is considered as an entry point to other websites, often by being or providing access to a search engine.

A portal is a website that collects content and provides a method for accessing that content. It is a centrally managed tool, a content and information-sharing website, containing communications and group effort applications for teachers and learners. It can serve as a basis for building web-based resources for teachers, learners and the community (Draft White Paper on e-education: 2003).

PRIVACY POLICY

The privacy policy is the policy under which the company or organization operating a Web site handles the personal information collected about visitors to the site. Many Web site operators publish their privacy policy on their Web site. The policy usually includes a description of the personal information, which is collected by the site, how the information will be used, with whom it will be shared, and whether the visitors have the option to exercise control over how their information will be used. It is the stated methodology used by a website for handling information collected about users of that website (Draft White Paper on e-education: 2003).

SATELLITE

Williams (1992: 396) defines a satellite in communications as a radio or television receiving and transmitting device orbiting the earth and capable of broadcasting signals over a wide area.

According to Iridis Encyclopaedia (2004: http://www.iridis.com/glivar/Arthur_C._Clarke), Arthur Charles Clarke proposed that geo-stationary satellites would make ideal telecommunications relays. He proposed this concept in a scientific paper titled "Can Rocket Stations Give Worldwide Radio Coverage?" published in *Wireless World* in October 1945. His concept was a success. The geo-stationary orbit is now known as the Clarke orbit in his honour.

SCALABILITY

According to the Free On-line Dictionary of Computing (2004: http://dictionary.reference.com/search?q=scalability&r=67), scalability refers to how well a solution to some problem will work when the size of the problem increases? For example, a

central server of some kind with ten clients may perform adequately but with a thousand clients it might fail to meet response time requirements. In this case, the average response time probably scales linearly with the number of clients. We say it has a complexity of "N" but there are problems with other complexities that need to be addressed.

Scalability is the ability to expand the number of users or increase the capabilities of a computing solution without making major changes to the systems or application software. It is the ability of a system - including both hardware and software - to handle larger loads when required (Draft White Paper on e-education: 2003).

TELECONFERENCING

The use of audio, video or computer equipment linked through a communications system to enable geographically separated individuals to participate in a meeting or discussion (Draft White Paper on e-education: 2003).

TERMINAL

A terminal is a device that allows one to send commands to a computer somewhere else. At a minimum, this usually means a keyboard and display screen and some simple circuitry. Usually one will use terminal software in a personal computer - the software pretends to be a physical terminal and allows one to type commands to a computer somewhere else. It may refer to an access device that enables the user to view web pages and transmit e-mail (Draft White Paper on e-education: 2003).

UNIVERSAL SERVICE AGENCY

The Universal Service Agency (USA) was established under the Telecommunications Act 103 of 1996. It operates under the regulatory and policy framework enshrined in the Act as amended in the year 2001 and Ministerial Policy Directions issued in the same year. Universal services are a reliable connection to the communication network that enables any form of communication to and from any part of South Africa. Universal access is the ability to use the communication network at a reasonable distance and affordable price, which provides relevant information and has the necessary capacity in under-serviced areas where over 60% of the South African population resides (Draft White Paper on e-education: 2003).

CONCLUSION

The key concepts relating to the understanding of this research on e-education are defined in this chapter. In subsequent chapters, the author discusses how each of these concepts forms

an essential part of e-education. In chapter 4 he discusses theories, which relate to communication and e-education. These theories form the theoretical framework against which he evaluates the status of e-education in KwaZulu-Natal (KZN).

THEORETICAL GROUNDING FOR E-EDUCATION

INTRODUCTION

This chapter deals with the pertinent concepts of communication and learning, the relationship between these concepts, and how they form the basis for e-education. The chapter is divided into two parts:

- o Theories of Learning, which relate to communication and e-education

- o Theories of Representation, which relate to communication and e-education

THEORIES OF LEARNING THAT RELATE TO COMMUNICATION AND e-EDUCATION

INTRODUCTION

With e-learning and e-education there is a real danger that the use of electronic resources becomes an end in itself, not a means to an end. To ensure that the end goal — learning — is kept in mind, this section focuses on critical aspects of the nature of learning. Towards the end of this section the principles of learning are related to e-learning specifically.

EXPERIENTIAL LEARNING

Henderson (2004: 184-189), suggests that experiential education should ask questions about the type of *evidence* that exists and how evidence leads to future practice. Theory with evidence can further build the body of knowledge. Education needs to combine theory with evidence. Also learning should consider learner inputs and outcomes. Henderson argues that good instruments to assist with providing experiential learning are a necessity.

Galloway (2004: 200-2002) strongly asserts that continued exploration of qualitative methods of learning develops our understanding of the process and depth of experiential education. Experiential education cannot be explained in terms of outcomes without understanding the inputs of experience. Learning has to be supplemented by an increasing interplay of theory and evidence. Knowing is accompanied by the lived experience.

Rogers[7] (2003: http://tip.psychology.org/rogers.html), distinguished two types of learning: cognitive and experiential. The former corresponds to academic knowledge such as learning vocabulary or multiplication tables and the latter refers to applied knowledge such as learning about engines in order to repair a car. Experiential learning addresses the needs and wants of the learner. Rogers lists these qualities of experiential learning: personal involvement, self-initiated, evaluated by learner, and pervasive effects on learner.

To Rogers, experiential learning is equivalent to personal change and growth. Rogers proposes that all human beings have a natural propensity to learn; the role of the teacher is to facilitate such learning. This includes:

- o Setting a positive climate for learning;

- o Clarifying the purposes of the learner(s);

- o Organizing and making available learning resources;

- o Balancing intellectual and emotional components of learning;

- o Sharing feelings and thoughts with learners but not dominating.

According to Rogers, learning is facilitated when the learner participates completely in the learning process and has control over its nature and direction. It is primarily based upon direct confrontation with practical, social, personal or research problems.

Self-evaluation is the key method of assessing progress or success in experiential learning. Rogers also emphasizes the importance of learning to learn and an openness to change. Roger's theory of learning evolved as part of the humanistic education movement.

Scope and Application of Experiential Learning

Roger's theory of learning originates from his views about psychotherapy and humanistic approach to psychology. It applies primarily to adult learners and has influenced other theories of adult learning and examines the significance of learning to education:

- o Significant learning takes place when the subject matter is relevant to the personal interests of the learner.

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[7] Also referred to Rogers & Freiberg 1994, *Freedom to Learn (3rd edition)*.

o Learning which is threatening to the self (e.g., new attitudes or perspectives) is more easily assimilated when external threats are at a minimum.

o Learning proceeds faster when the threat to the self is low.

o Self-initiated learning is the most lasting and pervasive.

It is self evident that experiential learning involves full participation of the learner in acquiring new knowledge. Participation allows the learner the freedom of exploration and the opportunity of purposefully learning in a non-threatening environment. The author proposes the learning theory of constructivism as a foundation for online experiential learning. What follows is an expose of how online learning can be applied "constructively" to facilitate experiential learning. Constructivism facilitates personal involvement in learning. What follows is an approach in which online learning provides an environment for experimental learning to succeed in urban and rural environments even in the absence of physical experimental/experiential environments.

CONSTRUCTIVISM

According to Gold (2001:4), constructivism is an epistemology of how people learn and assimilate new knowledge. Humans are active, knowledge-searching creatures that transform and interpret *experience* using developed biological and mental structures. They assimilate new knowledge by producing cognitive structures that are similar to the experiences they are engaged in. They then accommodate themselves to these newly developed knowledge structures and use them within their collection of experiences as they continue to interact with the environment. Knowledge is not separate from but rather embedded within experiences and interpreted by the learner. Knowledge then is about interpretation, and making meaning of the environment. In other words, though we may more or less share one reality, each of us conceives of it in different ways based on our prior experiences, belief structures and perspective. To learn, therefore, is to communicate and demonstrate understanding of the world.

According to Doolittle (2004: http://edpsychserver.ed.vt.edu/ workshops/tohe1999/text/ doo2.doc), constructivism is a theory of learning that has roots in both philosophy and psychology. He deduces that constructivism occurs when learners actively construct their own knowledge and meaning from their *experiences*. The following are derivatives of constructivism:

o Knowledge is not passively accumulated, but rather, is the result of active cognising by the individual;

o Cognition is an adaptive process that functions to make an individual's behaviour more viable given a particular environment;

o Cognition organises and makes sense of one's experience, and is not a process to render an accurate representation of reality;

o Knowing has roots in both biological/neurological construction, and social, cultural, and language based interactions.

Constructivism acknowledges the learner's active role in the personal creation of knowledge, the importance of experience (both individual and social) in this knowledge creation process, and the realisation that the knowledge created will vary in its degree of validity as an accurate representation of reality.

CONSTRUCTIVISM AND ONLINE EDUCATION

Doolittle further outlines the following basic principles of constructivism, which forms a foundation for optimising teaching and online learning.

o The Essence of Experience in Learning;

o The Role of Social Interaction in Learning;

o The Relevance of Content and Skills to the Learner;

o Using the Learner's Prior Knowledge to Encourage Learning;

o The Role of Formative Assessment in Online Learning Environments;

o Training Learners to Construct Knowledge in Online Learning Environments;

o The Role of the Teacher in Online Learning Environments;

o The Use of Multiple Perspectives in Online Learning.

The Essence of Experience in Learning

Whether building accurate representations of reality, common meanings in social activities, or personal coherent models of reality, experience is vital. As Galloway, (2004: 200-2002), and Henderson (2004: 184-189), mentions earlier, effective learning can occur when theory is combined with experience; thus, experience is a primary catalyst of knowledge construction. Experience provides the activity upon which the mind operates. In addition, knowledge

construction is enhanced when the experience is authentic. For the cognitive constructivist, authentic experiences are essential so that the individual can construct an accurate representation of the "real" world, not an unnatural world. For the social and radical constructivists, authentic experiences are important so that the individual may construct mental structures that are viable in meaningful situations.

Henderson (2004: 184-189), suggests that good instruments to assist with providing experiential learning are a necessity. Online education is very effective in providing virtual environments in which one can simulate real-world events. In order for online education to adequately satisfy this pedagogical statement the online environment should provide complex, culturally relevant, ill-structured domains within which the user can operate and "live." Virtual reality, simulators and micro worlds focus on this concept.

The Role of Social Interaction in Learning

Gunawardena, Lowe and Anderson (1997: 397-431), state that constructivism emphasizes social interaction as a basis for knowledge construction. Social interaction provides for the development of socially relevant skills and knowledge. In some cases, such as cultural customs and culturally arbitrary rituals (e.g., greetings, gender relations, dress), knowledge can only be attained through social contact. In addition, as an individual gains experience in a social situation, this experience may verify an individual's knowledge structures or it may contradict those structures. If there is contradiction or confusion, then the individual should accommodate this contradiction in order to maintain either an accurate model of reality or a coherent personal or social model of reality.

Online education provides a unique opportunity for learners to engage in social negotiation and mediation. The use of both asynchronous (e.g., email and threaded discussions) and synchronous (e.g. chat rooms) online communications allow for social negotiation and mediation to occur across both time and distance.

The Relevance of Content and Skills to the Learner

Constructivism emphasizes the concept that knowledge serves an adaptive function. Mason (1992: 105-116) suggests that if knowledge is to enhance one's adaptation and functioning, then the knowledge attained (i.e., content and skills) should be relevant to the individual's current situation, understanding, and goal. This relevancy is likely to lead to an increase in motivation, as the individual comes to understand the need for certain knowledge. Ultimately,

experience with relevant tasks will provide the individual with the mental processes, social information, and personal experiences necessary for enhanced functioning within one's practical environment.

Online education is capable of making vast amounts of very diverse information, knowledge, and skills available to the learner. Online education is capable of providing relevance as long as the learner is able to self-select a relevant topic, process, or skill. However, the volume and diversity of information raises its own problems. While the learner should be able to self-select, the role of the teacher as facilitator[8] of knowledge construction is to provide direction in terms of relevancy, and to ensure that the learner is not frustrated by information overload. This suggests that the mentor/teacher has to carefully research a selection of online material that meets the course outcomes as a basic starting point. The Communication Science Department at the University of Zululand has an effective online education programme. It is based on a hybrid programme of tradition and online education. Lectures are available online and the lecturer acts as facilitator and knowledge manager. The teacher thus guides the learner to work with the relevant knowledge.

Using the Learner's Prior Knowledge to Encourage Learning

Facilitating the different phases of learning, among others requires that the teacher act as a knowledge manager. According to Mason (1992: 105-116), this process of knowledge management requires that the teacher should begin with an individual learner's prior knowledge and guide her/him to first construct knowledge of absent or poorly-learnt information before proceeding to analogically construct new knowledge beyond what s/he already knows.

Therefore, understanding a learner's behaviour requires an understanding of the learner's mindset, that is, an understanding of the learner's understanding. Only by attempting to understand a learner's prior knowledge will the teacher be able to create effective experiences, resulting in optimal learning.

It is, therefore, necessary to ensure that a well-constructed method is in place to ensure that there is a significant rapport between the learner and the online educational environment. In a

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[8] The educational system is now focused on learning rather than on teaching. The developments of learning theory have changed the nature of learning and the perception of the learner. Knowledge is considered as socially constructed through action, communication and reflection involving learners. Teachers then will gradually become advisors, managers and facilitators of learning rather than providers of information (Bates, 1993).

synchronous environment mediated by the teacher, a learner's prior knowledge may be probed at the beginning of instruction and instruction may then be adjusted based on the feedback from the learner; however, in an asynchronous environment, this type of probing and responding is less fluid and flexible.

The Role of Formative Assessment in Online Learning Environments

The acquisition of knowledge and understanding is an ongoing process that is heavily influenced by a learner's prior knowledge. Unfortunately, knowledge and understanding are not directly visible, but rather should be inferred from outcomes (activities). According to Henri (1992:115-136), a teacher should continually assess the individual's knowledge, to take into account an individual's current level of understanding in on ongoing teaching and learning process. This formative assessment is necessary to accurately create the next series of experiences and activities for learners.

While online environments are capable of frequently assessing learners during instruction, difficulty arises in using this formative assessment to guide further instruction. The reason for assessing learners formatively is to make adjustments to instruction that takes into account the learner's current level of understanding. Instructors will often provide learners with "self-check" quizzes that assess learners during various parts of instruction; however, the use of these quizzes is usually marginal, providing feedback to learners so that learners have a better understanding of their learning. Rarely is this knowledge used to alter subsequent instruction.

Training Learners to Construct Knowledge in Online Learning Environments

The underlying theory of constructivism is that learners are active in their construction of knowledge and meaning. According to Ahern, Peck and Laycock (1992: 291-309), this activity involves cognitive management and self-organisation of experience, and requires that learners regulate their own cognitive functions, reconcile new meanings from existing knowledge, and form an awareness of current knowledge structures. Learners mentally reflect on the use and nature of objects and then construct new knowledge by generalising, or abstracting, new relationships.

In most online education environments, self-regulation, self-mediation, and self-awareness are requirements for successfully engaging in that environment. Online education typically requires learners to be more involved and more persistent relative to the educational environment. One aspect of online education that is currently lacking is educating the learner

in the processes necessary to successfully engage in online education. Learners often begin an online educational experience with no instruction concerning how online education differs from tradition classroom education. This pedagogical statement is attainable, but is currently not being addressed adequately.

The Role of the Teacher in Online Learning Environments

Teachers, in the cognitive constructivist perspective, are usually portrayed as instructors who "transmit knowledge." The teacher instructs, while the learner learns. According to Mowrer (1996:207-241), in the cognitive constructivist perspective, the role of the teacher is to create experiences in which the learners will participate that will lead to appropriate processing and knowledge acquisition.

The "teacher as guide" metaphor indicates that the teacher is to motivate, provide examples, discuss, facilitate, support, and challenge, but not to attempt to act as a knowledge conduit.

While it is still possible for instructors to teach and to use direct instruction during an online educational experience, it is not nearly as easy as it is when one is teaching in a classroom. As a result, one is likely to find less "instructing" and more guiding and facilitating in online education. In addition, online education can be effectively constructed to emphasize a facilitating role for instructors while learners engage in simulations, web-based data collection, and ill-structured problem solving. The self-regulatory and self-mediated nature of online education promotes the instructor taking the role of guide or coach.

The Use of Multiple Perspectives in Online Learning

A learner's understanding and adaptability is increased when he or she is able to examine an experience from multiple perspectives. These perspectives provide the learner with a greater opportunity to develop a more viable model of their experiences and social interactions.

According to, Anderson and Garrison (1995: 183-199), online education with a diverse group of learners, is ripe for the presentation and experience of multiple perspectives. Online education has easy access to international and culturally diverse resources, including diverse populations. With the passing of time, a greater amount of diverse articles and presentations are accessible online, providing learners with the resources for multiple perspectives.

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THEORIES OF REPRESENTATION

OVERVIEW OF THEORIES OF REPRESENTATION

In an article on the essential differences between scientific reasoning and every-day reasoning, entitled "How science reveals, and how humans perceive the universe to be," Klopper (1999: 248-272), points out that theory of knowledge can broadly be classified into phenomenological theories and interpretivist theories. According to Klopper phenomenological theories are predominantly used in the natural sciences. Such theories are based on the assumption that one primarily has to make a detailed observation of phenomena and systematically describe one's observations in order to give a good account of how things are and interrelate in nature. According to Klopper interpretivist theories, by contrast, predominantly are used in the human sciences, and assert that human existence and the activities in which humans engage, are more complex than might be initially seem the case, based on observation alone. Interpretivist theories state that humans construct internal mental representations, also known as mental models, of themselves and their place in the environment. Interpretivism implies that humans have different understandings of events because of their prior life experience and the knowledge that they have abstracted from those experiences in the form of memories. In this chapter the author takes an interpretivist point of departure to give an account of current theories of how people learn, of analogy as a primary process of learning and of conceptual blending as a precise explanation of how analogical learning takes place.

AN EXPLANATION OF HOW HUMANS PERCEIVE THEIR ENVIRONMENT

According to Klopper (1999: 248-272), the average learner uses personal mental models to conceptualise the natural order of things. Our everyday perceptions of how things are differ markedly from the mental model of reality that science reveals to us. These models are based on each individual's perception of environment and are structured according to set cognitive principles. In the course of the 20th century humanity has formulated a number of theories of knowledge to give an account for our understanding of reality.

Popular theories (folk theories) represent learning in terms of its physical manifestation i.e.: what one sees is what one gets. The perception of the learning environment is based on its physical attributes. Scientific theories of learning emerge as a contrast to popular theories of learning. Scientific theories suggest that reality is more complex than it appears to be, thus knowledge acquisition has to be formalised.

According to Klopper (1999: 248-272), the major lesson of 20th century science for the learner is that nothing is, as it seems, that reality differs markedly from the personal mental models that we individually construct to make sense of our place in the natural order of things. For instance, Klopper says a person reclining against a rock under a tree on a cloudless, windless day, looking at a field where not even a blade of grass stirs, perceives everything around him to be motionless. He does not have the sensation of spinning around the axis of planet earth, which in turn revolves around the sun, which in turn is thundering around the core of the Milky Way at thousands of kilometres an hour. According to Klopper one way in which humans create folk models that underdetermine the complexity of their environment, is through metaphors. The entities that are analogically equated in metaphors (e.g. *time is money*), cannot be considered to be literal equivalents. Pertinent examples in the case of e-learning are the concepts *cyberspace*, *web surfing*, *browsing*, *chatting* and *cyber sex*. The naïve folk model approach sees cyberspace or a chat room as a physical entity. Although we logically know that cyberspace is not a physical space, but a sort of mental space in a virtual environment. Because of the capacity that humans have for envisaging, imagining and make-believing, such mental constructs in the knowledge domain of *virtual reality* nonetheless have attained psychological reality as explanations for how instruments such as networked computers communicate with accessible servers world-wide that contain knowledge that can be retrieved and used on one's local computer. While in reality internet communication entails protocols that send electrons over copper cables, light pulses through fibre optic cables, or radio waves through space, from a local computer to a remote one and that returns retrieved information in the same way, computer users experience the process as going on a journey, as travelling somewhere, etc.

The virtual world that becomes accessible in this way can be used to assist a child sitting in a typical South African rural class to gain real understanding of how people live elsewhere, and how other environments are in relation to her/his own local environment. Where chalkboard representation are sure to fail, the use of images, text and sounds about "elsewhere" can help such a learner to *virtually experience* and to comprehend marine ecology or the geography of the Nile. The stimulation that e-education provides can, therefore simulate the real learning environment to provide greater understanding of those physical attributes that are beyond the boundaries of our present horizon. The effect of simulation is further deliberated later in this dissertation.

By using virtual means, e-learning, could render concepts about people, places, events elsewhere, and even abstract relationships, more readily understandable. What learners learn,

should relate to the three-dimensional environment in which the live. When children spin around like a top while playing, and then stand still, it will seem to them as if everything else in the room is spinning around them. The virtual reality of cyberspace can however provide the resources to teach them that contrary to what they feel, it is not the room that is spinning around them, but the fluid in the balance organs in their inner ear that momentarily keeps on spinning while they are already stationary.

Virtual learning environments, also sometimes called *virtual worlds*, while by definition not being *real*, can therefore enable learners to construct realistic and scientific mental models of complex relationships in their physical environment that would otherwise remain abstract. When a mathematics or physics teacher teaches learners about the sine curve (y=sin x) in the traditional classroom, the three dimensional waveforms of sine waves are reduced to two-dimensional representations. A learner may go through an entire lifetime without having a true perspective of sine waves in the three-dimensional world. Online virtual laboratories are able to provide the learner with true reflections of the real world. Refer to two and three-dimensional reflex ions of the equation y= sin x in figure 2. Note that in the figure 2 below, the waves would actually be moving when observed online.

Virtual laboratories simulate the real world on the learner's desktop with minimal costs when compared to doing the actual experiment in class. In the current public school it is unaffordable to perform experiments in the classroom. Most experiments are expensive and unobtainable. Raoul is a grade 9 pupil at Richards Bay secondary school. His learning experiences are based purely on textbook theory without any practical examples from the physical environment. For example, he has an entire set of notes on cam shafts (with a host of incorrect sketches) and is required to understand movement of these shafts without even seeing a dead cam shaft. Fortunately, he is able to go online at home and virtually experience movement of cams in various settings. This experience enables him to provide a clearer perspective of this topic to his peers and teacher.

Figure 2: Virtual laboratories transform one dimensional settings to 2 and 3-D settings.

Learners / people are intrigued by the idea of seeing things move, of moving themselves, and of being part of some event. Klopper (2004: manuscript) argues that the emergence of the Internet as redefining feature for living, learning and relaxation in the 21st century is related to the importance that humans ascribe to a metaphor that associates learning with moving and going on a journey.

At the beach "surfing" entails a range of pleasurable physical activities involving precariously balancing on a board while being carried along by waves that break on the beach. By contrast "surfing the net" involves minimal activity, but a strong a belief system that metaphorically associates the emotive state of pleasure and exhilaration, caused by visual experiences evoked by material downloaded onto one's computer, with the hedonic real surfing experience. The two sets of activities are equitable metaphorically because they both evoke the emotion of exhilaration. Surfing the net is actually a mental journey, which one undertakes in the World Wide Web. People, who reason by means of naive folk model principles, use metaphors to portray a sort of journey. A person gains new knowledge as s/he progresses on a journey. The use of metaphors in e-learning suggests a kind of learning experience as the learner goes on the journey (into cyberspace). When the learner "travels" through cyberspace, s/he undertakes a journey of experience and s/he begins to resolve inner conflicts associated with mundane forms of learning. The learner engages in an internal dialogue, also known as intrapersonal communication, in the process of making sense of inner experiences. The inner reasoning that forms part of gaining new insights on one's own, means that learning is an intrapersonal act of communication. e-Learning enhances intrapersonal communication as part of experiential learning. It should be understood that communication is a form of survival. Humans have a natural affinity to learn and to share knowledge to survive.

ANALOGICAL THINKING AS LEARNING

Learning is an analogical process. We learn by comparing something unfamiliar with something familiar to make it easier to understand the unfamiliar thing. To use an image, we see what is new by standing on the shoulders of those that have come before us. Klopper 2003: 3 schematises analogical thinking as follows:
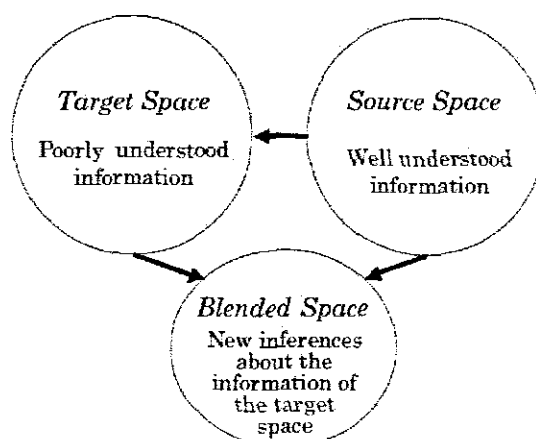
Figure 3: Klopper 2003's representation of analogical thinking

Analogical thinking displays a leaning towards imagery. The strong point of these representations is that the high level computer generated graphical images can be used to describe physical objects in the didactic environment with more flexibility.

Fauconnier and Turner 2002's theory of conceptual blending is a prominent theory of how humans interrelate and integrate concepts while they gain new insights about their environment and about our knowledge of our environment. Taking Fauconnier and Turner 2002 as point of departure Klopper (2003: 293), explains that one extracts apparently unrelated, but comparable concepts from one's broad domains of knowledge by associating them with one another in two smaller sets of knowledge. These smaller sets are termed source and target spaces, or in Fauconnier and Turner's (Fauconnier and Turner (2002: 217)) theory, input spaces. Such theories imply that the resultant insights are obtained when well-understood concepts from a source space are interrelated with concepts from a target space. This process of interrelation serves as basis for new insights by foregrounding similarities between the sets of knowledge, while keeping differences in the background.

Foregrounding similarities and keeping differences in the background analogically interpret target space concepts interpreted in relation to source space concepts. Such source space concepts can therefore be seen as a sort of a template for foregrounding major aspects of poorly understood target space concepts. By superimposing source space concepts onto target space concepts, one forms new insights about the target entity by suppressing dissimilar concepts. Well established e-education practices would for example allow the learner to examine youth programmes in his / her rural or disadvantaged community against those of youths in another village of another country. Similarities in behaviour patterns may be fore-grounded whilst keeping differences in the background.

CONCEPTUAL BLENDING AS ANALOGICAL THINKING

According to Fauconnier and Turner (2002: 217), people consider alternatives, simulate, make models, and propose hypotheses. Our species has an extraordinary ability to operate mentally on the simulated environment, and this ability depends on our capacity for advanced conceptual integration.

According to Fauconnier and Turner (2002: 17-101), conceptual blending accounts for a person's cognitive capacity to interrelate and blend concepts extracted from his vast conceptual network of knowledge. It is a symbolisation process that selectively inter-relates concepts from two separate cognitive domains, a source space and a target space to conceptualise a new perceived relationship known as a blended space. The process is used in the perception of all kinds of symbolic interrelationships; such as discovery, conceptual projection during mathematical calculations, and of course in perceiving grammatical and me-taphoric interrelationships.

People in different disciplines have different ways of thinking. Fauconnier and Turner, (2002: 17), stress that the adult and child do not think alike. The mind of the genius differs from that of the average person and that automatic thinking, of the sort we do when reading a simple sentence, is far beneath the imaginative thinking that goes on during the writing of a poem. Automatic thinking would be possible if the learner has had the opportunity of engaging in experiential learning. For the rural and most public schools in KwaZulu-Natal, online classrooms (as explained above) provide the most feasible means of offering virtual experiences that could stimulate cognitive imagination.

Conceptual framing has been shown to arise very early in the infant and to operate in every social and conceptual domain. Metaphoric thinking, regarded in the common sense view as a special instrument of art and rhetoric, operates at every level of cognition and shows uniform structural and dynamic principles, regardless of whether it is spectacular and noticeable or conventional and unremarkable. The skilled orator, the everyday conversationalist, and the child can use the various schemes of form and meaning, studied by rhetoricians.

Conceptual integration is another basic mental operation, which is highly imaginative, but crucial to even the simplest kinds of thought. It shows the expected properties of speed and invisibility.

Conceptual integration, as emphasised by Fauconnier and Turner (2002: 21), is indispensable not only for intellectual work, but also for everyday teaching and learning. When the science teacher helps us learn how to do titration by simulating the entire process via computer, it may look as if we are actually doing the titration. Performing the exact action may cause chemical spillage and results in burns or chemical wastage. Rather we should selectively combine the action of simulated chemical mixing with the action of titration and develop in the blend a new emergent process of titration.

The general purpose of conceptual blending is to understand that which is new or abstract in terms of that which is known or concrete. The act of blending entails that we analogically equate entities that we generally consider to be different in significant aspects by focusing on similarities between them. It is the similarities that enable us to project the features of the concrete entity onto the abstract entity, thereby arriving at a new understanding or blend of the abstract entity.

Cognitive pressures and principles guide the creation of blends, but in the case of titration[9], it is also guided by real-world affordances, including biophysics and chemistry. Most measurements that the scientist (learner / teacher) can imagine are impossible or undesirable to execute. But within the conceptual blend prompted by the instructor, and under the conditions afforded by the laboratory, the desired mixture will be emergent.

SYSTEMS THEORY IN EDUCATION

Systems theory, as described by Mersham and Skinner (2001a: 29), regards society as an integral whole, whose components work together. This approach emphasises the importance of equilibrium, balance, interdependence and the complexity of the various components or sub-systems that make up society. These sub-systems include the political order, the church, the media and commerce and industry. According to this view, communication is an integrating factor, which regulates and organises the sub-systems.

The primary functions of the system and its sub-systems are to maintain themselves. To reach this goal the system should maintain dynamic equilibrium or balance. This means that the components should provide for the needs of the system. Since what goes on in a system is

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[9] *Titration:* a method of calculating the concentration of a dissolved substance by adding quantities of a reagent of known concentration to a known volume of test solution until a reaction occurs. Encarta® World English Dictionary © 1999 Microsoft Corporation. All rights reserved. Developed for Microsoft by Bloomsbury Publishing Plc.

not always positive, and since society is never stagnant, the process is distinguished by integrative and disintegrative processes of social change. If negative changes are introduced that endanger the system's survival, feedback (communication) becomes the means used to restore equilibrium.

Essential to a system's theory perspective on new media technology is the notion of complexity and feedback. Complexity, which refers to the level of diversity in a system, is a basic quality of all systems. It acts as an important means as to how any system responds to input stimuli or change in its environment.

One of the pioneers in the study of complexity in systems theory is Gell-Mann, a Nobel Prize winner. Gell-Mann (1994: http://www.santafe.edu/sfi/People/mgm/mgm quark.html), suggests that complex systems are capable of adaptive behaviour, and is able to evolve. The functioning of an adaptive system is dependent on the important role of feedback, as communication.

Such complex adaptive systems are especially relevant to an understanding of new media technologies. This is apparent with the advent of artificial intelligence and artificial life, the interplay between complex systems of business, government and other institutions and media technology.

e-Education specialists have developed educational games which are capable of adaptive behaviour. As the learner "plays" the programme mutates to cater for individual skill and ability levels. For example, the game Tibia 726 allows the learner to develop at his / her own pace and the game develop or change to accommodate the learner.

e-Learning is a powerful learning tool because it uses dynamic visual images. It allows the learner to invoke the folk theory that one is moving while one is stationary. Computer games are the new development of story telling. These games allow the learner the opportunity to reside within the artificial virtual environment and engage in roles as an active participant of the game.

THE GLOBAL VILLAGE AND INTERNAL REPRESENTATION

According to Clapin (2000: http://www.phil.m q.edu.au/staff/ jsutton /PHI L363lecture3.html), it is relatively acceptable that minds have a representation of the world. If

one have the belief that the world is warming, it means that one represents the world as being in a certain way. Accepting this does not commit one to accept this state of the world.

According to The Free Dictionary.com (2004:http://www.thefreedictionary.com/), internal representation is a presentation to the mind in the form of an idea or image. The theoretical claim behind much of cognitive science is that objects similar to these familiar external representations exist in our brains and minds, and that these inner representational states play a crucial part, in explaining our behaviour and how we think.

Current cognitive sciences infer that there are inner mental representations, which cause and explain behaviour. Mental representation thus holds a crucial place in contemporary study of the mind. Thorough understanding of mental representation will make a significant contribution to the theoretical underpinnings of all the cognitive sciences.

A learner's internal representation is channelled by the amount of his / her exposure to environmental stimuli. As the transition to a knowledge-based economy accelerates, learners should have access to communication and information technologies in the classroom. Without these tools, learners will lack the necessary computer skills to compete in a digital world. Deploying computers in classrooms and connecting them to the Internet will enhance the learning process by providing learners and educators with access to information and teaching materials from around the world. Information technologies that offer new opportunities, efficiencies, and improvements in the education process are highly desirable because of the wider stimulation for internal representation.

Having a wider spectrum of stimuli encourages a more open forum for internal representation, which is more coherent with reality as it exists. Access to communication and information technologies in the classroom provides a learner with a wider scope for internal representation thus broadening his / her cognitive development. According to Greenspan (2004: http://www.clickz.com/stats/markets/education/article.php/3373681), despite findings that indicate problems with unsupervised exposure to ICTs in the classroom, learners are producing relatively good grades.

The modern programmable computer, through its forebear the Turing Machine, is capable of carrying out any finitely specifiable task (given enough time and memory). Such a powerful, flexible apparatus operates on the basis of internal representations; specifically, on the basis of binary representations of numbers, letters and truth-values.

Modern computers provide a small degree of proof of representational minds. Internal representations are essential to their operation, and there is good reason to believe that they can behave 'intelligently'. Computers demonstrate that internal representations may have a critical role in explaining intelligent behaviour.

USING REPRESENTATION IN E-LEARNING

When we imagine a scene or an object, it seems to us that we are observing a picture of that scene or object. The debate arises in interpreting the implication of this for understanding cognitive construction.

According to un-authored article (2004:http://www.gis.net/~tbirch/mi12.htm), pictorialism refers to mental images which are represented in the manner of pictures and according to Clapin (2004: http://host.uniroma3.it/progetti/_kant/field/mr.htm), descriptionalism refers to mental images represented in the manner of sentences. One needs to distinguish between the pictorial nature of the *experience of thinking* of the image, and the pictorial nature of the *representation*, which gives rise to the experience. It seems quite possible that a symbolic representation[10] (e.g. list of sentences) could give rise to an imagistic experience (e.g. a matrix).

A key point is that all systems of representation require decoding. Even pictures can be *culturally specific (e.g. photographs, mirrors), illustrating that one has to learn how to interpret the visual images contained in them.* When children are allowed the chance of being part of the global village, there is little discrepancy in decoding. Whilst images may be culturally specific, we observe that cultural boarders begin to disintegrate to form global cultures of a global village.

THEORETICAL FRAMEWORK

Learning entails a dual purpose:

- o Cognition for individual construction of meaning and

- o Communication for social construction of meaning

Individual learning is based on cognitive principals. Fauconnier and Turner's theory of conceptual blending is a prime example of a cognitive theory. The theory of conceptual

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[10] In the movie *Matrix Revolution 3* (2004), the use of words 'LOVE' and 'KARMA' reflect symbolic representations of individual's perception. This also relates to the process of decoding which is discussed in the next paragraph.

blending is important because it indicates how learning could take place in physical as well as virtual environments. It emphasises the metaphoric basis of thinking, according to which symbolic relationships can be used to let one thing represent another, also in the virtual environment. This implies that the use of virtual delivery of information, by means of ICTs in global networks or on personal computers, is not incompatible with experiential learning. It actually intensifies the learning process.

The theory of conceptual blending presents a rationale for how metaphoric thinking enables one to represent one thing with another using symbolic representation. The virtual environment actually enhances one's ability to learn to represent items. In real terms the symbols on the computer screen (monitor) are pixels. Such representations have a greater degree of reliability. Example: the river Nile is more realistically represented in a virtual environment rather than by using a white line on the traditional chalkboard or any other school textbook.

CONCLUSION

This chapter focussed on critical aspects of the nature of learning and representation, which relate to communication and e-education. Later in the chapter the principles of learning are related to e-learning specifically.

Constructivism, as an example of experiential learning, is discussed to show how experience corresponds to acquisition of academic knowledge. Constructivism is an epistemology of how people learn and assimilate new knowledge. The essence of experience in learning, whether in building accurate representations of reality, creating common meanings in social activities, or for generating personal coherent models of reality, is vital. This concept was used to express the viability of using virtual reality as a tool for experiential learning.

Later Klopper's 1999 model of how humans' perceive the environment was used as a cornerstone to examine theories of representation. Fauconnier and Turner's 2002 theory of conceptual blending is used to show how humans interrelate and integrate concepts while they gain new insights and knowledge of their environment. The concept of conceptual blending as a theory of representation has been used to explain how virtual environments are used favourably as learning environments. The stimulation that e-education provides can, therefore simulate the real learning environment to provide greater understanding of those physical attributes that are beyond the boundaries of our present horizon. This implies that the use of

virtual delivery of information, by means of ICTs in global networks or on personal computers, is not incompatible with experiential learning. It actually intensifies the learning process. This chapter reveals that virtual environments actually enhance one's ability to learn to represent items.

COMMUNICATION

INTRODUCTION

In this chapter, the author traces the development of learning from the combination of small group and to a lesser extent interpersonal communication to current Information Communication Technology and all contexts of mobile education. ICT to enable e-learning has been discussed. In the previous chapter the author discussed theories of learning and representation, which relate to communication. The concept of mobility has been a recent development of Information Communication Technology. With this development mentor and trainer are released from fixed geographical positions, e.g., in the physical classroom or from home to web server at school. Mobile devices allow both teacher and learner to be in any geographical location to engage in the communication process. A definition of mobile education is analysed. The technologies and factors that impact positively on the assimilation of mobile learning (mLearning) into education communities of KwaZulu-Natal are examined. The properties of mobile devices, which impact on the rate of assimilation of mLearning into these communities are scrutinised. Further, the author predicts how mLearning could change the work situation of education.

This chapter is divided into the following sections:

- o Communication

- o Communication and Technology

- o Communication In e-Education

- o Communication and e-Education: beyond Shannon and Mersham

COMMUNICATION

Encarta® World English Dictionary (1999) defines communication as:

"The exchange of information between individuals, for example, by means of speaking, writing, or using a common system of signs or behaviour."

According to Encyclopaedia Britannica Shanon in 1948 proposed a mathematical theory of communication in order to account for the quality of information transmitted over copper lines during telephonic communications. Shanon's original model has subsequently been represented graphically in one way or another by dozens of authors writing about the communication process. In the following section Shanon's original model is briefly explained. In the section thereafter Mersham and Skinner's 1999 adaptation of the General Communication Model is briefly explained as an example of such adapted models.

Shanon's original model is dealt with because it is pertinent to the quality of signals transmitted over electronic communication networks. These networks may include cases where electrons are transmitted over copper or networks where photons are pulsed through fibre optic relays, or networks where long-range radio frequency waves are transmitted via satellite. It could also include microwaves relayed between land-based towers, or Bluetooth empowered communication devices.

Mersham and Skinner's version of the general communication model is discussed because it firstly provides a useful starting point for an explanation of the general elements of any communication event. Secondly, it presents a springboard for a discussion of why one has to go beyond the limitations of the General Communication Model in order to address complex and dynamic aspects of communication such as the nature of intrapersonal communication/cognition (as manifested in the individual and social construction of meaning). Also, it accounts for the differences between cooperative, competitive and confrontational forms of communication.

SHANNON: COMMUNICATION INFORMATION THEORY

Shannon postulates a communication information theory, which is constructed against a mathematical framework. Shannon's Information Communication theory focuses on the problems embedded in sending and receiving messages and information. The theory is based on the idea that communication involves uncertain processes, both in the selection of the message to be transmitted and in the transmission of the message itself. His theory provides a way to measure this uncertainty precisely.

McEliece (1993-2001) states that in Shannon's theory, the actual meaning of the message is unimportant. Instead, the important qualities of communication are the amount of information that the message contains the accuracy of the transmission, and the quality of the

reception. All of these values are represented mathematically; so different messages and different communication systems can be compared, studied, and improved.

Shannon's theory measures the amount of information in a message by using units called bits, short for binary digits, which use only the numbers 0 and 1. Information theory provides a way to find the minimum number of bits required to communicate a given message. Information theory can also determine the maximum rate, in bits per second, at which a given communication medium can transmit reliable information.

Shannon's theory is primarily a theoretical study. However, it has had a profound impact on the design of practical data communication and storage system s, such as telephones and computers. The theory can be applied to both the transmission and the storage of messages, because storage is nothing more than transmission in time. For example, both making a telephone call to a friend in another city and tape recording a message for a friend to play later in the day involve the same issues of sending and receiving messages. In Shannon's theory, no fundamental distinction is made between these two types of problems.

Parts of a Communication System

When a message is sent from a sender to a receiver, the different parts of the communication system can be represented by the accompanying schematic figure 4, titled "Shannon's communication model," adapted from Shannon's work on information theory. The model he devised to represent a communication system consists of five major parts: the information source, the transmitter, the medium, the receiver, and the destination.
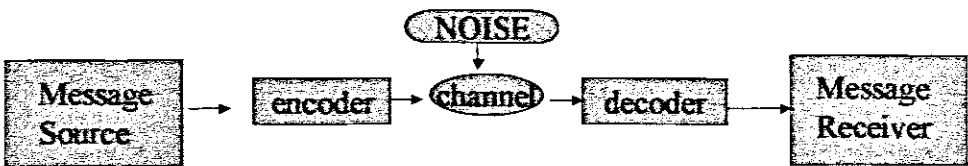
Figure 4: Shannon's communication model: 2000 Encyclopaedia Britannica, Inc.

The information source produces or selects the message or the sequence of messages to be transmitted to the destination. For example, the information source could be a distant spacecraft and the message could be an image of a planet, or the information source could be a rock-and-roll band and the message could be a new song.

The transmitter encodes the message into a signal suitable for transmission over the medium. For example, the transmitter could be the spacecraft telecommunication system that converts a photograph of Jupiter into a television signal. Another example would be the recording studio's audio equipment, which converts the rock-and-roll song into a sequence of tiny bits on the mirror like surface of a compact disc (CD).

According to McEliece (1993-2001), the medium in Shannon's model is the channel that is used to transmit the signal. The medium often contains disturbances, in the sense that when the signal arrives at the receiver, it may be slightly distorted. For example, the medium could be the millions of kilometres of empty space between Jupiter and Earth, with noise arising because the received signal is so weak. Or it could be the surface of a CD, with noise occurring because of fingerprints, dust, or scratches on the surface.

The receiver is a device that decodes (either exactly or approximately) the message from the received signal. It could be a large dish antenna or the electronics in a CD player.

The destination is the person (or thing) for which the message is intended. For example, the destination could be a teenager interested in planetary science or an astronomer interested in rock and roll.

Shannon's theory is the mathematical study of these five components, individually and in combination. Existing communication systems can be studied this way, and new systems can be designed based on the knowledge gained. For example, information theory can provide a way to measure the amount of information produced by a source or to measure the ability of a noisy medium to transmit information reliably.

Measuring Information: The Bit

In any communication system the message produced by the source is one of several possible messages. The receiver will know what these possibilities are but will not know which one has been selected. Shannon observed that any such message can be represented by a sequence of fundamental units called bits, consisting of either 0s or 1s. The number of bits required for a message depends on the number of possible messages: the more possible messages (and hence the more initial uncertainty at the receiver), the more bits required.

McEliece (1993-2001), uses a coin, as an example, which is flipped so that the outcome (heads or tails) is to be communicated to a person in the next room. The outcome of the flip

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of a coin can be represented using one bit of information: 0 for heads and 1 for tails. Similarly, the outcome of a football game might also be represented with one bit: 0 if the home team loses and 1 if the home team wins. These examples emphasize one of the limitations of information theory—it cannot measure (and does not attempt to measure) the meaning or the importance of a message. It requires the same amount of information to distinguish heads from tails as it does to distinguish a win from a loss: one bit.

For an example with more than two outcomes, more bits are required. Suppose a playing card is chosen at random from a 52-card deck, and the suit chosen (hearts, spades, clubs, or diamonds) is to be communicated. Communicating the chosen suit (one of four possible messages) requires two bits of information, using the following simple scheme:

O u tc o m e	B it P a tte rn
S p a d e s	0 0
H e a rts	0 1
D ia m o n d	1 0
C lu b s	1 1

Figure 5: Shannon's communication model: Using two bit information

Information Content of a Message

Shannon determined that the information content of a message is inversely related to its probability of occurrence. The more unlikely a message is, the more information it contains. Based on this concept, the exact information value of a message can be determined mathematically.
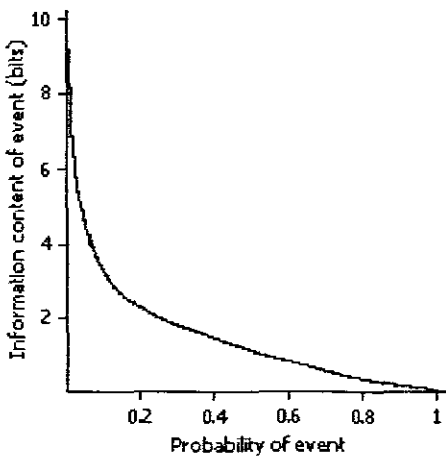
Figure 6: Shannon's communication model: Probability of an event

In the graph, the less likely or probable an event, the more information it conveys. The more possibilities a source contains, the more information it contains and, therefore, the more bits needed to represent the information content.

Medium Capacity and Disturbances

Shannon's theory is often used to design communication systems. An important property of a transmission system is its medium capacity. Sometimes known as the Shannon limit, medium capacity is a measure of the ultimate speed or rate at which a medium can transmit information reliably. The capacity of a particular system can be approached but never exceeded.

Shannon's theory says that if the transmitter is properly designed, information can be transmitted perfectly reliably at any speed up to the medium's capacity. However, if capacity is exceeded, then inevitably the message will be received at the destination with errors.

One factor that decreases capacity is unwanted information. Most communication mediums introduce some amount of distortion into the message. Disturbances interfere with messages and often cause errors to occur during transmission.

Disturbances in the medium may corrupt the data bits. However, Shannon showed that if the bits were computed in just the right way, the pattern in the code word would be so strong that the pattern will almost always be recognizable despite the medium disturbances. A pattern-recognizing device, which is called a decoder, forms part of the receiver. Its job is to reconstruct the original data, using the distorted data and the bits as clues.

Shannon did not show how the encoder and decoder should be designed; he only showed that the use of digits is possible. Later generations of mathematicians and engineers went on to design practical error-correcting systems so that it is now possible to communicate reliably at speeds near capacity.

Information Theory Applications

Information theory began as a theoretical science. Nevertheless, its insights led to a revolution in the design of digital transmission and storage systems. Three major areas that have directly benefited from information theory are transmission systems, storage systems, and the Internet. Computer modems have also benefited from information theory.

Computer storage systems are also designed using the guidelines provided by information theory. The random-access memory, or RAM, in modern computers would be impossible without error-control coding designed by information theorists. High-capacity hard disks and CD ROMs are similarly protected. Many of today's consumer electronic devices would also be impossible without information theory. Recording engineers have used concepts such as medium capacity and entropy to guide the design of compact disc, DAT (digital audio tape), and DVD (digital video disc) players and recorders.

The Internet and the World Wide Web are computer networks that store and transmit large amounts of data. Sending and receiving large amounts of information accurately over these networks require large amounts of medium capacity. Information theory, especially its data compression algorithms, has played a large part in making the Internet practical. For example, sending and receiving still or moving colour images require large amounts of memory and would ordinarily overwhelm the capacity of the Internet. With data compression algorithms, large images can be reduced to an efficient and manageable size, making rapid exchanges of information possible.

The basic theorem of information theory rests, first, upon the assumption that the message transmitted is well organized, consistent, and characterized by relatively low and determinable degrees of disturbances.

Transmission of compressed messages

Under these circumstances, by devising proper coding procedures for the transmitter, it becomes possible to transmit symbols over a medium at an average rate that is nearly the capacity of units per second of the medium. It is interesting to examine fractal theory, which is applied to the process of encoding or decoding in computer networks. Furthermore, Green's (1998: *electronic manuscript*) explanation of the fractal theory highlights the appearance of disturbances in message transmission, which compliments Shannon's model of communication.

According to Green (1998: *electronic manuscript*), a fractal demonstrates a limit. Fractals represent complex physical processes and dynamical systems. The underlying principle of fractals is that a simple process that goes through infinitely much iteration becomes a very complex process. Fractals build up a complex graphical representation by repeating the identical configuration of patterns on an ever-smaller scale.

Most fractals operate on the principle of a feedback loop. A simple operation is carried out on a piece of data and then fed back in again. This process is repeated infinitely many times. The limit of the process produced is the fractal.

Almost all fractals are at least partially self-similar. This means that a part of the fractal is identical to the entire fractal itself except smaller. Fractals can look very complicated yet, usually they are very simple processes that produce complicated results.

If something has complicated results, it does not necessarily mean that it had a complicated input. Chaos may have crept in (in something as simple as round-off error for a calculation), producing complicated results. Fractal Dimensions are used to measure the complexity of objects. We now have ways of measuring things that were traditionally meaningless or impossible to measure.

Thanks to computers, we can now generate and decode fractals with graphical representations. One of the prominent areas of research in electronic communications today is Fractal Image Compression. Many websites devote themselves to discussions of it. The advantage that modern computers have is that they can encode and decode images using Fractal Image Compression techniques.

Fractal research has shown that many entities in the physical universe repeatedly instantiate self-similar patterns of organisation at the microscopic, macroscopic and telescopic levels of organisations. An object is self-similar only if one can decompose the object into an arbitrary number of small pieces, and each of those pieces is a replica of the entire structure. Some examples of self-similarity follow. The red outlining indicates a few of the self-similarities of the object.
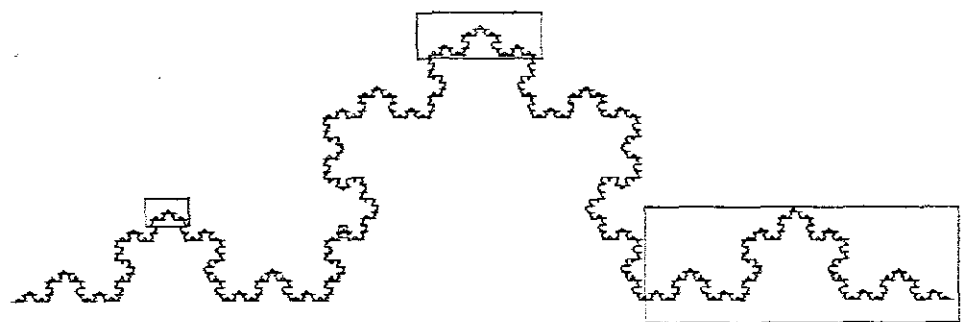
Figure 7: Repetitions indicating fractal loops. (Green 1998)

Fractals are used to determine redundancies in messages and removing the redundancies at the sending end (encoding) of the message by applying a number of iterations that will strip the same patterns out of the message. On the receiving end, the stripped down version of the message is reconstituted by applying the same number of iterations to restore the elements that have been stripped out so that one can send a vast message by encoding and then simplifying it on the receiving end by the receiver.

MERSHAM AND SKINNER: COMMUNICATION IS A PRODUCT OF THREE KEY ELEMENTS

According to Mersham and Skinner (1999), there are certain elements that form the essential structure of the communication process. These elements are the communicator, a medium that carries the message and the recipient. Communication cannot occur unless all three of these elements are present. One cannot directly exchange meanings (or thoughts) in messages. Messages first have to be converted into signs and symbols that have a physical form called the medium. The medium may be speech, writing, or images and sounds, which the recipient of the messages can physically experience, that is, something that one can see, hear or feel. Once the recipient has received these symbols, he or she interprets them and gives a meaning to them.

The collection of signs and symbols that is shared by the communicator and recipient contains the message and the meaning that one wishes to convey. The message may be a spoken, written language or some other kind of sign system, such as pictures. The medium is the physical base for the exchange of messages. One way to think of a medium is to imagine that it is a carrier or bearer of the message signs and symbols.

Mersham and Skinner (1999) use the example of one living in a rural area where one has to collect water from a nearby river. One might use a number of different containers for the purpose: a bucket, a drum, a bottle, and a calabash. In this analogy, the bucket is the carrier (medium) that carries the water (message) to its destination.

In the same way a container may be used to carry water from one place to another, so a medium 'transports' the message. Just as the container can have a variety of shapes and sizes, and can be made out of simple or complicated materials, so it is with the mediums, or media, of communication.

For speech, the medium is provided by sound waves that travel invisibly through the air. In vision, it is the light waves reflected from the surface of an object or coming directly from a

light source such as a television screen. Our human capability for touching each other is another medium. The air could also be a medium when it carries tiny particles that we can smell and taste. All have a physical basis for linking the communicator and recipient, and can have a pattern of symbols imposed upon them.

Sound waves, light waves, touch, and the air are all 'natural media'. But people have extended these 'natural media' by using technologies. In earlier times humans carved messages on bones, masks and sticks. Later they painted and sculpted. Eventually, the development of technologies extended visual, spoken and written symbols beyond the reach of human voice and eye in both distance and time.

Many people, who refer to a medium, mean the mass media: print, film or broadcasting, such as radio or television, or even tapes and compact disks.

Communication is a two-way process

Mersham and Skinner's (1999) model includes a two-way, or interactive, nature of communication. Figure 8 shows how individuals are both the 'communicator' and the 'recipient'; both individuals participate equally in the exchange. This is called interpersonal communication.
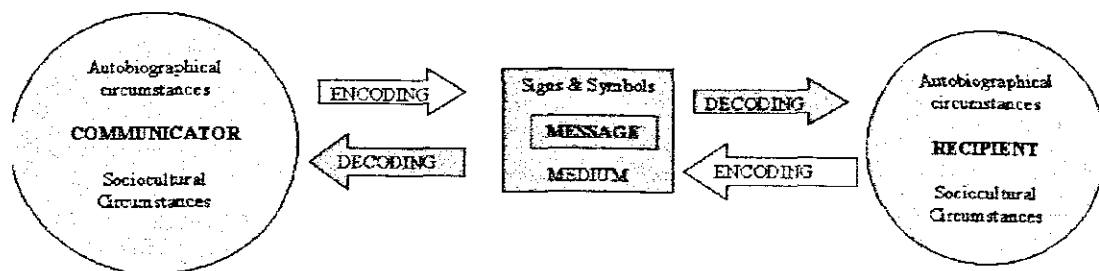
Figure 8: Communication as a Two-way Process.
A Model of the Bi-directional Communication Process.
Adapted from Mersham and Skinner 1999:10.

Figure 8 is used to describes how the communicator *encodes* a message according to his/her socio-cultural and autobiographical circumstances. This message is then sent to the recipient via a medium. The recipient then *decodes* the message according to his/her socio cultural and autobiographical circumstances.

Dynamic models of communication

While the different flavours of the General Communication Model, of which Mersham and Skinner's is a typical example, all allow one to make generalisations about the communication process, they lack some of the predictive, descriptive, and analytic powers required for

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characterising the complexities of different forms of communication. A major weakness of General Communication Models is that they assume that human communication is value-neutral. While it is often contested, it entails unequal distributions of power during communication, which manifests themselves as dominance and submissiveness, and above all complex and subtle relationships that relate to persuasion, social influence and compliance gaining (Gass and Seiter 2003).

Learners, concerned mainly with such persuasive and artistic forms of communication, often centre attention upon different kinds or modes of communication (i.e., narrative, pictorial, and dramatic). Further, they theorise that these messages, including messages of emotional quality and artistic content, are communicated in various manners to and from different sorts of people. For them, the stability and function of channel or medium are more variable and less mechanistically related to the process than they are for followers of Shannon or proponents of the post-Shanon General Communication Model. McLuhan (1975) asserts that the channel actually dictates, or severely influences, the message—both as sent and received. According to Encyclopaedia Britannica (2004), various dynamic models of communication have been proposed by analysts of communication, linguistic philosophers, and others who are concerned with the nature of messages, particularly their compatibility with sense and emotion, their style, and the intentions behind them. Learners of complex and dynamic aspects of human communication find linear as well as geometric models of communication of little interest to their concerns, although considerations related to these models, particularly those of entropy, redundancy, and feedback, have provided significant and productive concepts for most learners of communication.

In summary:

o The General Communication Model seriously underdetermines the complexity of communication in psychological, sociological and intercultural contexts.

o The General Communication Model imposes an egalitarian heuristic[11] on different forms of communication, of which many entail the negotiation of power relationships where one party effectively controls more power that others, as is the case in teachers in a classroom, a judge in court, a minister delivering a sermon.

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[11] According to Encarta (1999), heuristics is a method of solving a problem for which no formula exists, based on informal methods or experience, and employing a form of trial and error (iteration). Iteration is a process of achieving a desired result by repeating a sequence of steps and successively getting closer to that result.

COMMUNICATION AND TECHNOLOGY

COMMUNICATION AND CULTURAL CHANGE

The term "Information Communication Technology" is now used to refer to present-day electronic instruments that enable digital communications. However, the stylus and clay tablets used by a scribe in Mesopotamia about 5000 thousand years ago to write pictographic messages, should rightfully also be considered to be information communication instruments. ICT, ancient and modern, have a transformative effect on the societies that employ them. According to Lievrouw 2002, Egypt was transformed by papyrus and written hieroglyphics in 3100BC. By using cuneiform writing in ancient Babylonia, King Hammurabi (1795-1750 BC) presented the world with the first recorded legal codes carved onto the Rosetta Stone. Other scribes used styluses and clay tablets to develop a great economic system (The British Museum ©, *Mesopotamia time line.* 2004: http://www.mesopotamia.co.uk/ time/explore/frame_mes.html).

The Greeks recorded the first philosophical writings, epic poems and classical dramas that not only transformed the Greek society of the day, but also still form the bedrock of present-day western culture. The Romans used writing to invent a multi regional government that at the height of its power stretched from Britain in the North West to the shores of Bosporus in the East (Constantinople). The Romans developed an unparalleled system of government that depended on the Roman alphabet; and of course paper and the printing press extended new ways of thinking across Europe and paved the way for the European Renaissance and the Protestant Reformation.

The last quarter of the 20th century ushered in another renaissance in information communication technology. The continuous improvement of Information Communication Technologies have enabled users of the Internet to transmit ever increasing volumes of information between networked computers over larger distances in increasingly shorter time spans, irrespective of their physical locations. Currently a typical computer hard drive can contain the equivalents of hundreds of textbooks, depending on the needs and desires of its owner. With this explosion in the dissemination of information academics and scholars were forced to employ principles of knowledge management to cope with the information being gathered. The new nature of information transmission favoured efficient and effective interaction with end users. It also transformed the nature of mass communication. Feedback has become instantaneous. McLuhan's 1975, concept of the global village needs to be re-

conceptualised in the light of developments arising from Internet communication. Refer to my discussion on "The working situation of the learner / teacher" later on in this chapter.

McLuhan (1975: 74-78) pointed out that the television could be a very effective teaching tool in the classroom and at home. He argues that television has been more responsible for creating the *global village* than any other technology because we can see and hear events anywhere in the world as they happen and so can feel more connected to other places. He argued that radio, movies, and television had just as much impact, if not more, on modern society as printing. Electronic media create the sense of experiencing everything at once, in no particular order.

Communication media and technologies have contributed to a society that is changing very rapidly. Three key issues have arisen in the tide of this rapid change: *individual privacy, coverage of politics in the media, and the availability of information.*

THE TRANSFORMATIVE POWER OF THE INFORMATION AGE

Marchant (1988: 53) describes communication as a process in which a source makes data available to a recipient by means of a channel, signs and symbols with the intention of letting the recipient process the data into information with a meaning intended by the source. The process entails sharing, through which understanding develops. Without the elements of information and response, communication is incomplete. Therefore, the key factor is participation— accepting or rejecting information. It is feedback, which provides ideas leading to the modification of the original input and result in positive action.

Marchant (1988: 51) stated that more than a decade prior to his writing, the electronic revolution in communications was transforming the quality of life beyond all historical precedents of cultural change. Mankind is experiencing a new informational upheaval. The resulting socio-economic impact leads to inequalities as the gap between the information-poor and the information-rich widens. It is important that communication analysts and decision makers are conversant with the key concepts and models of communication relevant to their fields.

In the past the main concern of communication research was the investigation of effects, that is, of the changes in an individual's behaviour, which occur as a result of the transmission of a message. The concept "interactivity,"—the result of the new communication technologies—has resulted in an epistemological approach to communication science.

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The current information revolution has been the focus of much discussion, mainly from the point of view of the developed world. The crux of the matter is that a society's communication facilities are among its most important resources. As development proceeds, the goals of communication programmes, and of the system, change. Indeed, the only certainty in life today is change.

THE MATURING OF INFORMATION AGE TECHNOLOGIES

Graham (1988: 8) says the way we communicate with each other now is the result of research and developments in computer technology, microelectronics and space research in the last 25 years. During that time, the transistor has replaced the radio valve and, in turn, the integrated circuit or silicon chip replaced the transistor. As 'chip' manufacturing technology has improved, more and more individual electronic components have been packed into the same size of chip. The latest chips contain the equivalent of several rooms full of valve-based equipment.

Advances in space research enable messages to be relayed round the world by satellite[12]. The earth is now encircled by dozens of satellites that provide invaluable information-gathering and communications services to weather forecasters, geologists, telephone companies, television broadcasters and many others. Research and development in laser technology is continually producing new uses for lasers, especially in communications and information storage.

According to Steinberg (1999: 180-1), scientists agree that we are in the midst of a new stage in the development of communication: the information age, also called the computer age. With the introduction of wideband-24/7 connectivity, there is no clear-cut distinction anymore between the use of mass media and the individualistic forms of communication characteristic of the information age. A person could be word-processing while listening to online talk radio in the background, or even while watching online TV in the corner of the computer screen. During the current presidential elections in the United States, influential commentators are Blogging (web-logging political commentaries) in real time, on community websites, deconstructing the speeches of the presidential candidates, Senator Kerry and President Bush as the debate unfolds, thereby besting the commentators in the print media and television networks. The information age is the inevitable outcome of the maturing new

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[12] Refer to "Satellite" in Definition of Terms (Chapter 2).

technologies of the new century. The significance of the information age is that it has created virtual 'information societies'. These societies depend on access to large amounts of information on a global scale that can be accessed at any time from anywhere and use in any way that they see fit for their economic survival.

We can trace the beginnings of global wireless communication to the introduction of the computer and satellite technology after the Second World War. Most of the satellites are today used for broadcast services—that is, television and radio signals are sent up to the satellite and are then relayed to different stations all over the world. Important news events happening in one country can be broadcast around the world via satellite as they are happening and are seen simultaneously by millions of people in many countries.

While the invention of the printing press made possible the sharing of large amounts of information on a massive scale, computer technology has made this process even more efficient. According to Steinberg (1999: 181), computers are basically machines capable of processing and storing information. Originally used in large organisations to perform complicated mathematical calculations and to aid administration, they are used today in industry, medical research, the military, and the exploration of outer space, to name but a few examples. Computers are the basis of the Internet, the worldwide network that carries information and entertainment along what has become known as the Information Highway. Fang (1997) remarks that while scientists are yet to find a satisfactory definition of the Internet; it is not difficult to explain how it works. A person using a computer connected via a telephone to another computer anywhere in the world can send and receive large amounts of information on almost any imaginable topic along the Information Highway. Being connected to the Internet allows one to find out, for instance, the latest cricket score in a match being played in Australia, what courses are offered at University of South Africa, stock exchange prices in New York, or weather conditions in Paris.

Writing could justifiably be considered to be one of the most significant inventions of humankind, because it formed the basis of knowledge creation, knowledge management and the development of human culture and science. Second to the invention of writing, arguably, is the invention of digital communications. It not only globalises writing but it also enables humans to use nonverbal and verbal communication as part of the array of every-day forms of communication. Digital communications seamlessly fuses writing, visual representation and spoken communication. Today we therefore have multimodal virtual media that move

information across time and space. The difference is that information reaches unlimited numbers of people over vast distances at speeds unimagined before the rise of information communication technology. Some innovative forms of digital communication that enable e-education and e-learning are examined in the following paragraphs.

INNOVATIONS IN DIGITAL COMMUNICATION

The following innovations in software and hardware have relevance to e-education.

The Multilingual Web

Mersham and Skinner (2001a: 189) states that the Internet has rapidly expanded to cover the globe, but the vast majority of Internet websites are in English. This is acceptable in countries where English is commonly used or widely understood. To address these needs, the Web is becoming increasingly multilingual. For example, there are more than one million Thai Internet users, 60 per cent of who are domestic. The remainder are Thai nationals living or travelling abroad.

Where business is transacted trans-nationally, whether it is B2B (business to business) or B2C (business to consumer), individual multilingual websites are needed. For example, it is estimated that by 2004, 50 per cent of all on-line sales in the US will originate outside the country. For this reason, it's vital that customers are offered the same services such as product data sheets and technical FAQs[13] in their own languages. These services enable support costs to be lowered and brand loyalty to be more fully developed.

Mersham and Skinner (2001a: 190) add that some companies already offer alternative versions of their websites in different languages. For example Euronews, a free-to-air satellite television channel currently available to Europe, North and South America and Africa, has a website[14] that provides options for the user to access its news updates in Italian, Spanish, Portuguese, French and English. However, the cost of creating and hosting multiple language sites at present is beyond the reach of developing countries.

Nevertheless, globalisation software and services will soon become widely available. Global site infrastructure will include a set of applications that can be customised for any user in any country. So, for example, a user will choose a language in which he or she wishes to interact

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[13] Frequently Asked Questions

[14] www.euronews.net

from several hundred languages and dialects listed on the site. Successful trials, using the written word, have been conducted between two participants, one speaking German and the other French. The participants were able to engage in a conversation, although neither of them understood the other language. Each response was immediately translated into the language of the respective user. Future developments include interactive voice recognition software that will allow for a spoken interaction that functions in the same way. A Japanese person, speaking Japanese, will he heard by a Zulu-speaking person in Zulu, and vice versa.

Interactive Television — A View of the Future

According to Mersham and Skinner (2001a: 193), television, as we know it, is the most popular medium of mass communication used for entertainment and education. In recent years there has been a move towards enhanced television — where the viewer of TV is much more involved in the communication process. These advances are turning TV into a new exciting medium of the future.

This technological move sees the TV, Internet and PC converge into a new 'interactive TV'. One can use one's TV instead of a PC for the Internet and simple computing functions. Many people would be more comfortable sitting in front of the TV screen than in front of their PC monitor. Advertisers like the idea because interactive, web-enabled television allows consumers to make a purchase instantly, without having to move out of their seat.

Interactive elements such as on-screen links, interactive panels and displays during TV shows and TV commercials, as well as the expected full-screen access to the Internet, are soon to grace our TV screen. We will soon see digital video recorder functions and digital video discs (DVDs) replacing the familiar videotape and the videocassette recorder (VCR).

DStv (Digital Satellite Television) is Multichoice's package of pay channels that subscribers receive via satellite. DStv offers 45 video channels, six data channels and 51 audio channels (radio and music channels) on its satellite service. DStv reaches across Africa, with subscribers exceeding 500 000. Apart from other interests, Multichoice Africa has direct investments in or franchises for television platforms in South Africa, Botswana, Ghana, Kenya, Lesotho, Malawi, Mauritius, Namibia, Nigeria, Tanzania, Uganda, Zambia and Zimbabwe.

DStv first introduced its range of interactive channels at the end of 1999. The new data or information channels allow the viewer to find out the weather forecast, access financial information, do electronic banking, play games on TV, access intellectual puzzles and teasers,

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get daily horoscopes, obtain 'as it happens' news, sports and business updates, and monitor[16] channels simultaneously on the screen. Further interactive developments, such as allowing viewers to select the camera-view at sporting events and pay-per-view on demand of any programme, will characterise the future.

Music, Youth and the Digital Revolution

Mersham and Skinner (2001a: 194) state that empowered by Internet technology, music-loving youth have for several years been obtaining and sharing their favourite recordings for free.

Utilising digital formats like MP3 sound files and music-swapping Internet sites, young Net-savvy surfers have forced the recording industry to reassess the value of the media that they have long relied on, such as CDs and for-sale music videos. Already more than 11 million Americans have downloaded music free over the Internet, with no regard for copyright. This revolution could eventually consign music CDs to history's bargain basement bin, along with vinyl albums, cassettes and eight-track tapes.

Going to the Movies — On the Internet

It has been called 'the ultimate horror movie' for Hollywood executives —millions of people watching the latest movies for free. Following the impact of the Internet on the music industry, it was not long before full-length movies could be sent over the Web. More than 5 000 films already issued on a DVD[15] can now be copied and sent on-line. And thanks to advanced digital video recorders and a cadre of enthusiasts, even current movies can be on the Net within 48 hours of screening in the cinemas. Pirates copy first-run movies from projectionists' booths, using a digital video camera on a tripod and taking audio directly from the projector. Mersham and Skinner (2001a: 197) state that these copies that are only a fraction below DVD quality, are then distributed over the Internet.

Hollywood is now facing the same issues plaguing the music industry — and much sooner than expected. Now that so many people have adopted digital downloading, the adoption curve has become exponential. Movie industry executives are watching the case of the music recording industry, which, as a consortium, is suing Internet companies that make software-allowing users to swap digital music files.

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[15] Digital Video Disc

The Internet and Video

The integration of video into websites is a common practice, with live webcams proliferating and video-conferencing becoming a common corporate activity. New developments in digital tools allow the broadcast, recording, editing and publishing of any on-screen video. While largely a tool for trainers, video allows instructors to export existing information rather than having to create learning content.

Employing a screen camcorder and video production tool, exact copies of on-screen activity can be recorded and formatted into the most common Internet video formats such as AVI video files, Microsoft Windows Media Player files or Real Networks Real Player G2 files. Alternatively, live output can be captured and sent over the Internet in real time.

Specific areas in a video screen area can be highlighted, in the form of graphic shapes and images, through the use of 'floating annotations'. Objects can be dragged, dropped and repositioned on the computer's screen. For identification of source, each video can be digitally 'watermarked'.

The Semantic Web

Most of the web's content today is designed for humans to read, not for computer programs to manipulate meaningfully. Computers can describe web pages for layout and routine processing but in general, computers have no reliable way to process the semantics (meaning in language).

The semantic web is aimed at bring structure to the meaningful content of web pages, creating an environment where software agents roaming from page to page can readily carry out sophisticated tasks for users. It will be able to do all this without needing artificial intelligence.

According to Berners-Lee et al, (2002:37), the semantic web is not a separate web but an extension of the current one, in which information is given well-defined meaning, better enabling computers and people to work in cooperation. The first steps in weaving the semantic web into the structure of the existing web are already under way. In the near future, these developments will usher in significant new functionality, as machines become much better able to process and interpret (understand) the data that they merely display at present.

The essential property of the World Wide Web is its universality. The power of a hypertext link is that *"anything can link to anything."* Web technology, therefore, should not discriminate between the scribbled draft and the polished performance, between commercial and academic information, or among cultures, languages, and media and so on. Information varies along many axes. One of these is the difference between information produced primarily for human consumption and that produced mainly for machines. At one end of the scale we have everything from the five-second TV commercial to poetry. At the other end we have

medium of documents for people rather than for data and information that can be processed automatically. The semantic web aims to make up for this.

Like the Internet, the semantic web will be as decentralized as possible. Such web-like systems generate a lot of excitement at every level, from major corporations to individual users, and provide benefits that are hard or impossible to predict in advance.

The Power of the Semantic Web

For the semantic web to function well, computers should have access to structured collections of information. Furthermore computers should have sets of inference rules that they can use to conduct automated reasoning. The semantic web community has the task of adding logic and the ability to make inferences to the web.

Two important technologies for developing the semantic web are already in place: eXtensible Markup Language (XML) and the Resource Description Framework (RDF). XML lets everyone create their own tags—hidden labels such as <zip code> or <alma mater> that annotate Web pages or sections of text on a page. XML allows users to add arbitrary structure to their documents but says nothing about what the structures mean. Meaning is expressed by RDF, which encodes it.

The power of the semantic web will be appreciated when people create many programs that collect Web content from diverse sources, process the information and exchange the results with other programs. The effectiveness of such software agents will increase exponentially, as more machine-readable Web content and automated services (including other agents) become available. The semantic web promotes this synergy: even agents that were not expressly designed to work together can transfer data among themselves when the data come with semantics.

Properly designed, the semantic web can assist the evolution of human knowledge as a whole.

A Revolution in the Office

Mersham and Skinner, (2001a: 204), considers one of the problems with mobile office products and non-mobile office products is the ability to facilitate communication between the two products. For example, getting a notebook computer to 'talk' to a printer in the past meant re-plugging cables and moving things around. Infrared architecture solved some of these problems, but it was slow and devices that used it to communicate had to be virtually on top of one another.

Bluetooth is a communication technology set to revolutionise the modern office. Essentially Bluetooth is a wireless standard that lets virtually any device communicate with other office machines. Unlike infrared, Bluetooth does not require line of sight to work. Bluetooth is also ten times faster than infrared.

Bluetooth works by embedding tiny and inexpensive short-range trans-receivers into mobile devices and office machinery such as printers and digital copiers. Once a new Bluetooth device, like a cell phone, hand-held or mobile computer comes into range, Bluetooth allows it to communicate with similarly equipped machinery.

Bluetooth connects devices such as cell phones, printers, cordless headsets, mobile PCs and computer networks, and automates all communication protocols between them. If one writes e-mail on one's notebook personal computer (PC) while travelling on an aircraft, the message will be sent automatically as soon as one lands and switches on one's cell phone. Connection cables in offices will be an item of history. Notebook personal computers will communicate wirelessly with anything from the printer and fax machine to the modem or mouse one happens to be using.

Mersham and skinner (2001a: 205) state that all information between devices such as a notebook and a desktop PC is automatically updated as soon as the units are within range of one another. One could even transfer digital images from a digital camera via one's cell phone and the Internet to a PC anywhere in the world without touching anything as antiquated as a cable.

Bluetooth is in its infancy, but devices equipped with the new technology will increasingly become the norm.

The Electronic Newsletter

Online newsletters are used to promote businesses, goods or services. One can either create one's own newsletter or advertise one's businesses in a newsletter created by others. In most cases electronic newsletters are used to inform customers periodically about new product offerings, sales, discounts and other promotions that are on offer. Most browsers support html e-mail, which is e-mail that can also display graphics and text in colour. This means that e-mail can be used much like standard print media, but often at a fraction of the cost of design and delivery.

Electronic newsletters can also be used to generate revenue where they contain some form of advertising for products, whether offered by the same business or by other businesses. In forging relationships with other on-line ventures, links with affiliates can be inserted into the newsletter. The insertion of codes keeps track of customers that have clicked through on the inserted link and purchased something on-line. In this way, referral commissions can be earned.

It is also possible to sell sponsorships of newsletters to companies that are interested in their audiences. Conversely the sponsorship of newsletters from other companies is effective if their target audiences correspond to that of the organisation.

From a marketing perspective, newsletters are an extremely cost-effective way of advertising. Subscriber e-mail lists generally exhibit a lot of 'churn' (that is, people initially subscribe and then unsubscribe to a variety of newsletters) unless the newsletter provides quality content that keeps audiences and customers coming back for more. For example, although some visitors sign up and agree to receive mailings along the way, they may be interested only in registering for a one-off competition and will unsubscribe unless the content continues to interest them.

DIGITAL CONVERGENCE

McLuhan (1975: 74-78) compared each new medium to a rear-view mirror. McLuhan states that it will contain all or parts of previous media, and something 'new'. One can think of digital coding communication as a 'shopping trolley' incorporating all existing media forms —

text, speech, graphics, video, film and sounds. What is new is the increased possibility of two-way communication that digitised media present.

The most distinctive feature of the unfolding digital present is a proliferation of new media and new forms of communicative interaction. Media will continue to multiply. Everybody's daily life will become a whole ecology of media; some of these will be voluntarily chosen, and others will be inescapable parts of life in public spaces and the workplace (Agee 1998: 69—70).

Therefore, while on the one hand we see convergence as a narrowing to a singularity, what we tend to see on the other hand, is an additive model of change leading to multiplication of applications, devices and the means to communicate, that which are linked to each other.

Another dominant related idea is that technological convergence forces other forms of convergence. This is where convergence theory becomes the convergence movement where changes in services industries, corporate structures and policy are explained as responses to technological convergence.

Mersham and Skinner (2001a: 221) add that the more things converge the more they produce knock-on effects, which cannot be predicted from the contemporary technological horizon of understanding. For example, these include significant privacy copyright and security issues, control issues and breakdowns in systems integrity in the drive to greater personalisation or customisation. We are all familiar with the problem of the number of passwords and 'pins' we have to carry around in our heads — if we are smart — or in our bags and wallets — if we are not.

The World Wide Web represents the first truly converged medium. There will be further major developments of convergence through the availability yet unimagined bandwidth and speed of transmission, and the fact that the digital chip will soon form part of every appliance, machine and technology we encounter. Already a large percentage of digital chips are going into appliances and machines other than desktop computers.

A most important form of convergence has taken place between corporate/commercial interests and the Internet. A reliable example of digital convergence at corporate level is the

work done at Hirt and Carter[16]. This organisation does, among others, creative advertising at an international level. Although their staff are situated in a brick and mortar building most of their work is done online. They source work from countries across the globe and also work in conjunction with colleagues who are situated anywhere in the world. Most of their work is done in a virtual environment.

Initially the Internet portrayed promises of romantic dreams of information sharing and free access to information with the view of connecting the world together. The term 'globalisation' became the keynote of politicians and policy makers. Mackinnon (2003:116) maintains that the Internet has recently been subject to a third wave of hackers that looks to the Internet simply as a means of increasing profit. The spectacular collapse of the so-called Dot Coms[17] in 2000 restored a bit of the original ethos that characterised the fledgling Internet.

Whether this original spirit of freely sharing information ultimately manages to prevail against future attempts to co-modify information or not, the emerging new digital communication that drives the Internet is based on four important ideas, namely:

- o Digital encoding

- o Navigation and recipient control

- o Convergence

- o Interactivity

The first is that information and communication can be digitally encoded, whether text, voice, pictures, sound or video. This digital formatted information can then be easily accessed by a variety of digital devices, not just computers. This is because the digital chip can now be placed in any appliance or object, turning it into a communicating device. Everything becomes a communicating computer.

According to Negroponte (1995) the second important idea that has revolutionised communications is the concept of hypermedia, which allows recipients much greater navigational control in finding knowledge. This refers to the way in which web-based

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[16] Hirt & Carter is a company, which deals in all aspects of digital commercial communication. They have branches in Durban, Cape Town and Gauteng. They welcome educational tours to their offices.

[17] Basically Internet-based business ventures without an own capital base, with vague business plans that were run on public investments until the bubble burst

information is structured. In the digitally converged world, the depth/breadth problem disappears and we can move freely between generalities and specifics through what is called 'hyper linking'.

Hyper linking is consistent throughout all web-based media. Basically it allows one to look more deeply at a particular finer point and to move effortlessly back to the main body of work. Hyper linking is a term describing the interconnection of different parts of information with each other. In a printed book, sentences, paragraphs, pages and chapters follow one another in an order determined not only by the author but also by the physical and sequential construction of the book itself. Although a book may be randomly accessible and our eyes may browse quite haphazardly it is nonetheless fixed by the confines of its physical dimensions.

The third idea concerns the dissolving of traditional media boundaries, or convergence. The medium is not the message in a digital world. It is an embodiment of it. A message might have several embodiments automatically derivable from the same digital data. In the future, the broadcaster will send out one stream of bits, such as the weather, for example, which the receiver can convert in many different ways. The viewer can look at the same data from many perspectives.

Mersham and Skinner (2001a: 225) state that all of these different media representations are encoded in a common digital form, even though they are separately crafted in the multimedia experience. Digital convergence allows the fluid movement from one medium to the next, saying the same thing in different ways, and calling upon one human sense or another. If one did not understand something when one reads it the first time, one can see it as a cartoon or 3-D diagram. This kind of media movement can include anything from videos or movies. The common digital form, in parallel with developments in voice recognition, means that we will increasingly talk to devices, rather than input instructions through some form of keypad.

COMMUNICATION NETWORKS

, Graham (1988: 14) states that communication networks now use digital electronic technologies. Signals no longer travel as varying waves of electrical current, but as discrete pulses. This has resulted in new communications opportunities. Telephones can now be programmed like computers to remember numbers and re-dial engaged numbers. Several callers can talk to each other in a teleconference, or see each other in a videoconference. The

copper cables that used to carry telephone calls are being replaced with optical fibres. These are more reliable, they can carry more information down a thinner cable, /and they are made from cheaper materials. Optical Character Recognition (OCR) machines read typed addresses on envelopes and code mail for electronic sorting machines.

Electronic communication presents challenges and opportunities for the ways humans do business and interact with members and other organizations, and how they participate in the current reshaping of work, institutional responsibilities, higher education and the social contexts of generating and distributing knowledge. Meetings, publications, member services and public awareness are all affected by electronic communication. Technology changes how we work and the possibilities of work.

INFORMATION EQUITY

Newspapers, radio, and television were for many years the major sources of day-to-day information, and they were very inexpensive for the audience. Broadcast signals could be received free of charge, and daily newspapers supported themselves mainly with advertising so that per-copy price stayed low.

The media today, however, are charging more than ever for their products and services. More households pay for television than settle for over-the-air, or free, television. Local telephone rates have gone up. Newspaper, magazine subscriptions and book prices have increased sharply. On-line services (Internet service providers) charge customers by the hour to connect to their networks. Communication equipment is more sophisticated, and costs more, than in the past; even the prices of computers, which have become vastly more powerful in the past few years, have stayed about level. In short, people who can afford more and better services may become more informed than people who cannot afford them.

TRANSFORMED COMMUNICATION

Since the McLuhan era, communication has experienced the following positive changes:

- o Increased speed in information delivery and

- o High-speed interaction and feedback of voice, text and graphics

These factors changed the manner in which people work and communication. Earlier on it is argued that communication is a survival strategy. Traditional offices operated in closed brick and mortar buildings to facilitate immediate communication between members of an

organisation. These types of work settings, in certain instances, may be dissolved in the presence of mobile communication technology.

COMMUNICATION IN E-EDUCATION

A MOVE FROM DIRECT COMMUNICATION TO ONLINE EDUCATION

Conventional education has been offered in a classroom situation where the teacher and learner interact with each using face-to-face communication. This form of communication is group-based, and technology acts as a supplement to the teacher. For the learners this means that their physical presence and participation in group discussions, forms an integral part of the teaching and learning. The teacher has the challenge of meeting classroom schedules as well as the preparation and assessment of teaching materials. Despite these challenges, the traditional classroom offers a unique opportunity for teachers and learners alike, to interact with their peers. However, there is a problem that not everyone has the opportunity to get to school. For instance, they may be living too far away, may be physically handicapped and the like. These limitations called for other forms of education that had the capability of reaching out to a larger audience.

According to Neville (2004: 145-158), in *'lay terms'*, traditional training, is regarded as a training environment which encourages passive learning, does not develop problem-solving skills and ignores the individual needs of the learners, therefore it ignores the requirements of its end users. Traditional training has always incurred criticism; it is felt that despite huge advances in technology, the training room will always remain the same, that is, dysfunctional. It could be argued that advances in technology, such as multimedia and virtual simulations, have left the traditional classroom trailing behind with learners expecting more and more. The intensity of competition in the business market with advances in technology, and a strong shift towards a knowledge-based economy have each contributed to the demand for virtual (electronic) learning environments.

Distance learning, electronic learning and mobile learning (mLearning) offer solutions that address the shortcomings of the traditional classroom. Learning /training environments can help create and maintain skills and therefore the corporate knowledge base. They both alleviate the strain on corporate resources and facilitate learners changing training needs.

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A Web-based classroom includes resources such as discussion forums to support collaboration between learners and ultimately it should also support the needs of both the novice and advanced learner. A training environment is composed of a number of components that are integral to the effective operation of the environment and implementation

The advent of communications and transport technologies during the industrial revolution in the late nineteenth and early twentieth centuries, paved the way for offering tutorial services at a distance. According to Dye (2004: *e-journal*) distance education is education where teacher and pupils/learners are separated by space and/or time. Technical media are used to impart knowledge and to make possible real to-way- communication, in support of the process of teaching.

Prior to the advent of Internet in South Africa, University of South Africa was the largest distance education Universities in the country. Learners were offered the opportunity to work or stay at home and study course materials when they find it convenient. Course materials took the form of printed material sent by post. This called for improved road and rail transport especially to marginal areas. Advancements in information technology in the 80s, lead to the introduction of audio-visual aids, cable and satellite that further enhanced the learning experience. Through the application of these new technologies, it then also meant that it would be possible to link several geographically dispersed locations simultaneously, and thus extended the distance experience from one that was solely individual to one offering group-based, face-to-face teaching at a distance.

The electronics revolution in the 1980s also marked the era of personal computing. Since then, we have witnessed technological advances in processor speed, and significant drops in the price of personal computers. This facilitated the process of online learning or electronic learning (e-Learning). Bates (2004: 213-233) provides the following definition of online education:

"Online education is characterized by:
- o The separation of teachers and learners, which distinguishes it from face-to-face education.
- o The influence of an educational organization, which distinguishes it from self-study and private tutoring.
- o The use of a computer network to present or distribute some educational content.

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o The provision of two-way communication via a computer network so that learners may benefit from communication with each other, teachers, and staff".

Figure 9 provides a summary of differences between traditional learning and e-learning. A striking advantage of e-learning is that it places the learner at the centre of the learning process, giving him/her control over both content and process. Further, the advantage of the World Wide Web is that it is not dependent on any particular operating system and supports several media types. It is also available globally. From an educational perspective, it meant that teaching could now take place both synchronously and asynchronously (Keegan 2002: *online book*[18]).

	TRADITIONAL LEARNING	E-LEARNING
Delivery	Teacher determines when the learner will learn.	The learner is in control of the learning process.
Responsiveness	Presumes to know what the learner ought to learn.	Lets the learner set the agenda and solve his own learning problems.
Access	Moves sequentially, like studying from a text or script.	Allows the learner to set the order and agenda.
Symmetry	Remains physically and mentally separated from the work experience.	Helps make learning part of the work or task.
Modality	Requires a clearly defined beginning, middle and end.	Takes place whenever, however, in just the right amounts.
Authority	Places content responsibility on the educator or administrator.	Allows the learners and educators determine collaboratively.
Personalization	Conveys little, if any, sense of relationship between the learner and the material.	Intensely targets the individual learner.
Adaptability	Remains fixed in time and space until the training stops and new materials replace the old.	Places the learner at the centre of the learning process, giving him control over both content and process.

Darwin - Newsletter.
2004:http://www.darwinmag.com/read/090101/relearn_sidebar_2.html
Figure 9: Comparison of Traditional learning and e-learning

The impact on learners is that they may study course content from their computer screens, and thus are not dependent on being physically present at school. Time and place are no longer restrictions as the learning experience can be tapped anywhere one has a computer and access to the Internet. The teacher's role is made more flexible in that they can now tutor from the confines of their offices or homes. Learner-teacher / learner-learner interaction in eLearning is mediated through the use of e-mail, discussion forums and chat rooms

[18] http://learning.ericsson.net/leonardo/thebook/chapter4.html#mlearn

DISTANCE EDUCATION AND MOBILE EDUCATION

According to Fagerberg et al (2002: *e-journal*[19]) learning is an activity or process and shown as a change in a person's perceptions, attitudes or cognitive or physical skills. The term, e-learning, seems to be used to convince users that some supernatural things happen to ones brain when one places oneself in front of a computer screen. This miracle is very unlikely to happen, as learning in the real world is mainly hard work.

According to Dichantz (2001: *e-journal*) electronic learning is the collection of teaching and information packages in education, which is available at any time and any place and is delivered to learners electronically. They contain units of information, self-testing batteries and tests, which allow a quick self-evaluation for quick placement. Electronic learning offers lower level learning goals. Higher order goals like understanding, reasoning and (moral) judging are more difficult to achieve. They require an individualised interactive discourse and can hardly be planned. Even though we do not totally agree with Dichantz that higher level learning goals cannot be planned, we agree that such goals are much more difficult to plan.

Learners are probably more and more mobile, and they use mobile technology. In connection with the term mobile learning has lately emerged to be associated with the use of mobile technology in education. However, according to Sariola et al (2001:1), it is used more in commercial purposes rather than as an educational concept. Sariola et al (2001:1) argue whether the term is a commercial trick to market technology and educational services or if it is an emerging concept that educationalists should take seriously.

It should be noted that, although mobile learning is a new concept, serving mobile learners is not a new idea. Distance education has a history of more than 150 years, where institutions have offered high quality education to learners free of time and place. This means, that if we are willing to accept the concept mobile learning, distance-teaching institutions have provided mobile learning since its invention. Gaddén (1973) in Fagerberg et al (2002: 104) offer the example of the history of Hermods: once one of the world's largest correspondence institutions. He says that the original idea that resulted in establishing the institution in 1898 came when Hermods as a local language teacher in Malmö started to support one of his learners who moved to another city.

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[19] e-Journals can be accessed by keying the relevant authors or titles in the google search engine. www.google.com.

Thus, distance education institutions have provided mobile learning for many years. In fact, the correspondence courses of the first generation of distance education could be studied at any time anywhere. The introduction of the desktop computer (and other learning technologies), which required the learner to study at a certain place, often also at a certain time, reduced flexibility of distance learning. It is the introduction of mobile electronic equipment and communications technologies, which reintroduces mobility to the distance learner (and teacher). Kjell Askeland (2000) in Fagerberg et al (2002: 142), goes even further, and points to the fact that, if we disregard the need for an institution to plan and conduct teaching, mobile learning started when the printing technique was invented, and learners could learn without coming to schools and universities.

Others define mobile learning closely to distance education. According to Fagerberg et al (2002: 150), mobile learning is the ability to receive learning anytime, anywhere and on any device. Harris (2001) in Fagerberg et al, (2002: 162), combines technology and the flexibility concept of distance education in his definition: Mobile learning occurs at the point at which mobile computing and electronic learning intersect to produce an anytime, anywhere learning experience.

MOBILE LEARNING (MLEARNING)

According to Donna (2001: 20) mobile learning should prove to be a useful tool for blended training that employs face-to-face and remote methods. mLearning can include anything from job aids and courseware downloaded on one's personal digital assistant to Net-based, instructor-facilitated training via laptop. The keyword is wireless learning.

According to Dye (2004: *e-journal*) mLearning is learning that can take place anytime, anywhere with the help of a mobile computer device. The device should be capable of presenting learning content and providing wireless two-way communication between teacher(s) and learner(s). Generally, an educational organisation administrates both the course content and the communication services.

Donna concludes that wireless Internet is a must for mLearning to take off. To cater for huge chunks of data that is common in most educational websites, there is a need for high-speed wireless data transfer. However, this should be at affordable costs to the general public. The biggest impact mLearning will have on both learners and teachers are increased flexibility. As a result, a learner will be able to access educational resources from a variety of locations,

like for instance a classroom, a media centre, from home, or even from a network-empowered restaurant. Increased flexibility will place some demands on both teacher and learner. It will require of the learner to have a high level of self-discipline and self-motivation in order to achieve his or her academic goals.

According to Donna (2001: 20) the vision of *mlearning* is the intersection of mobile computing and *e-learning* that includes anytime, anywhere resources; strong search capabilities; rich interaction; powerful support for effective *learning*, and performance-based assessment.

Donna explains that we will realize that learning should move from an organizational function to an individual necessity. Eventually, learners will not know or care where the learner model is kept, where the content resides, nor how the communication is handled. This will happen as cost drops, product power improves, and design takes into account a wider range of learning styles and lifestyle needs. That will be true mobile *learning*

The use of information communication technology (ICT) in education can provide effortless ways of communicating among peers as well as between learners and teachers. The possibility of instant help from a peer or tutor creates an ideal environment for collaborative learning.

E-EDUCATION (ELECTRONIC EDUCATION)

E-Education in schools is about effectively integrating new Communication Information Technologies (ICTs) in the entire education process. It should be an integral part of the didactic triangle as well as a vital component of the management structure of a school or the entire school district. If e-education is properly set up in the school environment then the following ideas should be addressed:

- o ASSESSMENT: A hybrid system of traditional and electronic forms of assessment has to be set in place. Educational specialists should set electronic online testing so that testing can be standardized to meet global standards. The idea is to ensure that rural or previously disadvantaged public schools are not left isolated and that learners are part of the global village. The current System of Controlled Term Assessments (CTAs) used in KZN is inefficient because hard copies of testing or instructions never reach all schools timeously and this not only creates chaos in

rural and urban schools but also marginalizes many learners. A data bank of questions should be available to educators to streamline individual testing.

o SYLLABUS: A standardized core syllabus should be extracted from the curriculum by a team of educationsist from various districts in a region to ensure that learners are exposed to a mixture of global and local cultural content. This can be presented online or on compact discs (CDs).

o LESSON PLANS: Especially in KZN, where there is a shortage of qualified educators, there has to be a blueprint lesson plan for specific lessons. This can act as a guide when new educators are brought into a system and there is a lack of suitable guidance for these educators in the area. Generic electronic lesson plans should allow the educator to indicate the number of periods allocated for each section that is being taught and to compare this against suggested norms. Further, the educator should be provided with a suggested framework for the following so that he / she can customise requirements according a school's individual needs:

✓ Form of assessment

✓ Notional time

✓ Method of teaching

✓ Types of responses

o NOTICEBOARD: A system of allowing information to educators, learners, parents and other role players in education should be set in place. Among other items this should include core curriculum, timetables, testing process, course weightings and reference material.

SOULE'S RESEARCH

Soule (2003: 1) conducted research with short-term volunteers to assess the importance of ICT integration. She states that teachers do not need to learn about technology; they need to learn how to use technology to enhance their learners' understanding and critical thinking skills. Enhancing basic information and communication skills, like reading, writing, and speaking should be the focus of using Information Communication Technologies (ICTs) in education, not simply ICT literacy

RESEARCH SKILLS

Soule (2003:6) argues that there is a need for learners to develop basic research skills. Learners need guidance in developing their questions, in finding, selecting, and evaluating information, as well as understanding the meaning of plagiarism and how to cite references.

LEARNER MOTIVATION

Many learners think computers are fun and exciting. As such, ICTs can potentially provide a forum for cultivating research skills and intellectual curiosity. Soule (2003:6) states that this finding is similar to that of Robert Hawkins who manages the ICTs and Education Program at the World Bank Institute. Hawkins extracts ten lessons that policymakers, business and community leaders could bear in mind as they attempt to incorporate the Internet into the educational process.

Learning involves more than just motivation. Once the learners' attention is fixed, it does not mean they will learn better because they are using technology. It is important to use learner motivation as an opportunity to design learning experiences that require learners to use technology as a tool to help them build and demonstrate understanding.

USING TECHNOLOGY IN EDUCATIONALLY MEANINGFUL WAYS

Soule and her volunteers observed that learners tend to explore their interests in pop culture and play games when they are given time and access to computers without guidance. While this enables learners to cultivate their interests and to develop their computer skills, it is questionable if these pursuits provide learners with access to any academically relevant information. When coupled with school work and learner-centred direction, time and access to ICTs can enhance learning because learners can practice researching, and specifically have the opportunity to explore academically relevant information not available in school libraries.

ICTs AND CO-CURRICULAR EDUCATION

Co-curricular activities are not given the same amount of time and priority as core curriculum subjects. Information Communication Technologies can add to the learners' and teachers' motivation to work on these important themes by providing access to resources which are not readily available in print in most schools. This was the case at K.W. von Marees Primary School[20] where teachers used ICTs to enhance entrepreneurial education, and at

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[20] WEBSITE: http://www.schoolnet.na/logs/viewschool.php?login=kwvmaree Schoolnet.na, June 04

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Tamariskia[21] Primary School where educators used computers as tools to enhance understanding of civic education, and at Oshakati Senior Secondary School[22], where volunteers addressed reproductive health education by having learners research HIV/AIDS on the Internet.

USING COMPACT DISCS (CDS) IN E-LEARNING

Compact discs can be used as tools for accessing information in core subject areas. In addition, compact discs simulates the web experience, and by using them, learners can develop relevant web navigation skills. SchoolNet Namibia[23], put the Development Education Program's website on the internal server so all SchoolNet schools in Namibia as well as Teachers' Resource Centres could access the Development Education Program materials without being on-line. Microsoft donated the full version of Encarta encyclopaedia to Floration[24] Primary School. The school's improvised print library could not compare to the wealth of information available from these compact discs. Compact discs offer cost effective solutions to e-education in the absence of the Internet. They can hold vast amounts of information without requiring large storage space. These discs are relatively cheap and in most cases acquired free for educational purposes.

THE COMPUTER SCIENCE CURRICULUM

Some principals and teachers assume that the best way to use computers at their schools is through teaching courses based on the computer science curriculum. While this may help a select group of learners prepare for a career in computer science, this approach to computer training for the average learner is similar to teaching learners every part of a pencil before allowing them to draw. The problem is that, it brings the learners to view computers as exceedingly complex pieces of electronics without giving them any particular idea of how to effectively use them toward any valuable end in the real world. Much of the computer science curriculum is "outdated" because it requires learners to master such skills as using dos commands that they say the average computer user has not needed since the introduction of Microsoft windows 98.

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[21] WEBSITE: http://www.schoolnet.na/logs/ viewschool.php?login=tamarisk Schoolnet.na, June 04

[22] WEBSITE: http://www.graduates.com/ss.asp?id=276508, SchoolNet, June 04

[23] WEBSITE: http://www.schoolnet.na/, SchoolNet Namibia, June 04

[24] Aquadene, Richards Bay

USE OF ICTS AS EDUCATIONAL TOOLS

Pressure to prepare learners for exams discourages teachers from using class time for learner-centred activities. Some principals and teachers view the computers as a distraction. Frequently, the only time left for ICTs is after school when most learners and teachers often have commitments outside of school. There is no policy for public schools in KwaZulu-Natal that directs integration of ICT teaching to the entire curriculum. While it is positive that a few learners are using computers to enhance their extra-curricular interests, many learners remain ignorant about how computers can assist them with enhancing their learning and developing relevant and meaningful life skills through their academic studies. It is interesting that Cuban (2004: http://sustainability.terc.edu/ index.cfm/page/4066), a professor of education at Stanford University in the United States, reports that the most common use of technology in schools is word processing and Internet searching. He drew these conclusions based on research he conducted in the Silicon Valley, area in northern California. Specifically, he says that teachers are using technology mainly for administrative tasks such as communicating with parents, preparing syllabi, or recording grades. In cases where teachers report that they use technology, it is usually to maintain existing practice and not to teach in a new way. This suggests that teachers are not afraid to use technology. Teachers are using technology for many tasks, but it is questionable if technology is being used to enhance teaching and learning.

CURRENT INITIATIVES TO STIMULATE E-LEARNING

The revised history syllabus relating to post apartheid era conception of history in South Africa will now be available on the Internet. Omar Badsha, the initiator of History Online in South Africa, has made this possible[25]. All schools and pupils, including those who live in the most remote parts of South Africa, can log on to www.sahistoryonline.org.za and download the new syllabus and textbooks with current updates.

On 6 June 2004, Sunday Times published an article "Education At The Click Of A Button" by Glendenhuys. It explained how virtual schooling allowed children like 16-year-old model and dancer Nastassja van Loggerenberg to pursue a career in show business while getting her education at home. She is among 5000 pupils being taught by Brainline School on Computer, which is a South African Initiative that offers schooling via the Internet.

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[25] E-News, 20H00, 16 July 2003.

The virtual school is part of an independent sector, which has tripled in size since 1990. It offers the entire South curriculum, from Grade 1 to 12 on a single CD. Its biggest growth occurred after 1997 when home-based schooling was legalized. Both Independent schooling and home education have grown for parents wanting something different for their children to what the standard system provides.

The Oxford dictionary defines school as an organization for educating or giving instruction. One prospect is that the Internet[26] becomes such a school.

On Thursday 10 April 2003, SADTU- Gauteng, SchoolNet SA, the University of Jyvaskyla and Immenti Ltd presented the e-Journal (www.ejournal. schoolnet.org.za) as one mechanism to take learning to the learner, using the World Wide Web[27] as the classroom. As part of the Global Action Week, the e-Journal was presented at a workshop as one platform to facilitate education for all. (News from SACE'S: Professional Development, A Monthly Update. May 2002. Editor Rodwyn Grewan -Chief Executive Officer, SchoolNet)

The e-Journal[28] provides an individually populated, interactive, multimedia platform for the dissemination, sharing, collaboration and dialogue of any subject of interest. By using the WWW to host the e-Journal information is taken on to a digital platform.

IMPLEMENTING E-LEARNING IN KWAZULU-NATAL

Valuable information is freely available online. According to University of South Africa, 2002, one of the criticisms of curriculum 2005 is that schools lack the necessary material and human resources. This is the very area that the WWW can be an excellent tool and once the structure is put in place, could have a favourable effect on the educational budget.

With increased access to technology in schools and classrooms and with public support for its use, we can now look to a future where the Internet and other emerging information technologies have the potential to foster even more dramatic improvements in education. We have the potential to create an educational system enhanced by technology that could be better

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[26] The Internet is the linking of computers and similar communication devices via telephone lines and similar communication channels so that a network of computers (or similar devices) are linked to each other. An auxiliary network link is provided to an outside establishment, which is generally referred to as an Internet service provider, which subsequently links this network to other networks.

[27] Henceforth referred to as WWW. Computers on the Internet that store information which can be accessed by other computers are considered to be part of the World Wide Web. Information can be stored in many ways. One of these is through Web Page. If an Internet computer has a Web Page it may be part of the WWW.

[28] e-Journals are also used as references in this study.

suited to the needs of educators, learners and their families. Visionary school leaders foresee advances in our understanding of what learning really is, how diversified it is, and which methods are flexible enough to meet the learning needs of all learners.

DIGITAL CONTENT

Hendricks and Bryant (2000:5) state that digital content is the multimedia material that calls upon learners to seek and manipulate information in the collaborative, creative, and engaging ways that make digital learning possible. It includes video on demand, CD-ROMs, Web sites, e-mail, on-line learning management systems, computer simulations, streamed discussions, data files, databases, and audio. Digital content is critical to digital learning because it is:

- o Randomly accessed [29];

- o Relevant, up to date, and authentic;

- o Explored on many levels;

- o Easily manipulated;

- o Instantaneous;

- o Creative.

The National Academy of Science (2004: *online book*[30]) produced a report on *How People Learn*. They found that new and emerging technologies have the potential to enhance learning and the development of new knowledge in many exciting ways. For instance, technologies can help learners visualize difficult-to-understand concepts, such as differentiating heat from temperature. There are also visualization and modelling software, (similar to the tools used in the workplace) which increase learners' conceptual understanding. Since new technologies are interactive, it is now easier to create environments in which learners can engage in learning, receive feedback, and continually refine their understanding. In addition, new technologies provide access to a vast array of information, including digital libraries, real-world data for analysis, and connections to other people who provide information, feedback and inspiration. Finally, new and emerging technologies also offer opportunities to individualize instruction

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[29] According Freigenbaum (2003:79), video on demand will ultimately supplement live transmission by the use of wideband technology. Electronic delivery of entertainment will be enhanced so that it will be available whenever the viewer wants it. This will also become part of the e-education scenario.

[30] http://books.nap.edu/html/howpeople1/

and assessment in promising ways for all learners, including especially those learners at the greatest risk for school failure.

Helping Learners to Comprehend Difficult To Understand Concepts

For many learners, the lack of visual representation of many higher-order concepts makes learning them difficult. In this regard, teachers have been limited in what they can teach by the tools to which they have access. New technologies allow teachers to teach complex ideas and address intellectual challenges more easily. In the near future, learners who have difficulties understanding text will be able to access multimedia resources in real-time through the Internet or standalone software, allowing them to better understand the relevant underlying principles.

According to Angelo (1999: http://www.intac.com/~aboutcmp/Graphics99-2.html) many learners find difficulty in making connections between mathematical expressions and its related context. Computers, which can draw graphs and other mathematical objects, allow learners to "play" with them and help learners relate mathematical expressions to images in the "real" world.

Exploratory data analysis software (and other visualization techniques) allows learners to see patterns in data they would never glimpse if they had to do the calculations or even draw the graphs themselves, thus emphasizing the meaning of mathematical objects and the beauty of the patterns they exhibit.

According to Frankfurt (1996: http://www.particles.de/paradocs/_bbb/laban/www/ griesbec /choreoe.html) technology can be used in dance to document and analyse the dynamics of movement. For example, computer-aided choreography gives dance educators the ability to work out ideas of space and movement on screen without bringing the dancers together. Computer software created for movement notation allows teachers and learners to create and edit dance notation scores very quickly.

Helping Learners to Engage in Learning

One of the most promising uses of technology in education involves teachers helping learners actively engage in learning. Technologies such as CD-ROMs and robotics provide incredible resources for teachers. The increasing power and versatility of computers create teaching and learning possibilities dramatically different from those that were previously

available, providing teachers with the opportunity to enrich their instruction and learners with the opportunity to contribute useful resources to others. Technology resources and tools allow learners to explore their areas of interest and to investigate topics that have been mere words in a textbook.

EDUCATION FOR A SUSTAINABLE FUTURE

Through the Internet, learners also have a chance to work interactively in the "real" world. Many links have been established between practicing professionals and schools where learners actually assist in solving problems that professionals in the field are currently working on. In such situations, learners are able to work on and develop problem-solving skills in realistic workplace situations.

One of the most powerful opportunities afforded to education by technology is the opportunity to improve learners' individual learning needs. In addition to creating more engaging content, current new technology allows better and more accurate assessments of what learners know; where they are having difficulties, and how their teachers could best convey the knowledge and skills learners need.

Access to real-time tutoring increases when opportunities are made available via the Internet. ICTs work in a direction that meets learners' individual needs. All learners benefit, including learners with disabilities and learners considered at-risk of school failure. ICTs display a promise of making a difference for gifted and talented children, allowing them to learn at their own pace and explore subjects in greater depth. Every child has special needs and every child deserves individualized instruction. Effective use of ICTs shows great potential to be able to aid teachers meet challenges of all learners.

VIRTUAL LABORATORIES

According to Huang (2004: 734), because of the explosive growth in our scientific understanding, today's learners are required to learn and maintain a rapidly expanding knowledge base. Learners are also expected to understand and follow the crossover of information between different disciplines. As a result, they often have to understand the fundamentals of several disciplines, and be able to integrate that knowledge. Learners of every discipline are facing these new challenges, and it is clear that today's learners are markedly different from those of the past. Influenced by a lifetime surrounded by media, computers,

and the Internet, they bring with them different expectations. Educators need to meet these expectations in order to motivate learners to move forward.

It is not just the learner population that is driving change. The National Institutes of Health, which sponsors many biological and medical advances in the United States, has a new initiative called "Digital Biology: The Emerging Paradigm," whose goal is to merge biomedical computation with biology and medicine over the next ten years. One way to facilitate this movement is to use Information Communication Technology (ICT) as a teaching tool, so that learners, in turn, learn how to use ICT most effectively.

ICT presents educators and teachers with a unique opportunity to devise innovative methods of teaching. Learners today are more likely than ever to use new tools and technologies to advance their understanding of the sciences. Currently, this usage is mainly limited to searching the Web for information. However, computers and the Web can be used for much more. With computers, one can create learning scenarios like virtual patient simulations, and with the Web, these learning resources can be disseminated to the global community. Educators need to harness the power of these enabling technologies, which learners have already adopted, to create new and more powerful methods of teaching that will better prepare the learners for the next phase of their lives.

The Virtual Laboratory material is currently hosted on a password-protected site and is freely available to interested parties for educational use.

The Virtual Laboratory not only uses pictures, but also animations and interactive simulations. Learners are able to visualize and interact with dynamic processes in science. Virtual Labs also strives to make learning science fun. The more engaged the user is, the more likely the learning experience is to be positive. For example, after learning about how the kidney filters blood and controls water levels, learners apply their new knowledge by playing a simulation game. The goal of the game is to maintain water balance in order to survive on a deserted island, which helps to reinforce conceptual understanding and to ensure that learners understand how those concepts fit together.

TECHNOLOGICAL BACKGROUND OF MLEARNING

According to Bates (2004: 176) politics is a central issue, which can influence the extent to which broadband mobile technologies will be available to the general public. Political agenda influences the cost of wireless technologies since politicians influence legal policies that

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regulate the operation of telecommunication companies. The cost of buying a mobile device suitable for mLearning and the price of the mobile courses will also influence the spread of mLearning

Internet Connectivity

Web pages presented on the Internet are not static and text based. The Internet is dynamic and interactive, offering the possibility to include multimedia and advanced scripting capabilities. These enhancements increase learning possibilities via the Internet.

Global System for Mobile Communications (GSM)

The most widely used modus operandi for mobile communication is currently GSM. Mobile phones can be used for calls, Internet access and mobile telephony services, however, the slow data transfer rates offered by GSM (9.6 Kbps) does not warrant its use for mLearning.

Short Messaging System (SMS)

The ability to send limited amounts of text from one mobile phone to another is called Short Messaging System (SMS). With respect to mLearning, it can be used to convey small amounts of important information. The disadvantage of using SMS is that it can be distracting, particularly when one might be tending to other issues. This is a service that could also be used to send short messages to the learners or teachers as well as an automated reply from a server to say that one may now see one's grade on one's last assignment.

Multimedia Messaging System (MMS)

The use of multimedia on mobile phones is gaining ground at the moment with the introduction of the Multimedia Messaging System (MMS) to send pictures from one mobile phone to another. It is an extended version of SMS. Pictures may improve learners' ability to recall actual situations (Kynäslahti and Seppälä 2002: http://www.pjb.co.uk/m-learning/mlearnig.pdf).

Mobile Phones

When mobile phones was first introduced to our country they were bulky devices and offered a limited range of services. A new wave of fashion was ushered in as cell phones became smaller and lighter. With a mobile phone, one could be reachable independent of time and place.

Current mobile phones have the improved capability of managing SMS, e-mail, music, sound and pictures, including the added capability of connecting to the Internet. Although this technology is relatively new it displays great potential for improvement.

In South Africa data transmission speed is a bottleneck when mobile phones are used on the Internet. There is a lot of work being put into resolving this issue, and it is hoped that 3G technologies will be the answer. Asian countries have worked on developing 3G technologies, and have reached greater heights in this regard, compared to their European counterparts (Søiland, 2002: http://www.computerworld.no/cwi.nsf/print/ EA709707.06.2002).

Great technological advances have been made in the field of mobile telephony over the past years. This has resulted in increased functionality on smaller units. In the future, we will see mobile phones being used in a wide array of products and services; for instance drivers' licenses, identification cards, and the like. All this functionality will be integrated in a single mobile unit (Selnes, Mobilnyheter.com, 2001: http://www.mobilnyheter.com/guider/guide.asp?artikkelid=1).

In South Africa, usability features of mobile devices, such as small screen size; high data transfer costs and bandwidth limitations are some drawbacks to the use of mobile phones as a mLearning tool. Usability limitations will have to be addressed.

ONLINE TEACHING SYSTEM

According to William and Owen (2004: 208), the teacher's role in mobile education is a facilitator[31] in the learning process. The main challenge is to provide pedagogical support to mobile learners independent of time and location.

According to Sariola et al (2001: 254) tight classroom schedules are non-existent for mobile education and most educational content is readily available to the tutor on mobile devices or can be accessed using a wireless Internet connection

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[31] The educational system is now focused on learning rather than on teaching. The developments of learning theory have changed the nature of learning and the perception of the learner. Knowledge is considered as socially constructed through action, communication and reflection involving learners. Teachers then will gradually become advisors, managers and facilitators of learning rather than providers of information (Bates, 1993).

The learner's role is that of an information and skills seeker. To assist them in realizing this objective, wireless data solutions allow them to access a wide range of internal and external learning resources.

mLearning would promote non-exhaustive methods of study. Studying often and for shorter periods of time may give pedagogic advantages such as improved focus and better concentration on the subject.

THE WORKING SITUATION OF A LEARNER

There are implications that broadband technology is an important part of emerging communications so that people will be able to download information whenever they need them. According Freigenbaum (2003:79) video on demand will ultimately supplement live transmission by the use of wideband technology. Electronic delivery of entertainment will be enhanced so that it will be available whenever the viewer wants it. This is already part of the e-education scenario. This gives facilitators the option of creating lessons or assessments according to predetermined schedules or "on demand", i.e. whenever the learner wants to view the lesson. Traditional education is restrictive in that the recipient is bound by the constraints of the sender.

Video on demand blends easily with education to create education on demand. This innovation changes the manner in which traditional mass communication was portrayed. Previously mass communication was restricted by tight schedules and the inability to timeously receive feedback from the recipient. Education on demand alters and even overrides the constraints of traditional mass communication.

Mobile learning provides the learner with an assortment of flexibility both with regards to the choice of when and where to study as well as personalization of the mobile devices to suit their individual needs. The learner may be able to study in real life situations and be able to work in the field while being mentored by a teacher at a remote location. This situation augurs well for both learners and teachers in rural, semi rural and previously disadvantaged districts for KwaZulu-Natal.

The freedom gained from mobile learning may be too demanding for some learners to manage. Schools may need to run self-discipline courses with pupils in order to ensure that they cope with these new modes of study.

THE WORKING SITUATION OF A TEACHER

By assimilating a culture of mobile learning, the teacher and the mobile learner will benefit from increased flexibility. Learners will expect teachers to respond to queries promptly, irrespective of time and place. There will be no clear-cut division between tutoring hours and spare time.

There is much promise that teachers will not be overloaded, as long as adequate learner support services are in place and the course content is of a pedagogically and academically high standard.

THE FUTURE OF MLEARNING

mLearning has to be a comfortable and practical way of studying. The ordinary mobile units today are equipped with a small screen with rather poor quality. The next generation units provide true colour, great resolution and can present crisp clear colour images and movies as the more advanced models do today. These units also come with speakers and can play music in compact disk quality or even better. For mLearning learners this means the opportunity of a great audiovisual learning experience.

The problem today is that these multimedia units are rather expensive and only limited amounts of supporting services are available. We believe that in a few years the situation will be quite the opposite. Mobile multimedia units at reasonable prices will probably dominate the market, not the ordinary GSM-phones. There will be a broad range of services available for the users: Hopefully also educational services.

Battery capacity is a critical factor for any mobile device. There is no use offering mLearning courses if batteries run out after a short duration. Current mobile devices have reasonably good battery usage, but it is still not common to stream live video/music and display high-resolution graphics, which drains much more power than playing simple games on a GSM-phone.

Mobile units suitable for mLearning have to be equipped with a wireless communication device of some sort. Bluetooth, GSM and similar technologies use radio waves to transfer data without the need of a physical link between the units that are communicating. A concern is the extent to which users of mobile units are exposed to dangerous radiation. Research in the area does not unanimously indicate that the radiation from GSM- devices can lead to diseases like

brain tumour and cancer. Thus research has proven that people using the old fashioned NMT-system have a higher chance of developing brain cancer (Neset, 2001: http://www.itavisen.no/art/1296799.html).

The Internet is a perquisite for mLearning to take off. The Internet should be at affordable costs to the general public. The biggest impact mLearning will have on both learner and teacher is increased flexibility. Learning will be able to take place in other environments beyond the restrictions of time.

COMMUNICATION AND E-EDUCATION BEYOND SHANNON AND MERSHAM

INTRODUCTION

The author has been an educator in KwaZulu-Natal for twenty years (1985 – 2003). He has been involved in school management and grassroot education that included parental involvement via the school governing bodies. Most part of these years has been in an urban or suburban environment. The latter part introduced him to the rural as well as previously disadvantaged public schools. It was during this time that he was exposed to the problems of rural and previously disadvantaged public schools. Among other problems, one of the major problems was the lack of qualified staff. When unqualified personnel are employed there is always the problem of inability to provide suitable guidance. The main source of guidance normally comes from a textbook, a curriculum and some notes, which the principal may have borrowed from his/her kind relative. What needs to be strongly argued here is that even if a library full of textbooks or an overload of information from the internet is made available to a novice teacher, it will not be of much assistance unless the material via these sources are "tailor made[32]" to suit the curriculum. It has also been noted that this scenario is not absent within urban schools. Teachers in urban schools also have the problem of having to cope with vague curricula and varied assessment methods and standards.

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[32] This has relevance to "Knowledge Management" which is discussed in Chapter 2.

The Impact of E-Education on Traditional Education

In the first section of this chapter Shannon's model of communication is unpacked to explain how it permits flexible accounts of human behaviour and its variable relationships. The channel actually dictates, or severely influences, the message—both as sent and received. Also the elements of encoding and decoding in Mersham's model of communication, and the manner in which these processes influence the interpretation of the message are explored.

According to Schramm 1964:187, it is very helpful to know who makes the key decisions, who are the leaders, how great is their influence, what the importance of public opinion is, how is it formed and what influence the group norms exert on the individual. In the following paragraphs Diamond's representation of bureaucracy and power sharing is examined in conjunction with Gass and Seiter's model of compliance gaining to illustrate how bureaucracy will evolve in the context of e-education..

The psyche as well as the metabolism of modern humans was fashioned during the hunter-gatherer forms of nomadic existence. Even though 1300 years ago humans started forming a sedentary life style (Diamond 1999:240), our bodies still require the exercise and physical movement that we were programmed for as hunter-gatherers. Diamond (1999:268) distinguishes between the following cultural communities:

- o Bands;

- o Tribes;

- o Chiefdoms;

- o States.

According to Diamond (1999:268) the mobility of these communities varies from significantly mobile/nomadic to principally sedentary (in the same order as they appear above). Governance in these communities also progresses from a loose form of governance in the Bands, where there is no chief governing figure to a fixed bureaucratic form of governance in the States. The type of governance determined the type of communication in each type of community. In the "Band" communication was of a linear type where members communicated with each other on an equal status. The status of communication changes as communities· progress from Bands to States. Communication at State level occurs between members of unequal power settings which influences the manner in which they communicate.

In the above communities, communication occurs in small groups or clusters of small groups within the governing structures. In small group communication people normally form smaller nuclear groups to enable conversation. Conversation is the natural form of small group communication. In modern day governing structures, communication occurs in a context where participants occupy unequal power settings. The General Communication Model can explain communication in the "Band" communities where communication occurs on a linear plane i.e. where there are equal power relationships between participants.

Metaphorically, "Bands" would represent clusters of learners in playgroups or class groups where there is evidence of small group communication in an egalitarian context. Similarly, "Tribes[33]" are representative of school districts. According to Diamond (1999:263), there are clear differences between the various Tribes. For example, the "Big Man" tribe has a clear form of leadership. Big Man Tribes evolved into "Chiefdoms". Chiefdoms are elementary illustrations of bureaucracy[34]. Central laws promulgate hierarchy[35] of leadership within Chiefdoms, which stretch over a consolidated territory and the various tribes that form part of the tribunal.

In summary Bands display an egalitarian type of power sharing in a nomadic lifestyle. The Tribes display behaviour that entailed an elementary form of authority and a sedentary lifestyle. Authority was commanded by a singular power figure. This form of authority progressively became more organised as these communities developed from Bands to States. In the States there was a highly organised hierarchy of power and a purely sedentary lifestyle.

The education system displays a similar pattern of bureaucracy as displayed by the communities, which Diamond describes. If the school is divided into class groups, school teaching staff, middle management (heads of departments / deputy principals) and the principal, then each of these groups are likened to the Bands, Tribes, Chiefdoms and States respectively. The type of bureaucracy in Diamond's structure becomes a prototype for that which is represented in the school. This type of bureaucracy is actually replicated in all the structures of the Department of Education as illustrated in the table below. People with positions of power are seated at higher levels of authority.

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[33] Clusters of "Bands".

[34] Management or administration marked by hierarchical authority among numerous offices and by fixed procedure.

[35] A body of persons having authority.

	DIAMOND	SCHOOL	NATIONAL EDUCATION
Highest level of bureaucracy	States	Principal	National Department of Education
Intermediate level of bureaucracy	Chiefdoms	Middle management	School Regions
Elementary level of bureaucracy	Tribes	Teaching Staff	School Districts
Flexible levels of bureaucracy	Bands	Pupils	The School

Figure 10: Levels of hierarchy

Compliance gaining was an essential tool in maintaining power and authority in the tribal communities, which Diamond describes. Gass and Seiter (2003: 236) illustrate that compliance gaining generally focuses on persuasion aimed at getting others to do some thing or to act in a certain way. Gass and Seiter (2003: 244) add that regardless of the type of power that is at work, one thing remains clear: power affects compliance-gaining behaviour. As an example it is interesting[36] to note that Diamond (1999:377) refers to Dingiswayo and how he consolidated the Zulu empire. Dingiswayo was unique among clan chiefs of the era. He offered members of the Mthethwa confederation protection and a relatively autonomous rule. In exchange, clans paid him tribute and provided warriors for military campaigns. By trading their tribute the Mthethwa became one of the most powerful peoples in the region.

The form of governance and hierarchy, which exists within an educational system, can be traced back to the bureaucratic form of governance, which Diamond speaks of in the "States[37]". According to Diamond (1999: 268) bureaucratic governance existed in the era of Chiefdoms and States. The function of forms of bureaucratic governance is to maintain control within communities.

Diamond's model of hierarchy has become a metaphor for how school is managed at school, district or regional level. When a band evolves to become a tribe it does not denounce its properties but incorporates it into the new system to form a hybrid system of functioning.

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[36] This research is based in and on KwaZulu-Natal.

[37] Clustering of Chiefdoms.

According to Stewart (2004: SABCNews.com) the rate of Internet penetration in South Africa is 6.5%. This has sparked many debates as to whether assistance should be given to feed the hungry or to find ways to stimulate Internet penetration in South Africa. One such forum may be found at http://www.ojr.org/ojr/forums/newforum.php?forumID=53389&order=subject. Discussions based on the following themes are a common occurrence:

- o Feed the poor and ignore Internet connection;

- o Promote Internet access or;

- o Provide Internet for education to enable sustainable self-sustenance.

Assuming that e-education is ideally implemented it would be expected that, just as previous education inspectors have become education managers, Education managers would become online Education Facilitators[38]. This envisaged online scenario would result in Education Facilitators ensuring that all schools including rural and urban schools will have easy access to administrative and educational material promptly. Expectedly, principals and teachers will have passwords to selected material. Education gate keeping will ensure that all schools have access to proper education material such as sample lesson plans, sample assessment guides and sample year plans to ensure that even the most disadvantaged school has meaningful guidance. Schools such as those in Aquadene and Brakenham that are without many specialist teachers can have novice teachers log on to such a well planned website and download the necessary lessons and merely pass these to learners. Novice teachers in these areas have very little professional guidance and are struggling with textbooks, which do not provide much guidance in terms of lesson plans, depth of curriculum coverage, levels of assessment.

It is further envisaged that in an ideal e-education climate in KwaZulu-Natal, Educational Facilitators (ex-educational managers) will be able to provide a more feasible service by ensuring all schools receive all circulars simultaneously by electronic means. This may be in the form of e-mails and small message reminders via cellular phones. For example, a small remote school which always received circulars a few weeks after urban schools received them or do

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[38] According to Bates 1993, the educational system is now focused on learning rather than on teaching. The developments of learning theory have changed the nature of learning and the perception of the learner. Knowledge is considered as socially constructed through action, communication and reflection involving learners. Teachers then will gradually become advisors, managers and facilitators of learning rather than providers of information.

not receive some circulars at all will be able to receive an SMS[39] from an education facilitator to inform her/him that s/he needs to go to the nearest mobile communication centre and download circulars or educational material.

In the ideal e-education scenario, the education facilitators will be able to centralise education management with fewer visits to advantaged schools and optimise visits to disadvantaged schools. Feedback to struggling schools / teachers from education gatekeepers could be appropriately structured. The education gatekeeper will be able to compile a database of specific lesson plans, assessments, record keeping criteria and year plan with assistance from competent teachers. These can be immediately made available to those who need assistance, rather than waiting for a few weeks to arrange an appointment with someone who can assist.

The education gatekeeper will have the same powers as Dingiswayo as illustrated by Diamond in his analysis of bureaucratic "States". Bureaucracy in the e-education scenario poses greater advantages since the education gatekeeper can be virtually in many places at the same time. This was an essential characteristic in the strengthening of the Zulu empire. Unfortunately, in the traditional tribal era, chiefs had to travel great distances to meet all clans and they also had to make use of aides to assist them in performing some of these visits.

Traditional teaching authority was derived by the use of autocratic compliance gaining (detention or corporal punishment) techniques. A teacher's status was determined in how much negative power s/he could wield. In the new e-education scenario, levels of knowledge will determine the teacher's status of power. Although there is no systematic research result yet that confirms or disconfirms the possibility, it is generally believed that children more effortlessly adopt computer communication as a primary instrument of electronic communication. This has implications for the authority of educators in an e-education environment since learners could have a better command of computer-mediated learning. Diamond's model of hierarchy suggests that who ever controls the resources controls the power. Adults have more power/ authority because they control the resources in the organisation (family). According to Diamond where there is equal distribution of power, authority and control are derived by compliance gaining. Compliance gaining became the motivating factor in who acquires command.

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[39] Small messaging service.

For e-learning (within e-education) to be successful, teachers have to use non-authoritative means of commanding educational power and control such as techniques of positive compliance gaining. Within the reviewed education context, there is a strong emphasis of eliminating corporal punishment in the classrooms. The source of the teacher's higher power is no more derived from corporal punishment. Compliance gaining is used to give the teacher the sense of authority in the classroom. Further, a good command of the subject provides the teacher with a strengthened relationship of power. Because of the varying roles that are occupied by the teacher and learner, channels of communication vary according to the level of authority of the sender or the receiver. Therefore, models of communication for learning are required to accommodate these unequal relationships.

During teaching and learning, the process of communication involves persuasion, confrontation and negotiation. An example is when a learner encounters new knowledge s/he may find difficulty in assimilating this new knowledge, which lends to a confrontational situation between learner and teacher. The teacher may use this situation to negotiate the terms of understanding to provide lucid meaning to the new knowledge.

The teacher could use forms of persuasion to entice the learner to placidly accept new knowledge. This could be achieved by creating an element of trust between the teacher and learner. In teaching and learning there is no negative meaning attached to the persuasive, confrontational or consultative type of communication. When persuasion is applied in communication during teaching, the learner is intrinsically motivated to work on his/her own without expecting external rewards. S/he thereafter works for personal gratification. It is therefore advisable for the teacher to direct confrontational communication to a persuasive form of communication. Persuasive communication is important in the OBE paradigm because of the existence of unequal power relationships in education.

In e-education, the position and authority of the teacher is dynamic. This situation is potentially explosive because children have a tendency to learn how to use new technology faster than adults. It is possible that their knowledge if ICTs may outstrip that of their educator. In OBE, expert knowledge of the subject places the teacher in a superior position of authority whereas in e-education it is their expert knowledge of the subject as well as practical operational knowledge of the ICTs that are required to give the teacher the sense of authority. People are very chary of new technology because it destabilises their sense of control if they

do not have command over the technology. e-Education further complicates education if it is not introduced in the correct way.

Knowledge acquisition is not based on a linear model, which dictates that knowledge is poured into a learner. Learners consciously determine what knowledge they accept or reject based on their relationship with their facilitator[40]. This relationship may be based on the level of trust that they have of the facilitator. If the teacher is extremely persuasive s/he may be able to change the learner's belief and enable the learner to accept what is being presented otherwise it will be negotiated.

The author of educational software will be referred to as the primary communicator in this dissertation. The primary communicator is the mass communicator since s/he is designing (interactive) learning material for large population groups. The primary communicator can influence acceptance of knowledge by attaching pleasure to the delivery of knowledge in the form of edutainment. When learning is combined with games and entertainment, it underplays failure and rewards success emotionally. This form of virtual learning allows brighter learners to progress to higher levels of learning at a faster rate and permits the average learner or the underachiever to progress at the individual's comfortable rate of learning. The use of edutainment in e-learning combines the painful task of learning with pleasure. Incorporating comic characters that are familiar to the learner further enhances the learning process. When compared to a learner going through a traditional worksheet, a blend of e-learning and edutainment makes learning pleasurable. In this case the primary communicator uses covert knowledge to represent ideas. Virtual educational games provide the learner with targets, which should be achieved.

E-LEARNING WITHIN THE CONTEXT OF EDUCATION

e-Learning can be delivered through a CD-ROM, over the LAN, or on the Internet. It includes Computer-Based Training (CBT), Electronic Performance Support Systems (EPSS) and Web-Based Training (WBT), as well as distance learning. e-Learning is flexible learning using ICT resources, tools and applications, focusing on interaction among teachers, learners, and the online environment, and on collaborative learning. e-Learning usually refers to

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[40] According to Bates 1993, the educational system is now focused on learning rather than on teaching. The developments of learning theory have changed the nature of learning and the perception of the learner. Knowledge is considered as socially constructed through action, communication and reflection involving learners. Teachers then will gradually become advisors, managers and facilitators of learning rather than providers of information.

structured and managed learning experiences, and may involve the use of Internet, CD-ROM, software, television, other media and telecommunications.

e-Learning, for the most part of the learning situation, occurs in a virtual environment. The virtual environment simulates the natural / physical environment in its ideal form. This implies that the virtual environment "filters" the natural environment of distortions at the point of learning, to produce an ideal learning environment. Therefore, all forms of communication, which exists in the physical, are replicated in a "pure" form in the virtual learning environment. Mass communication, Intrapersonal communication, Online Small Group communication, Interpersonal communication and Organisational communication in the form of Digital communication are present in the virtual learning environment.

When the learner opts to engage in self-tutoring (in the virtual environment) by using information technology such as an interactive compact disc, s/he is engaged in a form of Intrapersonal Digital communication. In this instance the role of the facilitator is taken over by the learner. Simply, the learner becomes the facilitator and the learner.

Content responsibility is placed on the facilitator in both the physical and virtual learning environments. In the virtual learning environment both parties can collaboratively determine other aspects of learning such as choice of content or the rate of learning. The learner in the virtual learning environment is at the centre of the learning process, giving him control over both content and process. When the learner opts to use an education CD, such as a maths CD, the learner is facilitator and learner. The teacher's role as communicator is minimised to provide instruction as to which CD to use and probably instructions relating to its technical use. The facilitator provides support when required.

In the traditional classroom, a teacher was able to gain the compliance of learners by means of the range of punitive options at his/her disposal, e.g. detention, writing lines, awarding poor grades, ridiculing, physical punishment, all backed up by the support of fellow staff members, the principal. In present-day settings a teacher's ability to gain compliance resides in her/ his persuasive / motivational abilities and her / his command of knowledge. A teacher who persuades wields just as much power as one that punishes, its just different kinds of power with different degrees of visibility. Persuasion is used covertly, while bullying, ridiculing, insulting etc. are used overtly. In e-learning there are a number of invisible/ covert minor co-communicators along with the major one that overtly wields the power.

Learners concerned mainly with such persuasive and artistic forms of communication often centre attention upon different kinds, or modes, of communication (i.e., narrative, pictorial, and dramatic) and theorize that the messages they contain, including messages of emotional quality and artistic content, are communicated in various manners to and from different sorts of people. For them, the stability and function of channel or medium are more variable and less mechanistically related to the process than they are for followers of Shannon or proponents of the post-Shanon General Communication Model. (McLuhan asserts that the channel actually dictates, or severely influences, the message—both as sent and received.) According to Encyclopaedia Britannica (2004), various dynamic models of communication have been proposed by analysts of communication, linguistic philosophers, and others who are concerned with the nature of messages, particularly their compatibility with sense and emotion, their style, and the intentions behind them. Learners of complex and dynamic aspects of human communication find linear as well as geometric models of communication of little interest to their concerns, although considerations related to these models, particularly those of entropy, redundancy, and feedback, have provided significant and productive concepts for most learners of communication.

CONCLUSION

In this chapter the author traces the link between new communication technology and its association with learning and communication. This chapter further acknowledges that new communication technologies have altered the way we work and learn because of the complex nature of electronic communication. The concept "interactivity,"—the result of the new communication technologies—has resulted in an epistemological approach to communication. Humans need to be schooled on methods of communication and effective use thereof since it is common for people to continually desire more and more information, but they make the mistake of confusing information with knowledge. Information overload fuels stress and promote faulty thinking.

Electronic communication has effectively revolutionized our society. An unexpected by-product of this revolution has been the emergence of a generation of learners weaned on multidimensional, interactive media sources, a generation whose understanding and expectations of the world differ profoundly from that of the generations preceding them. If we are to give these children the education necessary to succeed in our technologically intense, global future a new form of educational practice, one that builds on children's native learning abilities and technological competence, should replace our existing methods. The theoretical

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foundation for such changes exists, and the time to implement them is now. We have allowed our schools to remain in the past, while our children have been born in the future. The result is a mismatch of learner and educator. But it is not the children who are mismatched to the schools; the schools are mismatched to the children. Only by revising educational practice in light of how our culture has changed can we close this gap, and reunite our schools with our children and the rest of our society.

According Diamond (1999:268) real world communication occurs in a context of unequal power relationships. Unequal status relationship is based on knowledge and ability. Unequal distribution of power in relationships determines the nature of communication. Communication, especially in the educational scenario between learner and teacher or facilitator is not a linear process. e-Education in combination with OBE alters the manner in which teachers and learners traditionally communicate, therefore, all role players in education need to look at innovative ways of ensuring effective delivery of information.

The following chapter deals with the psychology and sociology of cyberspace.

VIRTUAL MOBILITY

INTRODUCTION

This chapter focuses on the nature of virtual socialisation and its association with learning. The similarities and differences in physical and virtual associations (relations), as well as their impact on learning styles, are studied. Furthermore, simulated learning environments are investigated.

PSYCHIC MOBILITY

According to Colombi[41] (2003), social mobility occurs whenever people move across social class boundaries or from one occupational level to another. Mobility can be upwards or downwards. Physical mobility is bound to space and time. It can involve a mental state of mobility such as when people progress from one social class to another and can be restrictive in terms of personality characteristics. Virtual mobility is flexible with virtually no boundaries in space, time or personality. Digital relationships are democratic, economical and strongly supporting of long-life learning approaches. They also remind us that "virtual" does not simply means "unreal" or synthetic.

Modernisation was for Lerner (1964: 412) a psychological process, which carried certain institutional implications. He argued that modernization required that individuals shed the vestiges of traditionalism and develop a modern consciousness. 'Empathy' was for Lerner the most vital psychological attribute of individuals in situations of transition. This mechanism enables newly mobile persons to be interested in "what's going on in the world" and to "get out of his hole".

Lerner (1964: 53-54), considered the media crucial to the fostering of empathy through its ability to affect a transplant of Western ideological and institutional forms into traditional societies. He viewed US television and radio programming as highly desirable catalysts in this modernising process. Movies and radio/television dramas provided: the daily world of their audience with sustained, even intimate, experience of the lives of others. He argued that the media open to people an infinite vicarious universe from within which Western man was disciplined in empathic skills of a modern world.

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[41] Workshop on ICT and learner mobility: *Combining Virtual and Physical mobility.*

Schramm (1964:33-34) believed the mass media to be vital to the inculcation of the required psychological and institutional changes. Schramm was concerned about the educational potential of the media. According to him, education entails the induction of certain values, which closely approximate those of the modernizing consciousness. These centre on those who manifest ambitious, hard working, upwardly mobile, value innovation, risk taking and responsible characteristics.

Lerner and Schramm (1976: 287-301), define western consciousness as mobile; possessed with empathy where empathy is a form of psychic mobility. Empathy is the ability to see oneself in other's situation. This involves personal detachment from tradition and stability.

Prior to the advent of computers and Internet in schools, junior primary teachers used story telling to transport learners into a world of fantasy. This world of fantasy was unique to each individual. Their imagination of the story depended on their own concept of reality (refer to my chapter on constructivism).

Role-playing was the generic means of transforming oneself into another and another's reality. Role-playing allowed the learner to perceive another's belief system as related to one's own, without perceiving one's own as principles.

As an example, one may refer to the following. After a hard day's work the writer needed to engage in some inspirational activity and indulged in Drive on Mars, 2004: www.driveonmars.com/. The researcher was transformed into a "real" astronaut. Upon 'landing' on mars, he 'drove' a 4X4 on the dusty terrain. Being an unskilled off road driver the author almost somersaulted into a huge crater but it eventually turned out to be an entertaining ride. Subsequently he tried to find a water hole but his efforts were in vain. After many virtual hours of driving and discovering, the author was tired and logged off. He shut down the computer, locked up the office, sat in the car and headed for home in peak hour traffic.

The researcher was able to create an avatar of himself and share in a world, which was only possible in cyberspace. According to Avatar (2004: http://www.digitalspace.com/avatars/) an Avatar is one's body double in Cyberspace. It is one's presence in the virtual communities growing inside two and three-dimensional virtual worlds online. With the Internet and increased bandwidth, one can now leave simple chat rooms behind and venture forth into the true frontiers of virtual world cyberspace.

Figure 11: Cyberspace: An example of an Active world

In response to the growing demand for online education tools, Activeworlds Inc.2004: www.activeworlds.com/edu/awedu.asp, launched The Active Worlds Educational Universe (AWEDU). The AWEDU is a unique educational community that makes the Active Worlds technology available to educational institutions, teachers, learners, and individual programs in a focused setting. Via this community, educators are able to explore new concepts, learning theories, creative curriculum design, and discover new paradigms in social learning.

In digital space, life has finally found a place to evolve beyond its age-old restrictions of time and space. Life is no longer limited by the supply of available atoms or slow chemical reactions. Life is no more trapped by the bonds of the natural environment, for it can travel massless and at the speed of light across the solar system.

The idea of virtual reality entertainment creates a challenging potential in education. Refer to my discussion in chapter 4, section three and four.

THE AVATAR

According to The Free Dictionary (2004: http://www.thefreedictionary.com/) an avatar is a temporary manifestation or aspect of a continuing entity. According to Suler (2004: *Electronic book* [42]), in cyberspace, the term "avatar" is used to describe one's personal manifestation in a virtual world. It may be the visual image one creates for oneself, as well as the psychological character or persona one presents to others. The term comes from the Hindu religion in

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[42] This is an example of an electronic book, which may be downloaded free from www.rider.edu/suler/psycyber/basicfeat.html. In order to locate a reference download the book and use the "edit" and "search" function on your toolbar. The concept of online books is discussed in Chapter 2.

which it refers to the various forms that gods chose to manifest themselves in the human realm. Using computer-generated virtual environments, "avatar psychotherapy" could be the exploration of the client's healthy and problematic identities by exploring the manifestation of those identities within imaginary scenarios. Using psychoanalytic terms, we would say that the client teases out, amplifies, explores, and therapeutically develops the various "representations," "identifications," and "internalisations" that make up their intra-psychic world, that are the nuts and bolts of their overall sense of self.

Simply, an avatar is a virtual representation of oneself in cyberspace. The individual who enters cyberspace creates this representation. This means that one is in control of creating one's image. The individual is responsible for the personality characteristics, which s/he discloses in the communication environment s/he finds herself/himself. A cyber profile on the other hand, refers to information which others glean about one by examining one's participation in cyberspace.

Mersham and Skinner (1999: 99) uses the model of the Johari window to assist us in assessing the type of information we disclose, who we make disclosures to, and the communication environment we find ourselves in. They further postulate that the amount of information we disclose in our interpersonal relationships also influences our relationships. The Johari Window, named after the first names of its inventors, Joseph Luft and Harry Ingham, is one of the most useful models describing the process of human interaction. A four paned "window," divides personal awareness into four different types, as represented by its four quadrants: open, hidden, blind, and unknown. The lines dividing the four panes are like window shades, which can move as an interaction progresses. In this model, people are represented in their own window.

- o WINDOW ONE: The area of free activity or public area (OPEN) refers to behaviour and motivation known to self and known to others;

- o WINDOW TWO: The blind area, where others can see things in ourselves of which we are unaware;

- o WINDOW THREE: The avoided or hidden areas, represents things we know but do not reveal to others, (e.g., a hidden agenda, or matters about which we have sensitive feelings);

o WINDOW FOUR: Areas of unknown activity, in which neither the individual nor others are aware of certain behaviours or motives. Yet, we can assume their existence because eventually some of these behaviours and motives were influencing our relationship all along.

The process of enlarging the open quadrant is called self-disclosure, a give and take process between a person and the people s/he interacts with. As one shares something about oneself and if the other party is interested in getting to know the person, they will reciprocate, by similarly disclosing information in their hidden quadrant. We are often better off not telling secrets regarding our sexual behaviour, mental health problems or large-scale failures. If one gives information about oneself, one gives other people power over one. As one's level of confidence and self-esteem develops, one may actively invite others to comment on one's blind spots.

We all have defences, protecting the parts of ourselves that we feel vulnerable about. The blind quadrant contains behaviour, feelings and motivations not accessible to the person, but which others can see. Feelings of inadequacy, incompetence, impotence, unworthiness, rejection, guilt, dependency, ambivalence for loved ones, needs to control and manipulate, are all difficult to face, and yet can be seen by others. To forcibly reveal what another wishes not to see, is "psychological rape," and can be traumatic.

When one's avatar enters cyberspace, one will most probably be interacting in "Johari window one" and as one's association develops one may move to "window two" with certain chosen avatars.

CUES THAT VALIDATE A PERSON'S PRESENCE IN AN ENVIRONMENT

According to Levinson (2003: 46), improvement in technologies of transportation and those of communication should go hand in hand. Victorian engineers made bicycles and railways extend our physical reach, while the telegraph speeded up communications. Thereafter air travel and the telephone developed.

Levinson (2003: 46) anticipates that the virtuality of the Internet would be matched by improved travel into the sensuality of real space. Suler (2004: *Electronic book*) supports the idea that in order for a person to form meaningful relationships and experience life fully, one needs to be physically present, wholly aware of the physical environment with all one's senses and fully involved psychologically and emotionally with others - rather than being preoccupied

with distracting thoughts, memories of the past, and anticipations of the future that fog our minds. Furthermore he contends that the notion of acknowledging the presence of people was born in a time and place before anyone started going online. To create a positive learning environment the instructor should create a learning environment where the students feel comfortable, non-threatened, stimulated, challenged and important. They need to feel that they can ask questions without feeling stupid; they can laugh at their own mistakes and realize they can move on to discovery. The instructor needs to make every effort to keep the classroom lively and certainly the instructor needs to present material that will challenge the students' intellectual abilities. Furthermore, they need to feel that they are important, that they have control over their outcomes. Suler (2004: *Electronic book*) proposes four cues for perceiving the presence of individuals within an environment:

- o Sensory stimulation from the environment;

- o Change in the environment;

- o Interactivity with the environment;

- o The degree of familiarity.

The Effect of Sensory Stimulation in an Environment

As a general rule, the more multi modal sensory stimulation we receive from our surroundings, the more that environment feels real and the more present we feel in it. If we can see, hear, smell, and touch, we know we indeed *are* somewhere. Cyberspace environments currently fall short on the dimensions of smell and touch, but they are becoming increasingly more sophisticated in the visual and auditory stimulation provided. Each degree of added sensory complexity and detail can heighten our perception of environmental presence because the setting acquires more sensory character.

According to Doman (2004[43]) Multi-Sensory Environments consists of specific intense visual, auditory, and kinaesthetic stimuli. These environments provide for specific developmental needs of normal infants. The stimulation provided to children in high stimulation environments is great enough to get through even the poorest sensory channel. The level of function achieved by an individual is a reflection of the stimulation and opportunities afforded the individual by his or her environment. Stimulation, which is produced in sufficient frequency, intensity, and duration, excites the brain, improves the

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[43] *Journal of the National Academy for Child Development. Electronic version available at:* http://www.nacd.org/

organization of the brain, and permits increased functional activity. Suler (2004: *Electronic book*) maintains that we can also feel comfortable within environments which possess low sensory character, such as no-frills text communication involving email, chat, instant messaging, web logs, and message boards. Even though there may be no pictures or sounds, a rudimentary visual setting still arises from the very basic elements of text boxes, buttons, fonts, and overall window design. The simple rectangular window itself creates a visual sensation of place and a perceptual invitation to enter it. Even the word "window" itself conjures up sensations of entering a new cyberspace. Particular visual features within a window can make it more inviting. Even simple design elements like colour, the use of space, and suggestive text make a difference.

Throughout the life span, especially during childhood, humans rely heavily on the close stimulation of touch and smell in developing the awareness of, and intimacy with, significant others. Although Suler (2004: *Electronic book*) acknowledges that Cyberspace currently falls very short on the dimensions touch and smell, it is becoming increasingly more sophisticated in the visual and auditory stimulation provided. Each degree of added sensory complexity and detail can heighten our perception of the other person's presence because the person acquires more sensory character.

The Impact of Change in the Environment

Our natural physical environment is occupied by moving objects or items which have become ubiquitous to our lives. A tree swaying in the wind, a barking dog, a moving car or the old man walking down the road are familiar scenes, which make the environment friendly and real to us. Adding movement, as in motion pictures, may intensify even more the sensation of experiencing a real place. A cyberspace environment embodying movement tends to be perceived as more life-like. Suler (2004: *Electronic book*) states that any online environment that allows the person to move, change, or does something enhances that person's presence. Web cams offer the opportunity to see facial expressions, shifting body language, and physical motion - but even much more simple indications of action and change can be effective in generating presence. In multimedia communities where members use real and imaginary pictures called "avatars" to represent themselves, the ability to move the avatar to different positions in a room mimics physical body movement. Switching from one avatar to another can create body language and a change in identity expression. Even in the pure text environments of chat, message boards, and web communities, a person's presence can be enhanced by the ability to move from one section of the environment to another, assuming

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other people are able to see the person's movement. In any environment, multimedia or text, the opportunity to add, remove, or change something enhances one's presence in the minds of others who experience that alteration of the setting.

So too entering, leaving, and re-entering an environment - which is possible in almost any online setting - signifies one's actions and presence. Similar to the peek-a-boo game that delights children, cycles of appearing and disappearing reinforce one's existence in the minds of others. When one vanishes, the other's anticipation of one's return remains in his or her mind of one's continuous presence over time. Only after a sustained period of no longer reappearing does one's anticipated presence begin to fade in the other's consciousness.

Interactivity with the Environment

The Free Dictionary defines the verb to interact as "transmit thoughts or feelings". Kirsh[44] (2004: http://icl-server.ucsd.edu/~kirsh/Articles/Interactivity/brock-single.html) asserts that if we consider examples of interactivity in daily life, our clearest examples come from social contexts: a conversation, playing a game of tennis, dancing a waltz, dressing a child, performing as a member in a choir, reacting to the audience in theatre. All these highly interactive recreations teach us something about the nature of interaction. Each requires cooperation; the involved parties should coordinate their activity or else the process collapses into chaos. Kirsh deems that all parties exercise power over each other, influencing what the other will do, and usually there is some degree of negotiation over who will do what, when and how. Multimedia technology offers instructional designers an unprecedented opportunity to create richly interactive learning environments. Interactive learning offers the learner freedom to learn in a stimulating environment. Freedom seems necessary for learning environments in order to emphasise learner control. Kirsh further asserts that perception itself is interactive.

Kirsh (2004: http://icl-server.ucsd.edu/~kirsh/Articles/Interactivity/brock-single.html) argues that lessons should be interactive and explorative. Learning environments are supposed to create a context where users can discover interesting phenomena, pose their own questions, sketch out their own plans for deeper inquiry, and yet change their minds in an adaptive and responsive manner depending on what they encounter. This means that while users probably engage in some degree of advance planning they are equally involved in continuous, online

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[44] HOD: Dept. of Cognitive Science - Univ. California, San Diego - kirsh@ucsd.edu

improvisation. The interactivity built into a multimedia environment should be sensitive to the goals of users, and help to direct them in fruitful directions.

Kirsh (2004: http://icl-server.ucsd.edu/~kirsh/Articles/Interactivity/brock-single.html) further affirms that multimedia technology offers instructional designers an unprecedented opportunity to design richly interactive learning environments. Already it is possible to offer students the capacity to invoke animated and highly specific advice of experts, to pass visualization filters over tables of numbers to better reveal their statistical structure, to design and simulate experiments, and to explore mathematical relations.

As the degrees of freedom of both designers and users increases, it is more important than ever to understand the process of interaction in cyberspace. According to Suler, (2004: *Electronic book)*, we reach a fuller level of presence when we can interact with the environment rather than simply witness it. Very basic elements of interaction involve the ability to enter, move within, and leave a virtual setting. Any sensory or verbal cue that heightens the sensation of entering and leaving an environment enhances its presence as a setting distinct from other settings. A window that springs forward from the hard drive icon augments the feeling that one has entered that space. A voice saying "Welcome" when one signs on lets one know that one has crossed a threshold from one area to another. So too the ability to move within the environment - to see it from different perspectives - adds to its spatial quality and power of presence. In a multi-page web site, a navigation bar on each page creates the perception of being in one "room" among many possible rooms. In sophisticated 3D graphical environments, the ability to look 360 degrees around a room, and to move around an object and see it from various viewpoints, simulates life-like perspectives and life-like presence.

We know we are somewhere when we can have an effect on the setting, when it reacts to our actions. Reciprocal reactivity between one and one's environment enhances one's sense of presence in that environment. Even something as simple as being able to click on a key to make something happen enhances the feeling of doing and being in that space. As opportunities to interact with an online environment become more sophisticated and less predictably routine, the more fully present that environment feels.

To appreciate the power of movement and reciprocal interaction in creating presence within an online setting, notice what happens when one's program crashes. Nothing responds

to one's mouse clicks. Everything freezes. The environment becomes dead and one's sensation of presence in it evaporates almost immediately.

Kushner (2004: 52) asserts that multiplayer online computer games, such as EverQuest and Asheron's Call, have become popular by emphasizing team play and community participation. Participants meet in these fantasy-themed online worlds not to compete but to hang out. As a result, one of the missing links that caused earlier virtual worlds to crumble seems to be emerging: an audience. According to the technology research firm IDC, 87.3 million people are playing online games. Around 400,000 are paying $13 per month to play EverQuest, by far the most popular pay-to-play game. And these online games have become the training wheels for virtual worlds.

Suler (2004: *Electronic book*) maintains that if others do not react to one's being and doing, one's subjective sense of one's own presence tends to wane. When ignored, that sense of self and presence fades, perhaps resulting in feeling lost, powerless, frustrated, angry, lonely, or depressed. People whose presence is not acknowledged may avoid the environment or act out in negative ways to attain some kind of attention. Lacking eye contact, handshakes, and hugs, people in text-only environments may be especially susceptible to feeling overlooked. If no one replies to one's email or post, one's very existence in that setting comes into question. One's sense of the others as being real and present also may fade, because real people respond to each other's presence.

Any person's identity and the ways to convey it are highly complex. People feel more present to others - and even to themselves - when they are able to express a wide range of thoughts, memories, emotions, and motives. An online environment providing tools that maximize these expressions of personal identity will enhance the experience of someone in particular really being there.

Our ability to explore and interact with the presence of another person enhances our knowing not only that someone is here, but also who that someone is. A person may say nothing, but one may see their avatar in the room or their name in the chat room user list. One may feel uneasy about that person because one is not sure who he or she is, or even if that person is a male or female. One may not even be sure if the person is present at all. A strange sense arises when one cannot be certain if someone is here, and, if indeed they are here

or who exactly that person is. This is a common situation in cyberspace. Interacting more and knowing more about the other provides the remedy to that apprehension.

Understanding Territorial Familiarity

Unfamiliar territory and the unknown tend to make people anxious and uncomfortable. This situation normally leads to confusion, which causes people to leave a probable learning environment. Based upon research, Kelly and Cool, (2002: *Electronic journal*), deduce that as one's familiarity with a topic increases, one's searching efficacy increases and one's reading time decreases. Suler (2004: *Electronic book*) reasons that we tend to feel at home and comfortable in a familiar setting. We have "been" there before which makes it easier to "be" there now. Among the almost limitless choices of online environments to inhabit, we tend to stick to just a few - those familiar ones where presence has taken root in our consciousness. To the contrary, any setting that looks confusing or unintelligible, that doesn't make visual or linguistic sense, or that offers no meaning to us, will tend to make us feel uncomfortable there.

Without overstating the importance of familiarity it needs to be noted that novel settings and situations can appeal to our attention and curiosity. New environments create a challenge to explore, learn, and master them, thereby heightening immersion and presence. The fantasy quality of online games and communities also appeals to the unconscious: the human mind seeks out a dream-life. Although far from familiar, and sometimes even incredible, online fantasy environments can stimulate presence by addressing the basic human need for an altered state of experience and consciousness.

Relationships feel more alive as we discover new things about our companion. People seem more real when they occasionally act in ways we did not anticipate. This is why software" robots" and other forms of artificial intelligence (AI) possess more presence in the early stages of encounter, but tend to lose some or all of its presence over time. Even if the avatar they create possesses high sensory character, most AI programs are not complex enough to sustain their presence as a human-like entity. They become too predictable, too mechanical. Some people, in a controlled text environment, may not at first be able to tell the difference between a machine and a human - but over time, very few if any programs can sustain the wide range of complexity, change, and interactivity that we interpret as human presence.

As along as an online environment is flexible enough to allow people to express the complexities of their identity - and as long as people use that flexibility - they can maintain as

well as enrich their presence. People also may apply the fantasy features of online games and communities to enhance the presentation of their identity with a dose of imagination. It is the effective balance between the familiar and new - between reality and vision - that raises presence to new levels. With all its numerous options for manipulating and combining text, visuals, sound, movement, change, and interactivity, cyberspace offers many possibilities for the creative expression of presence.

THE DIMENSIONS OF AWARENESS

Suler (2004: *Electronic books*) maintains that relationships in cyberspace encourage us to re-examine many of the traditional assumptions about physical presence and time. The environmental presence of a physical setting always manifests itself in our current state of technology, via a computer screen. All of the many *"here's"* we can experience online emerge from that screen. Our actual physical location has not changed at all, which points to the power of the mind to shape sensory character and interaction into a psychologically real and meaningful environment. As we sit and look into our monitors, cyberspace reminds us that what we see and experience is always shaped by what we think and feel.

Despite the powerful possibilities for presence online, we should remind ourselves that indeed our body sits in a room, in front of a computer, in a setting that is quite different from the online encounter. We may not even be consciously aware of that setting around us, which points to the importance of dissociation in allowing us to experience presence online. To fully immerse ourselves into the environments and relationships of cyberspace, we should be able to minimize awareness of the setting around us - at least for a time. If the phone rings or the dog barks to go out, we shift our attention back to our physical surroundings. We cannot immerse ourselves fully into cyberspace and in-person presences simultaneously, no more than we can completely immerse ourselves into different online settings or relationships simultaneously.

With practice, we learn how to manage a multi-tasking of presence. We can be here and now in one particular online system of environmental and interpersonal presences, while keeping an eye and ear open for something that might call our attention to another system - either the in-person setting or another online setting. Usually it is a change in one of the other environments that signals us to attend to it. For example, while fully engrossed with an email companion, part of us notices an IM icon blinking, the call to presence of another companion. The process resembles mindfulness meditation in which we focus our presence on and with

one thing, but also allow another part of our mind to silently notice and then shift concentration to other things that might arise from the wide range of possible presences in the periphery of our field of awareness. Rather than being one-dimensional, presence involves shifts in magnitude, direction, and juxtaposition as we balance and redirect our awareness from here to there.

The sense of presence arises from the objective cues of sensory stimulation, change, interactivity, and degree of familiarity - but that the impact of those cues is heavily influenced by the subjective interpretation of the individual. The worlds and relationships of cyberspace remind us that the being, here, and now of presence resides in the human mind.

IDENTITY MANAGEMENT IN CYBERSPACE

According to Suler (2004: *Electronic book)*, one of the interesting things about the Internet is the opportunity if offers people to present themselves in a variety of different ways. One can alter one's style of being just slightly or indulge in wild experiments with one's identity by changing one's age, history, personality, and physical appearance, even one's gender. The username one chooses, the details that one does or does not indicate about oneself, the information presented on one's personal web page, the persona or avatar one assumes in an online community are important aspects of how people manage their identity in cyberspace. Identity is a very complex aspect of human nature.

Suler (2004: *Electronic book)* proposes five interlocking factors, which are useful in navigating the maze of how people manage who they are in cyberspace:

Level of Dissociation and Integration

According to Suler (2004: *Electronic book)*, a single person's identity embodies multiple identities. One possesses many sectors within one's personality and plays numerous roles in one's life - such as child, parent, learner, employee, neighbour, or friend. Cyberspace offers a niche for each of these specific facets of selfhood. Some people even talk about how we can "deconstruct" ourselves online. One does not have to present one's selves in total - how one looks, talks, moves, one's history, thoughts, feelings, and personality, all in one big package. In different environments, we can divvy up and present our characteristics in packets of various sizes and content. Thanks to thousands of online groups each devoted to a distinct professional, vocational, or personal topic, we can express, highlight, and develop specific interests and life experiences while setting aside others. One does not have to mention to one's

stock trading e-mail list that one also hang out at the *"I Dream of Jeannie"* fan club site. When one joins an online community, one often has a choice about how much, if any, personal information one places into the members' profile database. Online communication tools even give one the choice about whether one wants people to see how one looks or hears one's voice. The desire to remain anonymous reflects the need to eliminate those critical features of one's identity that one does *not* want to display[45] in that particular environment or group. The desire to lurk - to hide completely - indicates the person's need to split off her/his entire personal identity from her/his observing of those around her/his: s/he wants to look, but not be seen.

Compartmentalizing or dissociating one's various online identities like this can be an efficient, focused way to manage the multiplicities of selfhood. Cyberspace gives people the opportunity to focus on and develop a particular aspect of who they are. It may even give people the chance to express and explore facets of their identity that they do not express in their face-to-face world. Everyone in Gary's in-person world may not know that he is a romantic medieval knight in an online role-playing game.

However, the importance of integrating the assorted components of selfhood should not be ignored. Bringing together the various components of online and offline identity into one balanced, harmonious whole may be the hallmark of mental health.

The Development of Positive or Negative Attributes

According to Suler (2004: *Electronic book*), the different components of who we are can be categorized as either positive or negative. There are some universal criteria that can help us distinguish the two. Most of the time we will criticize a person's need to hurt other people and applaud compassion. But it's not necessary to present universal truisms about good and bad. Subjectively, a person can feel shame, guilt, fear, anxiety, or hatred about some aspect of their identity, while accepting and appreciating other aspects. People also strive to attain new, idealized ways of being. Those who act out in cyberspace are in some way hurting or violating the rights of others, or hurting them. Others may use cyberspace as an opportunity to exercise their positive characteristics, or to develop new ones in a process of "self-actualisation." Online romances, even those involving a clearly recognized element of fantasy, can be growth promoting. In some cases people may express a negative trait in an attempt to work through it

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[45]This has relevance to the Johari window, which is discussed, at the beginning of this chapter.

A gay person who learns to accept his homosexuality as a result of participation in an online support group has changed the valence from negative to positive.

Whether we view something about ourselves as positive or negative can become a complex issue. The various environments and styles of communication on the Internet serve as a flexible testing ground for exploring one's personality. In a chat room, a quiet person comes to realize the freedom and delight of spontaneously opening up, and how that leads to friendships.

Level of Fantasy or Reality in Environments

According to Moltenbrey (2004:1) the virtual environment allows one a "second life" to reinvent oneself to reflect your true personality. It opens the possibility to allow one to be who ever one wanted to be within this environment. "Second Life" is a place where one can completely stretch one's imagination and the boundaries of reality by exploring personal fantasy that is outside the realm of possibility within real life.

According to Suler (2004: *Electronic book),* in some online interactions one is expected to present one as one truly is. One does not pretend to be someone other than one's true identity. Other groups in cyberspace encourage or even require that one assumes an imaginary persona, as in the fantasy worlds of MOOs, MUDs, and other game environments. In multimedia chat communities, one has no choice but to wear an imaginative looking avatar to represent oneself. Many other environments fall somewhere in between reality and fantasy. One could get away with pretending to be someone very different than who one is, or one could alter just a few features - like one's name, occupation, or physical appearance - while retaining one's other true characteristics. This can go un-noticed, especially in text-only environments. In fact, one does not know for sure if other people are altering their identities, or how many people are altering their identities. Hidden positive and negative parts of oneself may seek expression in an imaginary identity that comes to life online.

Many people walk around in their face-to-face lives wearing "masks" that are quite different from how they think and feel internally. All the time people are discovering things about their personality that they never realized before. Our daydreams and fantasies often reveal hidden aspects of what we need or wish to be. If people drop the usual persona and bring to life those hidden or fantasized identities online, the dilemma that surfaces is whether the online personality is the true personality.

Level of Conscious Awareness and Control

According to Suler (2004: *Electronic book)*, how we decide to present ourselves in cyberspace is not always a purely conscious choice. Some aspects of identity are hidden below the surface. Covert wishes and inclinations leak out in roundabout or disguised ways without our even knowing it. We're not always aware of how we dissociate parts of our identity or even of the emotional valence we attach to them. A person selects a username or avatar on a whim, because it appeals to him, without fully understanding the deeper symbolic meanings of that choice. Or she joins an online group because it seems interesting while failing to realize the motives concealed in that decision. The anonymity, fantasy, and numerous varieties of online environments give ample opportunity for this expression of unconscious needs and emotions. This becomes evident in the psychological concept of transference.

People vary greatly in the degree to which they are consciously aware of and control their identity in cyberspace. They temporarily surrender their normal identity to the imaginary persona. Some people, on their own, make a fully intentional choice about who they want to be in cyberspace. Some are partially aware of their choice and with help or through experience become more aware. Others resist any self-insight at all. They live under the illusion that they are in control of themselves.

The Choice of Media

According to Suler (2004: *Electronic book)*, we express our identity in the clothes we wear, in our body language, through the careers and hobbies we pursue. These are the media, which we use to communicate who we are. Similarly, in cyberspace, people choose a specific communication channel to express them. There are a variety of possibilities and combinations of possibilities, each choice giving rise to specific attributes of identity. People who rely on text communication prefer the semantics of language via written discourse. There are also the "verbalisers" who are opposed to "visualisers" who may enjoy the more symbolic, imagistic, and holistic reasoning that is expressed via the creation of avatars and web graphics. Some people prefer synchronous communication (such as chat), which reflects the spontaneous, free form, witty, and temporally current self. Others are drawn to the more thoughtful, reflective, and measured style of asynchronous communication, as in message boards and e-mail. There are personalities that want to show and not receive too much by using web cams or creating web pages; to receive and not show too much by lurking or web browsing; and still others who want to dive into highly interactive social environments where both showing and receiving thrive.

The media chosen can intimately interlock with the degree of identity integration and dissociation, and with the extent to which a person presents a real or imaginary self.

PERSONALITY TYPES IN CYBERSPACE

According to Suler (2004: *Electronic book),* the basic psychological features of online environments shape how people and groups behave in those realms. Online behaviour will always be determined by how those features interact with the characteristics of the people in those environments. A variety of systems might be useful in classifying those characteristics. We might focus on specific features of the user, such as the person's computer skills, goals for using the Internet, demographic characteristics (age, social-economic status and occupation). There is several comprehensive theoretical systems in psychology that could help us examine how various personality types behave in cyberspace: for example, the Myers-Briggs system.

Cyberspace is a psychological space that can stimulate the processes of projection, acting out, and transference. It can alter sensory experience and can even create a dream-like state of mind.

THE POWER OF SIMULATION

According to Linser (2004: http://www.ausis.org/SimPlay/papers/ suppose.html), role-play simulation allows learners to explore attitudes and beliefs, which they may not hold. It also enables them to explore modes of action, which they would not otherwise take. A fairly standard method of inquiry occurs when one assumes the position of the other in order to explore their implications. Thus in suspending their own beliefs, learners open up to possibilities for understanding beliefs and ideas that they may not hold. In playing a role in a simulation however they also become aware of the consequences when these attitudes and beliefs serve as the basis for action.

Simulation offers consequences of action in a safe environment. In a safe environment personal beliefs are sheltered by the persona being played and the real identity of learners is hidden from view. Learners can explore modes of action they would not have otherwise taken.

Moreover, where virtual effects substitute the real consequences of actions, learners become free to explore issues, values, beliefs and attitudes they would otherwise feel emotionally constrained to explore. If just a game, any challenge to these emotionally laden issues would not threaten the edifice of identity to which they are linked. Further, when playing a role, learners become aware of, and indeed as part of the game of make believe, the

defence mechanisms that challenge these values are normally aroused. The emotional consequences that would have been provoked under real conditions are thus prevented and learners can deal with issues, perhaps in a more rational manner.

Playing in teams allows learners to challenge and explore their own ideas and beliefs among peers without the constraints, which the authoritarian position of teachers might impose. Moreover, the ability to discuss an issue with peers, to test ideas and modes of action creates an atmosphere of exploration much more difficult to achieve otherwise. Not only do the weaker learners get the benefit of helpful attention from the stronger learners, but the group as a whole seems to become infused with a 'buzz' or 'adrenalin rush' often found in team sports. Learners motivate their peers and share views with each other in a more profound way than they would have in doing individual assessment work.

Using different media forms of communication creates significantly different spatial and temporal effects for social relations. This directs attention to the structural constraints imposed by the medium and the way it can both limit and create new opportunities for learning.

The absence of paralinguistic non-verbal cues and status markers become an opportunity to explicitly reflect on their importance in face-to-face interaction. Their absence had an important function for learning as the need to explicitly point them out in textual form required participants to reflect on their use in the different interactive contexts.

The simulation medium effects significant alterations to a whole range of relations: the simulated, the collaborative and institutional. It separates the learning space from the institutional space, the virtually interactive from the organizational procedural and replaces the context dependent verbal exchange with the content of written text.

The technology as a medium for learning thus helps learners by providing a secure environment for 'taking on the attitude of the other'. By using the identity of the role as the bearer of the beliefs, values and actions to be challenged, the identity of the learner remains protected. It allows the learners to suspend belief so that they can 'play' with these beliefs, values and actions, investigate them and experience their consequences.

ROLE PLAYING, STORY TELLING AND SIMULATION

Story telling is an important form role-playing takes in learning environments both informal and formal. During story telling, the storyteller assumes a role and personality often different, or in a different state of mind than his or her own. Thus, the storyteller role-plays a person or situation different from the current one to convey information to an audience.

Schank and Abelson (1995: 1-18) propose a theory of memory entirely based on stories. They claim that memory is indexed by stories and cognition is the process of storing, indexing and retrieving these stories in the right context. If memory were constructed like this, it would seem natural to use storytelling and role-playing in learning environments. The more cues used to store and recall information, the easier it is to do so. Embedding factual information in a story ensures a better chance of recalling its uses later because of the large number of mental cues a story provides.

Storytelling affords a more 'likable' context to learning rather than a normal lecture. Bettelheim (1976: 78) writes a psychoanalytic account of fairy-tales in storytelling for children. He describes many of the emotional reasons children need fairy-tales to cope with their lives. Specifically he lists the functions of a story are to entertain, arouse curiosity, stimulate imagination, develop intellect, clarify emotions, attune to anxieties and aspirations, give recognition to difficulties, and suggest solutions to personally meaningful problems. In essence, stories build children's coping strategies and get them thinking about real life problems.

The entertainment and arts world is filled with examples of role-playing. Entertainment value is evidence for the highly motivating aspects of role-playing. The trend is that more immersed environments for entertainment captures the attention of the audience better than more passive environments. For example, watching TV is not as exciting as going to a movie theatre as a theatre provides a more immersed environment for viewing.

Television has become a standard for storytelling in modern culture. The majority of the viewing audience watches television programs that involve stories. That is, dramas, movies, and comedies. Dramas tell serious stories both fact and fictional to audiences to convey emotion and explore moral dilemmas.

Games are a promising medium to explore storytelling. They provide all the same functions of television, movies, novels and plays, but add aspects of collaboration, and interaction

Early graphical games engaged players by offering a form of role-playing. Games such as Sony's EverQuest[46], Virtual Fighter, Capcom's Street Fighter II, and Midway's Mortal Kombat offer engaging graphics and a pick of various fighting characters. When playing, a user assumes these characters' means and goals in a given game scenario. That is, one possesses their ability to fight in certain ways to win a tournament or defend oneself. Midway's Mortal Kombat takes this one step further by using actual choreographed moves from real life actors. Their successes have been enormous. These types of games add captive motivation and entertainment to the list of functions of role-playing. The limitation here is in variation and content quantity. There is usually only one goal even though there are many different role-playing aspects to attaining that goal. The website, http://secondlife.com/?a=51be5f4405b5022428eb4e4d6c139dc2, by vendor "Second Life" provides a superior example of virtual role-playing.

CONCLUSION

In this chapter the nature of virtual socialisation and its association with learning is discussed. Similarities and differences in physical and virtual associations and their impact on learning styles are also examined. Simulated learning environments are also investigated.

Parallels and differences of human behaviour in physical and virtual environments are studied. In exploring the psychology of both physical and virtual space, the author illustrates heightened levels of stimulation in virtual learning environments. Learning occurs when reflection on experience leads to new paths in handling situations. When the relation between experience and knowledge becomes knowledge/experience, that is when they are fused into a dynamic resource for handling situations, learning has occurred.

Chapter 8 deals with education in cyberspace in six countries other than South Africa.

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[46] EverQuest (2000) is a registered trademark of Sony Entertainment and Verrant Interactive, copyright 2000. http://www.everquest.com/

Chapter 6

ADOPTION OF E-EDUCATION IN OTHER COUNTRIES

INTRODUCTION

Subsequent to taking the reader through an understanding of e-education in the previous chapter, the author examines approaches to e-education and attitudes of education authorities, principals, teachers and learners to e-education in the following countries:

- o India

- o Nepal

- o Brazil and Latin America

- o United States of America

- o Malaysia

- o Europe

A brief overview of the status of e-education at an international level is provided prior to examining its status in the above countries.

A BRIEF OVERVIEW

According to Gokarn[47] (2004:http://www.ewh.ieee.org/r10/bombay/ lecture/ 34wtd.htm), people all over the world are becoming increasingly dependant on ICTs that range from radio and telephones to television and Internet. Unwittingly, we are using one form of technology or the other to obtain on daily information needs in the form of the news, the market, education, health weather or travel and tourism and banking. The availability of ICT infrastructure is not evenly distributed in the world and hence a knowledge gap has developed between 'information poor' and 'information rich' countries, an imbalance between urban and rural areas and even between younger and older generations, and in some societies, between men and women.

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[47] Lecture on 34th World Telecom Day by Lt Gen Prakash Gokarn PVSM, AVSM

This technological inequality between individuals, societies and nations is known as the digital divide. Since ICTs, whether mobile telephones, personal computers and Internet, are tools that are used to generate wealth and prosperity, inaccessibility to these devices can deepen economic disparities. Gokarn presents the following disparities:

- 70% of the world's poor have little access to ICTs leave alone a telephone;

- Consequently over 1/3 of the world's population has NEVER made a telephone call;

- The developed world has 50% telephone lines per 100 people. In developing countries the ratio is 1-4 telephone lines per 100 people;

- Most of the information exchanged on Internet is in English – a language spoken by just 10% of the world's population.

It is also a reality that the power of information technology and telecommunications has given birth to a globalised economy, which will greatly influence the economy of nations. The nature of ICTs therefore offers a golden opportunity to raise the large masses of people to higher levels of education, health and prosperity.

Figure 12a

Figure 12b
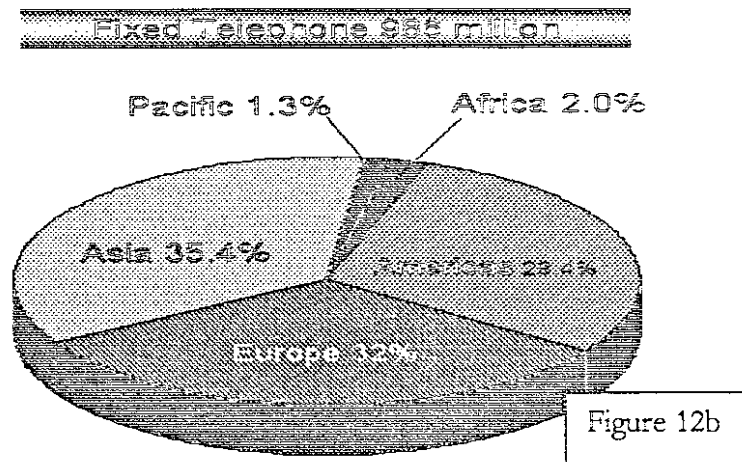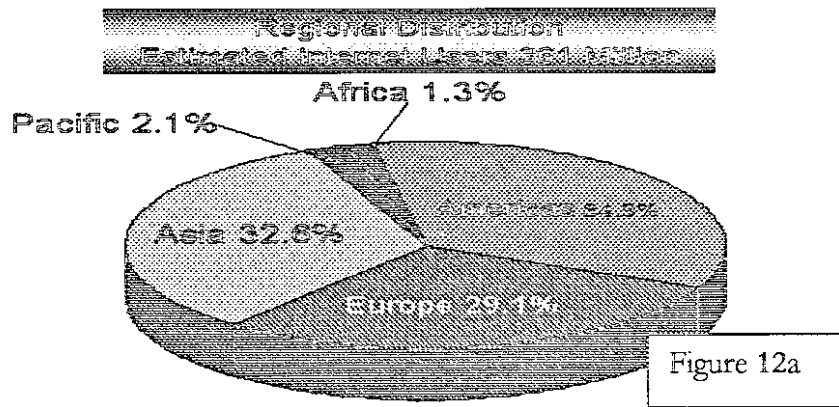
Lecture on 34th World Telecom Day: http://www.ewh.ieee.org/r10/bombay/

Figure 12: Estimated Internet users

According to Utsumi[48] (2004: http://www.ewh.ieee.org/r10/bombay/ lecture/34wtd.htm), the speed of Information and Communications Technologies, especially the Internet, is revolutionizing whole aspects of social, cultural and economic life. ICTs are creating many opportunities to improve our quality of life. But because of their uneven spread, they are also creating new challenges; notably the emergences of a digital divide.

Gokam uses figure 12a and 12b (above) to show that Asia and Africa, which together forms ¾ of the world population, has access to ¼ of the Internet and fixed telephone lines. If we look at the distribution of Internet and fixed telephone lines between continental regions we notice that in relation to population and poverty the digital infrastructure of Africa is the lowest. Some developing countries in the Asia Pacific region appear to be growing rapidly.

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[48] Lecture on 34th World Telecom Day in Mumbai

There are billions of people in Africa and remote areas of Asia who remain untouched by the ICT revolution because of:

- o Ignorance of the English language ;
- o Complexity of learning PC usage;
- o High cost of PC's;
- o Non-availability or high rates of access to the Internet.

INDIA

"India is the only country other than US where we have done significant software business in ICT. The amount of work going on has actually helped us. First of all the quality gets very high marks and India has been able to keep improving and increasing the number of trained people coming out of its universities. So even the number of jobs has gone up and there are good people taking those jobs. India has weathered this tough period for IT and that is a very good sign. India has done incredibly well in the services area. Distance is not a barrier in getting talent. India should be proud." Gates: (2002: http://www.globallearning.de/glearn/cgibin/gluserpage.cgi?StructredContent=m130307).

E-LEARNING IN INDIA

According to Srinivasan[49] (2002: http://www.global-learning.de/g-learn/cgibin/gluserpage.cgi?Structured Content=m130307), "the Net" has found a strong hold on the way education is imparted in India.

The Indian government premeditated that by ensuring that every child is exposed to basic literacy and basic ICT skills by the time he or she ends primary schools the country can truly bridge the digital divide. According to Gokarn (2004: http://www.ewh.ieee.org/r10/bombay/lecture/ 34wtd.htm[50]), ICT and communication jobs

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[49] Srinivasan, B. (2002) Online Distance Education, University News, 40 (47), Nov 25 - Dec 1, p. 18.

[50] Lecture on 34th World Telecom Day in Mumbai

do not demand too much physical effort and encourage both genders. They provide equal opportunity to women to progress in society. Gradually, computer education is being made an essential part of the school curriculum. For school level education, interactive TV and infrastructure developed by IGNOU and NIC with VSAT technology has made TV the "Second Teacher" or "Third Parent".

THE BEGINNING

e-Education was introduced when the Prime Minister of India constituted a National Task Force on Information Technology and Software Development in May 1998. The purpose of this taskforce was to formulate a long-term Indian National IT Policy to develop India into an IT software superpower. It was emphasized that the Government in association with IT companies will aim to achieve 100% IT literacy at senior secondary level (10 + 2) in 5 years and at secondary level in 10 years (Srinivasan 2002: http://www.global-learning.de/g-learn/cgi-bin/gl_userpage.cgi? StructuredContent=m130307).

E-LEARNING INITIATIVES

The main factors contributing to the success of e-learning in India include cheap labour, good English speaking skills and the hard-working nature of Indians. Supplemented by these qualities, and to be on par with the emerging international standards for online course content, leading organizations like Aptech, NIIT, Zee, IGNOU, IIMs, etc., undertook initiatives in the online learning field.

Informational and e-learning portals like zeelearn.com, classteacher.com, schoolcircle.com, egurucool.com, piewebmaster.com, vidyainfo.com, entranceeguru.com and bizkool.com provide online e-learning solutions to India.

These initiatives promoted anytime, anywhere learning. The restrictions in terms of job requirements and modern lifestyle and limited available time, had been one of the main factors in the growth of online education. As on today, India stands out as a leader among Asian countries in the field of online education (although the facilities cannot be equated with those of developed countries like the USA, Australia, and European).

Owing to the efficient system of education, India can boast to be one of the largest producers of CBT and WBT (computer-based and Web-based training). They now supply

instructional designers, Web designers, technical writers and educational subject matter experts to other countries. Due to the high level of scientific and technical skills of Indian professionals, more than 25% of the world's custom software was Indian in 2002 (Srinivasan 2002:http://www.globallearning.de/glearn/cgibin/gluserpage.cgi?StructuredContent=m13030 7).

Projects Related to E-Learning in India

The Maharastra Industrial and Technical Consultancy Services (MITCON) initiated computer courses through e-learning with 530 centres bridging the digital divide in rural areas and smaller townships in the interior locales of Maharastra. Learners can register themselves at any of their e-schools and access the course content either at these e-schools, a cybercafe of their convenience, or at home. Another MITCON experiment in e-learning is launching e-vidya in the Marathi language in the Maharastra State, targeted to benefit more than 7,500 learners (Srinivasan 2002: http://www.global-learning.de/g-learn/cgi-bin/gl_userpage.cgi?StructuredContent=m130307).

Indian ICT Indicators

India's Internet user base increased 27% to 7 million in calendar year 2001 – 2002 as against 5.5 million in 2000 – 2001. In comparison to India's growing passion for Internet, China's Internet user based grew at 51% to 3.4 corers as against 2.25 corers last year. Japan recorded the highest user base of 4547 i.e. almost 50%. In terms of population in India, 1 out of every 160 persons uses Internet, while in Japan every 2nd person does. The number of hosts[51] or Internet website in India grew by 132% to 82979 in 2001 as against 34810 in 2000. China and India are evenly matched in Internet host sites. In the case of deployment of PC's China has 2.5 corers, India a mere 6 million i.e. 1 out of every 1600 people (Indian) owns a PC (Gokarn 2004: http://www.ewh.ieee.org/r10/bombay/lecture/_34wtd.htm).

Concluding Remarks

New developments and initiatives clearly indicate that the e-learning mode of imparting education will give a new face to the educational system in India. The government and non-governmental agencies are making considerable efforts to establish and promote online

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[51] Number of PC's directly link to www

education. This is clearly reflected through the fact that many schools, colleges and universities have gone online and learners have got a new platform to obtain education through the NET.

Figure 13 shows an "e-Governance Cart" which is used for:

o   Govt. information – forms, Schemes;

o   Land records;

o   Education;

o   Agriculture;

o   Weather;

o   Healthcare;

o   Email, fax, Internet;

o   Entertainment;

o   Video conference.

Figure 13: Mobile ICTs in rural India[52]

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[52] ICTD Project Workshop HYDERABAD July 8-9th 2004 R.Chandrashekhar (Joint Secretary, E-Governanc, Department of Information Technology, Government of India)

In India, mobile communication is enabled by using personal computers that are connected via wireless technology on Rickshaw. Such mobile platforms are used for bringing Information Communication Technologies directly to the rural user at his/her doorstep.

NEPAL

NEPAL COUNTRY PAPER

According to Dhakal (2004: website[53]), 23.4 million people inhabit Nepal. It is estimated that 44% of the rural households and 23% of the urban households subsist below the poverty line. 88% of the population lives in rural areas. The literacy rate in the country is 53.7%.

Poverty alleviation is the sole objective of Nepal's National Development Plan. ICT (Information Communication Technology) is one of the means to achieve its objective and accorded high priority in the plan. Nepal believes ICT can bring the rural poor into the main stream of the national as well as global market. Further, Nepal believes ICT can:

- o Empower the civil society;

- o Strengthen democratic institutions;

- o Make government more transparent and more accountable;

- o Eliminate the geographic barriers in the flow of information;

- o Be used in all areas of public interests such as education, health, economy and more in a cost effective way;

Nepal's National Development Plan incorporated the following ICT infrastructures:

- o Print Media;

- o Radio Broadcasting System;

- o Television Broadcasting System;

- o Telephone;

- o Computer and E-education.

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[53] http://66.102.11.104/search?q=cache:_7R6wVMKMbqcJ:www.aptsec.org/seminar/meeting-2002/digital-op/ICT-08-Mr.Dhakal-Nepal.ppt+e-education+mobile+education+in+india+nepal&hl=en&ie=UTF-8),

PRINT MEDIA

There are 3 192 newspapers registered in Nepal. Most of the newspapers are circulated in Kathmandu valley. Newspapers from Kathmandu can reach 25 districts within 24 hours. Half of the districts in Nepal still have no newspapers.

RADIO BROADCASTING SERVICE

Radio Nepal, a government controlled broadcasting station, was established in 1951. Its transmission has reached to 80% of the population. Since 1998 Nepal government has granted the license to the local broadcasting corporation. At present, 25 licenses have been issued to private and commercial sectors for radio broadcasting. It is estimated that 1.8 million radio sets are currently being used in the country.

TELEVISION BROADCASTING SYSTEM

Nepal Television started broadcasting its regular programs in 1985. Nepal Television (NTV) now covers 55% of the country's population and 40% of the land area. NTV has recently started broadcasting its programs via satellite. Recently licenses have been granted to three private operators. A total of 200 licenses have been given to the cable operators all over the country.

TELEPHONE SERVICES

There are 384 462 installed telephone lines in the country and 20 696 mobile telephone subscribers. Nepal is linked to 131 countries via telephone. Rural telecommunication services are given priority. One of the rural telecommunication services is provided by MARTS (Multiple access radio telephone system) who has 693 terminals in rural settlements.

COMPUTER AND E-EDUCATION

Computer was introduced in Nepal in 1971 and there are 18 current Internet service providers in the country. Now, there are about 40 000 Internet subscribers and 18 Internet service providers. It is estimated that there are about 200 000 computers in the Kingdom of Nepal. ICT related education include computer courses offered at High school level. The government has resolved to provide free Internet access to high schools. The establishments of Information Technology parks are in process.

INSTITUTIONAL FRAMEWORK TO DEVELOP ICT IN NEPAL

The Ministry of Information and Communication (MOIC) and the Ministry of Science and Technology (MOST) are acting as promoter, facilitator and regulator in the ICT sector. His

Majesty's Government has established a separate autonomous body. The Nepal Telecommunication Authority (NTA), which is responsible for the national and foreign private investors in the telecommunication sector. Nepal Telecommunication Cooperation (NTC) is the only operator providing basic telephone and mobile services. National Information Technology Development Council (NITDC) is constituted for policy making, under the chairmanship of the Prime Minister. National Information Technology Coordination Committee (NITCC) has been the coordinating manpower for this sector. National Information Technology Centre (NITC) executes and implements His Majesty's Government's plans and policies. Information Technology Park Development Committee manages and coordinates the construction of info-cities and info-villages.

TELECOMMUNICATIONS POLICY

The main objectives of the telecommunications policy are:

o   To make available the various types of high standard reliable telecommunication services;

o   To make available the telephone service as per the demand of the market in addition to basic telephone service in remote and inaccessible rural areas;

o   To provide new and recent telecommunications services with the objective of making Nepal an international connection hub;

o   To empower the regulatory authority to foster healthy competition and protection of consumer's interest;

o   To enhance the quality of services at reasonable prices in a competitive environment through private participation;

o   To establish an ICT infrastructure to assist comprehensive development of all sectors, namely: agriculture, tourism, health, education, commerce, postal services etc, with maintaining the regional balance as well.

INFORMATION TECHNOLOGY POLICY

Nepal's vision is to place itself on the global map of information technology within the next five years i.e. from 2000 to 2004 and to build a knowledge-based society. The government hopes to achieve this by making Information Technology accessible to the general public and to create employment through these means. The policy aims to identify Information Technology as a strong infrastructure to boost national economy.

Research and development in the field of Information Technology and other related activities are prioritised. The policy encourages the private sector's role in the development of Information Technology field by creating an atmosphere conducive to attract investment in the private sector. Information Technology policy aims to establish a venture capital fund with joint participation of public and private sectors.

REGULATIONS

In furtherance of high priority assigned to ICT policies, appropriate plans of action are being implemented for short term, mid terms and long term visions. The following plans have been identified:

- o Intellectual Property Act is enacted to regulate transactions to be carried out through ICT;

- o Private sectors are encouraged to develop infrastructure to bridge the Digital Divide;

- o There are plans to provide telephone lines in each village before 2004;

- o Public and private schools are encouraged to provide basic computer education in high school level;

- o Developing infrastructure and communication Infrastructure;

- o Formulated laws/rules/policies to encourage private sector investment.

All universities in Nepal offer IT courses and learners are encouraged to use Internet for their educational materials.

TARGETS TO DEVELOP ICT

His Majesty's[54] Government has a target of providing basic telecommunication services in every district by 2005. It specifically aims to:

- o Provide satellite phones to remote areas;

- o To establish an Information Technology based software industry;

- o Provide telemedicine to major health centres;

- o To establish Internet nodes in district headquarters by 2004;

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[54] King Gyanendra Bir Bikram Shah Dev.

- o To provide computer education to all by 2010;

- o Tax concession on import and export of Information Technology hardware and software;

- o To introduce distance learning systems.

CONSTRAINTS

Nepal believes that due to its strategic location, it can have the advantage of a flourishing software industry and have possibilities of exporting software and other IT services. Nepal can be a place for offshore sources of software and data processing but the IT industry is in its infancy stage. The country lacks local IT content. With the Nepali font not yet standardized, language barrier poses a further problem for transfer of information.

The country is plagued by the following added problems:

- o Low telephone penetration and long waiting times for connections (3 to 5 years);

- o Limited points of presence of ISPs;

- o Lack of appropriate bandwidth up to the village;

- o Lack of reliable public Electricity supply;

- o High up-front costs (a computer costs over $700 and a new phone line over $130);

- o Low level of computer education;

- o Little public awareness about the Internet and use of computers;

- o Inadequate human resource development and a brain drain of qualified specialists;

- o Lack of sufficient funds needed for huge investments in the ICT sector.

The ICT sector hopes to create telecommunications infrastructure, help computerization in school, start up IT industries, provide web hosting for organizations, set up IT Parks and improve human resource development.

BRAZIL AND LATIN AMERICA

OVERVIEW[55]

According to Castro (1997: http://www.knight-moore.com/ pubs/halflife.html), universities in Latin America and Brazil are being inspired by the British Open University's ideology and are rapidly incorporating Internet and other computer-based technologies into its range of instructional tools.

The Virtual University of Monterey in Mexico is the largest, most international, and most technologically advanced university in the country. Costs at this private institution are not yet lower than conventional universities.

Another good example of the use of technology in formal education in Latin America is incorporated in primary and secondary school education targeted on 15-30 year-olds who are already in the labour force. The Fundação Roberto Marinho's *Telecurso 2000*[56] program is delivered by television to millions of people every day in Brazil. This program was developed by a private foundation and financed by the Federation of Industries of São Paulo State, but it is increasingly being used in public primary and secondary schools. Educational programming including the *Telecurso 2000* is now being delivered direct to home by satellite on a special educational channel (*Canal Futura*).

In Brazil, Chile, Costa Rica, Jamaica, and Mexico major programs are now underway with government support to bring computers to the classroom of public as well as private schools. There is already a good deal of experience accumulated in the United States and other countries as well.

Educational television is an area where Latin America is a world leader, and strong economic arguments can be made for giving priority to exploiting this existing comparative

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[55] This overview has been inspired by the Forum on Education in the Information Age, Cartagena, Colombia, 9-11 July 1997. The following authors contributed to the forum: Castro, Claudio Moura (1997). Education in the Information Age: Promises and Frustrations". Washington, D.C, The Benton Foundation, Communications Policy and Practice Program, What's Going On series. Daniel, Sir John (1996). Mega-Universities and Knowledge Media: Technology Strategies for Higher Education. London, Kogan Page. Knight, Peter T. (1996). "Destined to Leapfrog: Why a Revolution in Learning will occur in Brazil, Russia, and South Africa".

[56] These are educational software.

advantage. But given the rapid development of wireless technologies, which permit more personalized and interactive approaches; it is important to at least experiment in the use of Internet and other computer-based training and education technologies to complement television. Brazil's *Telecurso 2000* is now moving to develop complementary Internet-based instruction and support to its televised programs and print-based instruction.

UNITED STATES OF AMERICA

UNITED STATES AMERICA: DEPARTMENT OF EDUCATION

According to Vail (2003: http://www.asbj.com/specialreports/0902Special %20Reports/S1.html), over the past few years, states in America have started to embrace the idea of incorporating online instruction into the standard curriculum, and some have crafted policies to guide schools in how they should use online instruction. Alabama, for example, requires *online teachers to receive special training, according to Education Week.* And five states now require at least one in-person meeting between learners in online courses and their teachers.

According to Riley et al (2003: http://www.ed.gov/technology/elearning/e-education.pdf), the United States Department of Education has outlined five technology goals to facilitate qualitative e-education. For each of these goals[57], there are several options that can be undertaken to ensure sustained development in implementing technology successfully for e-education.

Goal 1: All learners and teachers will have access to information technology in their classrooms, schools, communities and homes.

An essential component of school development and transformation efforts in the 21st century, in the United States and abroad, will be learner and teacher access to educational technology, such as computers connected to the Internet. Universal access to the Internet will help end the isolation of teachers; exponentially expand the resources for teaching and

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[57] Refer to the pie graph above in order to examine the direct proportion that exists between the goals listed there and the success of e-education in USA.

learning in schools and classrooms; provide more challenging, authentic and higher-order learning experiences for learners; and make schools and teachers more accountable to parents and communities.

The quality of Internet access is crucial to the American government. Broadband access will be the new standard. Slow, unreliable connections that cannot support interactivity or rich multimedia content will no longer be sufficient. To take advantage of access to technology for improved teaching and learning, it will become increasingly important to build and support network infrastructures wired or wireless, desktop or handheld devices that allow multiple devices to connect simultaneously to the Internet throughout every school building and community in the nation.

To realize the goal of universal access to educational technology for learners and teachers, the American e-education policy strives to ensure sustained and predictable funding for technology to ensure that technology plans reflect the educational needs of learners and are regularly updated. The policy aims to improve the affordability, reliability of educational technology; ensure that school buildings and facilities are modern; strengthen their commitment to eliminating the digital divide; and ensure that all learners have equal opportunities to access and the use of technology.

Goal 2: All teachers will use technology effectively to help learners achieve high academic standards.

Most teachers have been prepared for a model of teaching dramatically out of step with what is needed to prepare the nation's learners for the challenges they will face in the future. Opportunities have been identified to enhance teacher quality and teacher preparation, particularly as they relate to the effective use of technology in education.

Ensuring that the nation has effective 21st-century teachers requires more than just providing sufficient access to technology for teaching and learning. The United States Department of Education has pledged to improve the preparation of new teachers, including their knowledge of how to use technology for effective teaching and learning; increase the quantity, quality and coherence of technology-focused activities aimed at the professional development of teachers; and, improve the instructional support available to teachers who use technology.

Goal 3: All learners will have technology and information literacy skills.

The need to prepare learners with the skills they need to participate fully in an increasingly technological society has become a major priority for the American nation. A meaningful, unified approach to providing learners with the skills they will need for the future is being more than a checklist of isolated technology skills. These skills are only a first step in assuring all American children will become proficient information and technology users.

Also necessary are information problem-solving skills, such as how to define tasks, identify information seeking strategies, locate and access information, determine information's relevance, organize and communicate the results of the information problem-solving effort and evaluate the effectiveness and efficiency of the solution. The call for this new "21st-century literacy" does not supplant current efforts by states and districts to set and even raise academic standards for learners.

The opportunities made possible through the use of technology will be available to all learners as they progress through school, regardless of personal or socio-economic factors. Even for those learners who do not pursue technology careers, ensuring technology and information literacy skills will provide a number of benefits.

The United States Department of Education includes technology and information literacy in state and local standards for what learners should know and be able to do. Measures have been set to ensure learners use technology appropriately and responsibly; to develop new learner assessment tools; and to strengthen partnerships with industry to help meet the workforce needs of the future.

Goal 4: Research and evaluation will improve the next generation of technology applications for teaching and learning.

The United States Department of Education deem that we are still at the beginnings of a technological revolution that is bringing dramatic changes to our society. They acknowledge that this technological revolution will not automatically translate into a similar revolution in teaching and learning. Therefore, they realise the need for an expanded, ongoing national research and evaluation program to improve the next generation of technology applications.

The Americas noted that to implement such a program requires a sustained, multi-disciplinary collaboration of learning scientists, technologists, and subject-matter experts. Numerous organizations have pointed out the urgency of this national need, including the

President's Committee of Advisors on Science and Technology, the U.S. Department of Education, the National Science Foundation, the National Research Council, private charitable foundations, independent research institutes and representatives of academia.

To ensure that research and evaluation will improve the next generation of technology applications for teaching and learning. The USA initiated a systematic agenda of research and evaluation on technology applications for teaching and learning; encouraged state and local evaluations of technology programs; and supported the dissemination and use of research-based information to improve teaching and learning.

Goal 5: Digital content and networked applications will transform teaching and learning.

The United States Department of Education have deliberated that digital content and networked applications will support transformative changes in their approaches to teaching and learning. In order for these changes to lead to increased educational opportunities for all learners, digital content and networked applications are independently judged to be of high quality (both in terms of grounding in learning science and pedagogical effectiveness), are well-documented, comprehensive and are available for all grades and subject areas, and have the power to inspire or motivate learners. They are also easy to find and access, easy for learners and teachers to use, and accessible to people with disabilities.

MALAYSIA-KUALA LUMPUR

AFRICA-ASIA WORKSHOP MARCH 2002[58]

Distance learning in Malaysia has been in trend for the last four decades. The mode of delivery was print-based because of the absence of the Internet at that time and most of the tuition was conducted face-to-face.

The demand for education increased by leaps and bounds, because of the acute shortage of university places in the public institutions, and the considerable hike in tuition fees. The country witnessed a proliferation of private institutions, especially in the early 1980's.

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58 Paper presented at the Africa-Asia Workshop on Promoting Co-operation in Information and Communication Technologies Development, organised by United Nations Development Programme (UNDP) and the Government of Malaysia at the National Institute of Public Administration (INTAN), Bukit Kiara Main Campus, Kuala Lumpur, on 26th March 2002.

According to Alhabshi, 2002: 3, the advent of Internet in the early 1980's did not attract e-learning instantaneously. Two reasons may be suggested for such a lack of enthusiasm in e-learning: Firstly, the Internet was still not very stable and its lack of penetration would not attract the critical consumers required. Secondly, face-to-face teaching and learning is still very much preferred for lack of confidence in independent study.

e-Learning was introduced by Universiti Tun Abdul Razak (UNITAR) in September 1998. Only 162 learners registered for the two undergraduate degree programmes namely Bachelor of Business Administration (BBA) and Bachelor of Information Technology (BIT). At least half of that number who registered was from working individuals who have either failed to get a place in other universities or who have had some post secondary qualification and intended to improve them-selves. They were strongly motivated to study by the flexibility offered by UNITAR through its e-leaning programme.

Unlike most of the global institutions, particularly in the USA, which depends heavily on the Internet to deliver materials and provide active interaction between learners and faculty, UNITAR offers a hybrid model that combines three important components. The three components are the interactive, multimedia content on CD's and on the web, the face-to-face meetings and the Internet-based support system that provides continuous interaction between the learners and faculty.

The production of interactive, multimedia content is available both on CD and the web because of the wireless broadband technology that is now available. The web-based interactive, multimedia content is often cheaper to produce and easy to modify or update. A special outfit has been established by UNITAR to develop all its contents.

The face-to-face meetings are important, especially for those coming straight from high school, as a means of building confidence in them and for those who are still sceptical of the e-learning mode. UNITAR has established seven centres throughout the country to cater for the widely distributed population of its learners, who now number more than 7500.

COURSE MANAGEMENT SYSTEM

The Virtual On-line Instructional Support System (VOISS) is the main course management system for learners and instructors at UNITAR. The system contains more than ten different modules or functions, such as the on-line tutorial, forum, frequently asked questions (FAQ), e-mail, bulletin board, announcement, assignment, quiz and examination. All modules, except

the on-line tutorial (OLT) fall under the category of asynchronous communication tools. The synchronous on-line tutorial is implemented rather cautiously due to network instability and narrow bandwidth even though most people tend to associate real-time, multimedia learner-instructor interaction as defining the e-education academic model. The VOISS is currently on version 2.0, which is a considerable improvement of its predecessor version 1.0. Local software engineers have developed both versions.

VIRTUAL LIBRARY

The main library of UNITAR, meant to support the reference needs of learners, holds more electronic, on-line collection than the physical form. Learners can gain access to the library anywhere, anytime from any computer. This makes it possible for any registered learner in any region to use one single source of library materials. The strength of the virtual library rests on its on-line database subscription such as ProQuest, ERIC, EuroMonitor and ABI/INFORM Global[59] with more than 1000 titles accessible by all learners in real time.

This concept is very much in line with that of a virtual university environment pioneering e-education in the country.

OTHER SUPPORT SYSTEMS IN A VIRTUAL ENVIRONMENT

Apart from the tutorials, learners may send e-mails directly to their course co-ordinator or to the Customer Relations Manager (CRM) whenever they have any problems. If they send any query through e-mail, fax or telephone to the CRM, they can rest assured that their queries will be attended to in less than 24 hours. All queries that are made through CRM are recorded and forwarded to the right personnel for immediate response. The person who sends the query would be given a ticket number with which they could use to check the status of the query. Those personnel who do not respond in time will receive a reminder from CRM to do so immediately. The service is provided 24 x 7 or 24 hours a day, seven days a week.

The learners are also receiving support from the virtual library at any time they like or need. Apart from the electronic materials that they could access from anywhere at any time, they have also established a system whereby course co-ordinators will post additional reference materials in the form of notes or articles for their learners to benefit from in a special section of the virtual library. Learners can access these materials at any time virtually without having to go to the university as is done in conventional libraries.

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[59] These are digital library service providers. They are also software vendors.

A branch in Cambodia has also been established, and negotiations are in progress to establish partners in Indonesia. Accreditation from the National Board of Accreditation for seven programmes[60] has been received. UNITAR has obtained the Multimedia Super Corridor (MSC) status, which implies that they have been recognised for their ability to produce the right type of knowledge workers for the country's future needs.

UNITAR holds the opinion that e-education is the way of the future and hence they are completely committed to it. They have realised that for them to be successful they have to be ahead of the others because competition is becoming much stronger.

EUROPE

OVERVIEW

According to Perspectives of ICT in the New Europe (2004: http://www.elearningeuropa.info/doc.php?id=4987&lng=1&doclng=1), the largest development ever undertaken by the European Union (EU) has become a reality. Ten new countries are running fast through the full adoption of new technologies into education.

Cyprus, the Czech Republic, Estonia, Hungary, Latvia Lithuania, Malta, Poland, the Slovack Republic and Slovenia had entered the European Union, increasing the population by 75 million citizens. They have been referred to by the term 'Acceding countries' and now they are the new member states.

In the new members and candidate countries 66% of households do not possess a PC and 81% do not have access to the Internet. Instead of these difficulties, the number of Internet users has grown by almost 60% since the year 2001, from 8,6 users to 13.9 users per 100 population, while in the rest of the EU the average growth was only 29%. Although the

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[60] These are Certificate in Business Administration, Certificate in Information Technology, BBA, BIT, MBA, MITM and MIMT

percentage of Internet users is much less than the rest of the EU, some countries are close to the average level (Cyprus, Czeck Republic, Estonia and Malta).

PC penetration has increased visibly since 2001 and some countries, like Cyprus, Malta and Slovenia have penetration rates close to the average of the rest of the European Union.

AFFORDABILITY OF COMMUNICATIONS

The affordability of a PC is obviously a key factor to spread Internet use. In some countries this equipment can be quite expensive. The cost of a PC as the percentage of monthly income can rise to 366% (Lithuania), 213% (Bulgaria), 204% (Latvia) or 196% (Romania). In other countries the percentage goes down to 47% (Malta), 59% (Cyprus), 83% (Poland) or 86% (Slovenia).

In the countries with higher costs, the decision to buy a PC would require significant justification in terms of 'added value' provided by the services on the Internet. The user would need stronger reasons to be connected rather than the simple goods purchasing or the possibility to use eGovernment services. This fact suggests that there are a lot of opportunities to create new services.

OPPORTUNITIES FOR ALTERNATIVE TECHNOLOGIES

Data from Estonia and Lithuania show that 46% of households are without a fixed line service. This percentage includes 23% of rural households, 15% of urban households and 8% of metropolitan households. Obviously there are good opportunities for the use of alternative technologies such as cable TV and wireless to gain access to the Internet. An example of the use of alternative technologies can be found in Czech Republic where one of the mobile operators has launched a service providing a wireless internet connection (based on GPRS technology) covering the whole country. A fixed monthly fee provides unlimited Internet access. On the other hand, the 85% of Malta is covered by cable TV services, hence providing an alternative medium to connect to broadband.

USAGE AND FREQUENCY

Significant increases in the number of regular users in the Internet can be found in the Czech Republic, Estonia and Slovenia, possibly due to economic conditions and the lower relative costs of a PC and Internet access.

The average percentage of regular Internet users in all countries is 31%. Only 7% are irregular users, while the percentage of non-users climbs to 62%. The Czech Republic, Estonia and Slovenia are the three countries with at least 50% of users.

The most widespread usage of the Internet in the Acceding and Candidate Countries is for information searches, with over 80% of regular users making this claim. Obtaining games and music is an activity pursued by almost 40% of users. Over 75% of users claim that they send and receive e-mail and on average 32% of users say they use Internet to participate in chat rooms and discussion forums.

EQUIPMENT

Approximately half of the countries concerned have achieved, and several other countries are approaching, the target of 5 – 15 computers per 100 pupils. There has been significant progress in the provision of computers for learners in secondary level. Cyprus, Czech Republic and Hungary have increased by fifty percent from 2001 to 2003. At the secondary education level ICT is on the whole a compulsory subject. In most cases, national curricula combine the two approaches to ICT: as a separate subject and its use as a tool for other subjects.
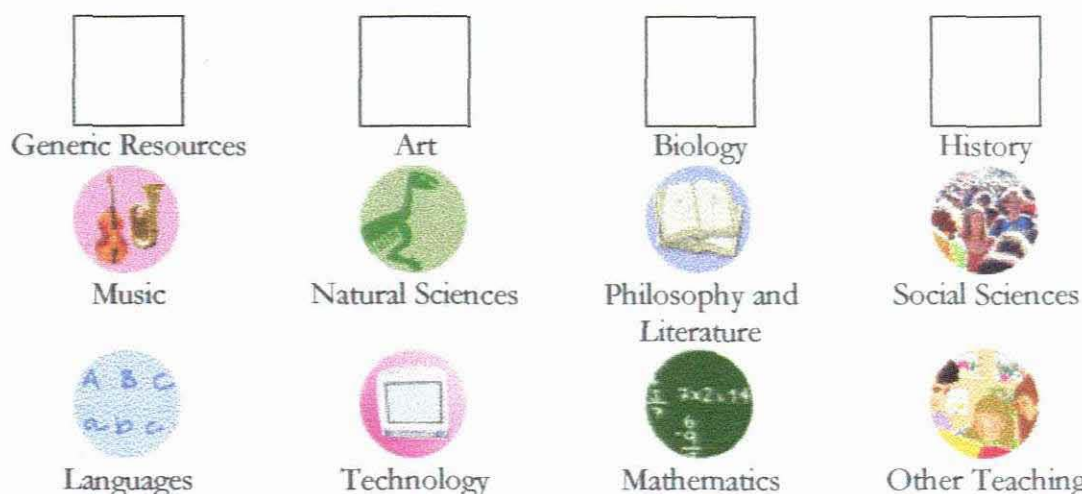

Figure 14: Visual description of an active European web page that is used by pupils and educators who engage in e-learning[61]

There has been significant progress in the provision of websites for learners and educators in secondary level. Figure 14 illustrates one example of such interactive websites.

[61] Web page:
http://www.elearningeuropa.info/dir_schools.php?lng=1&sid=2c066a62c60274e0617d1264a4a4a6d2&p3=1

OBSTACLES TO USAGE

The cost of a computer and the cost of the Internet connection were cited as reasons for not accessing the Internet by 11% and 8% of respondents respectively. In the countries with a lower GPD per capita, sufficient Public Internet Access Points could be established as an interesting alternative to home computers.

Only 11% of respondents claimed to have not exact knowledge on what the Internet actually is. On average, 23% of the people claimed that they do not know how to use a computer. Finally, the main technical reason given for not using the Internet is the lack of an access device at home (17% on average).

CONCLUSION

The development of e-education in six different countries was examined in this chapter. Considerable progress has been made in many areas related to the Information Society in the recent years. Many countries have made significant efforts towards the implementation of the Knowledge-based society.

Some highlights of the review were the noticeable desire to stimulate development of interactive, media rich and multilingual knowledge management. The implementation of e-government services, the integration of ICT training into every pupils' education or the deployment of lifelong ICT training was identified.

A review of literature and studies pertinent to this study was undertaken in order to particularly explore the use and impact of ICTs in developed and developing countries. An attempt was made to look at the area of teaching and learning as well as the administrative, managerial and technical prerequisites that are necessary for sustained ICT development and use. The literature indicates strongly that the effective use of ICTs in a country impacts strongly on the competitiveness of that economy within the global marketplace as well as the ability of governments to deliver on their social goals.

The development of ICTs in education is seen as an important priority by most countries. Experiences from other countries (whatever their stages of development) show that factors, which accompany the successful implementation of ICTs in schools, are structured and continuous. Effective programmes are designed to train educators to use the new technology for educational purposes. The literature also shows that ICTs should be integrated from the beginning into the teaching and learning process, as well as the administration and

management systems for the path of development to be effective. At the same time studies from other countries show that as educators become more confident so the levels of integration and innovation increase.

The next chapter focuses on KZN's proposed policy on e-education. The ex-minister of education has requested invitations for comments on the proposed policy.

E-EDUCATION IN SOUTH AFRICA

INTRODUCTION

The Indian model of e-education (among other models) was examined in the previous chapter. In this chapter the speech by the President of India, which was delivered at The University of KwaZulu-Natal during September 2004, is reviewed. He uses developments in India as a possible model for how e-education can be implemented in South Africa.

The draft proposal for the introducing of ICTs into South African Schools (as outlined by the Department of Education and Culture: 2003) is inspected. The proposal includes the purpose of ICTs in schools, government's response to the growing digital divide and the various stages for its introduction into our schools. The draft paper also suggests guidelines for implementation and maintenance of ICTs in schools.

EVOLUTION OF ENRICHED SOCIETIES

On 17 September 2004, the President of India addressed a congregation at the University of KwaZulu-Natal. His address was based on the evolution of enriched societies. What follows is a summary of key aspects of his message.

"Friends let me recite the four beautiful lines:

- o *Learning gives creativity;*

- o *Creativity leads to thinking;*

- o *Thinking provides knowledge;*

- o *Knowledge makes you great.*

My presentation will be focused on how to achieve a prosperous, a beautiful and an enlightened Africa and how India can be a partner in such a great mission, a mission for the people who have become independent from apartheid and foreign rule." (President of India: 2004)

The President of India went on to explain that we have multiple societies in every nation starting from agricultural society, industrial society, and information society leading to knowledge society. During the 20th century, societies underwent a change from the

agricultural society, where manual labour was the critical factor to the industrial society, where the management of technology, capital, and labour provided the competitive advantage. The information era was born in the last decade. Networking within the country and with the other nations and the software products drove the economies. Some of the nations including India exploited this opportunity well. In the 21st century these nations have entered into the knowledge society.

He explained how we can work together to make our societies enriched by knowledge and transforming them into knowledge societies. This encompassed efficient utilization of existing knowledge to create a comprehensive wealth for the nation and also improve the quality of life, in the form of better health, education, infrastructure, and other societal needs. The ability to create and maintain a knowledge society infrastructure, develop the needed knowledge workers, and enhance their productivity through the creation, growth, and exploitation of new knowledge, will be the key factor in deciding the prosperity of this knowledge society. Whether or not a nation has developed into a knowledge society is judged by the way it creates and deploys knowledge in sectors like ICT, Manufacturing, Agriculture, and Healthcare.

The President of India outlined that in the knowledge economy the objective of a society changes from fulfilling the basic needs of all round development to empowerment. He offered the following suggestions for the development of our country:

o The education system instead of going by text book teaching will be promoted by creative, interactive self learning – formal and informal with focus on values, merit and quality. The workers instead of being skilled or semi-skilled will be knowledgeable, self-empowered and flexibly skilled and would adapt to newer technologies seamlessly. The type of work instead of being structured and hardware driven will be less structured and software driven.

o Management style will emphasize more on delegation rather than giving command. Impact on environment and ecology will be strikingly less compared to the industrial economy.

o The economy will be knowledge driven and not industry driven for which special capacities need to be built and nurtured among the students.

o All the ingredients for capacity building should be embedded right from the beginning of the students' life. A good educational model is the need of the hour

to ensure that the students grow to contribute towards the economic growth of a nation.

o   For participating in the nation building tasks, the following capacities are required to be built among the students in their formative years by the educational institutions are: The capacity for research or inquiry, the capacity for Creativity and Innovation, particularly the creative transfer of knowledge, the capacity to use high technology, the capacity for Entrepreneurial Leadership and the capacity for Moral Leadership.

o   Teachers should give learners the skills with which they find a way through the sea of knowledge that we have created and continue with life-long learning. Today, we have the ability, through technology, to really and truly teach ourselves to become the life-long learners. This is required for sustained economic development.

o   Learners should learn how to manage knowledge collectively. When the information is networked the power and utility of the information grows as squared as predicted by Metcalfe's law. Information that is static does not grow. In the new digital economy information that is circulated creates innovation and contributes to national wealth.

o   Every learner should continuously learn to know how to use the latest technologies for aiding their learning process. Universities should equip themselves with adequate computing equipment, laboratory equipments, and Internet facilities and provide an environment for the students to enhance their learning ability. In the midst of all of the technological innovations and revolutions we cannot think that the role of the teachers will be diminished. In fact the teacher will become even more important and the whole world of education will become teacher assisted and would help in "tele-porting" the best teacher to every nook and corner of the countries and propagate the knowledge.

o   The aptitude for entrepreneurship should be cultivated right from the beginning and in the university environment. We should teach our students to take calculated risks for the sake of larger gain, but within the ethos of good business. They should also cultivate a disposition to do things right. This capacity will enable them to take up challenging tasks later.

His summary indicated that inquiry, creativity, technology, entrepreneurial and moral leadership are the five capacities required to be built through the education process. If teachers develop in all learners these five capacities, they will produce "Autonomous Learner" a self-directed, self controlled, life-long learner who will have the capacity to both, respect authority and at the same time is capable of questioning authority, in an appropriate manner. These are the leaders who would work together as a "Self-organizing Network" and transform any nation into a developed nation in a time-bound manner.

TECHNOLOGY FOR DEVELOPMENT: NON-LINEAR GROWTH

Further, the President elaborated on the issue of technology for development. Technology is the non-linear tool available to humanity, which can affect fundamental changes in the ground rules of economic competitiveness. Technology is born when science is applied to progress. The technology results into cost effective and high quality products, leading to economic growth and a clean green environment. Sustained economic growth and a clean green environment with technology value addition leads to prosperity of the society. The President felt that the prosperity of society brings happiness and peace in the nation and that technology can help in providing cost effective quality education to a large number of students located in far away places through Virtual Classrooms.

A MULTI-PRONGED APPROACH FOR TELE-EDUCATION

The president adopted a three-pronged approach to make distance education programme viable and spoke of successful propositions needed to serve as a universal tele-education system to all remote parts of the country. The three essential components are Connectivity, an efficient Tele-Education System and generation and deployment of quality content.

Remote locations could still be reached through space communication with its low costs, high bandwidth and networking capability. Also data compression techniques can be of great help in increasing bandwidth utilizations. These network systems should provide a highway for reaching quality education, tele-medicine, e-governance, e-commerce and entertainment to all parts of the country.

He emphasised that once we have the connectivity, then there could be a universal tele-education system in place to bring virtual classrooms in a multi class environment with seamless two-way interaction between the teachers and students in a collaborative environment. This system should not only enable the lectures to be delivered from the

university to reach any remote corner but also enable a good teacher in the remote area to lecture to other participants of the programme.

The President narrated an experience in the tele-education delivery system piloted at Rashtrapati Bhavan (President's house) for providing satellite connectivity for the PREVIK (President's Virtual Institute for Knowledge) members. The connectivity was through V-SATs provided by ISRO, Voice Over-IP and Internet. It provides for both synchronous and asynchronous communication, from text to voice, to video; one-to-one, one-to-many and many-to-many connectivity. On this platform, a live virtual studio environment was created to connect a number of remote locations and provide seamless connectivity. It was possible for him to give a presentation and address the participants in the remote locations and also interact through various collaborative tools. He could refer to any information on the web and push them to all the remote locations. He could also delegate the remote expert to give a lecture to all those who are connected.

According to the President, they have established a Digital Library and digitized around two million pages. He explained how he could search for a particular page and push the page to all the participants through tele-education. It is an integrated solution, which made him feel as if he was virtually connected to all participants in multiple locations.

According to the president, there are three L's of learning: lectures, laboratory and library. The content encompasses all the three L's. Content can be generated in many ways. The first one is the assimilation of the subject by an expert teacher through research study of many books and articles leading to the generation of quality and creative content in a presentable format. The teacher presents in a unique and innovative way to make the content appealing and easily understandable to the students. The second form of content could be based on a self-learning method by breaking down the content into a series of question and answer models and FAQs. Third, content may be from various books, which can be extracted through a digital library and presented just in time to all the remote students. Fourth may be content from the Internet, where a wealth of information is available. A teacher may search for the information on the Internet and push the content live through the tele-education system.

The content should have supportive animations, which may even bring virtual laboratories and virtual immersion effects to the remote students. When the content is generated, it should

be a sharable learning object across the nation and across all platforms. The content may be generated making use of the student's creative and innovative thoughts under the guidance of the expert teachers as a group activity based on a pre-determined standard. This is possible since the educational institution has developed the capacity within the student to teach while studying. The generated content through this process may be validated and deployed for delivery of lectures through the tele-education system.

Teachers after delivering the talk will also be asked a number of questions by the students. The proceedings of the questions and answers session can be added to the content document for enriching it.

The President of India offered willingness to work together with South Africa in focused mission areas, establishing connectivity through satellites and high speed networks in all educational missions. He stated that India is also willing to work together with South Africa in creating quality contents, be it the lectures, the courseware or the digital library and also provide a well tested tele-education software suite for immediate deployment.

"Through this world of education we the people of India are willing to walk with you – a long walk to freedom from poverty." (The President of India: 2004)

DRAFT WHITE PAPER ON E-EDUCATION: SOUTH AFRICA'S RESPONSE TO THE DEVELOPMENT AN ICT ENVIRONMENT

According to the South African delegate at the "e-Space" world conference in Yasmine Hammamet Tunisia, South Africa does not identify ICTs as a priority-working tool. (SABC news: 2 July 2004 – 08h30)

According to Asmal, *(Draft White Paper*: Sept 2003), Information and communication technologies (ICTs) are central to the changes taking place throughout the world. Digital media has revolutionised the information society and advances in ICTs have dramatically changed the learning and teaching process. This has opened up new learning opportunities and provided access to educational resources well beyond those traditionally available. The provision of a telecommunication infrastructure available for learning and teaching is gradually increasing, and many schools are exploiting the benefits of ICTs to enhance the quality of teaching and learning. The introduction of ICTs to schools is creating new ways for learners

and teachers to engage in information selection, gathering, sorting and analysis. In addition, ICTs have the potential to enhance the management and administrative capacity of schools.

The White Paper sets out Government's response to a new information and communication technology environment in education. Government wants to ensure that every school has access to a wide choice of diverse, high-quality communication services, which will benefit all learners and local communities. The service provided by the initiative will enhance life-long learning and provide unlimited opportunities for personal growth and development to all. The challenge of providing modern technologies to schools in order to enhance the quality of learning and teaching will require a significant investment. Given the magnitude of the task ahead, and in the true spirit of Tirisano, the public and private sectors will have to join hands to ensure that children receive high-quality learning and teaching. This White Paper represents a new framework for the collaboration of Government and the private sector in the provision of ICTs in education. Through this initiative, it is hoped schools will turn into centres of quality learning and teaching for the twenty-first Century. It is hoped that the White Paper will enable the education sector and all its partners to ensure optimal availability and use of ICTs in education, in a manner that will create better access to quality education for all, and bridge the digital divide, both within our country, and between our country and other parts of the world.

THE USE OF ICTS IN SOCIETY AND EDUCATION

A global revolution is currently taking place in education and training. It is driven by the changing nature of work, the realities of the information age, new global partnerships and an awareness of the need for equal distribution of educational opportunities.

Education systems have an obligation to deliver on public expectations of quality education for economic growth and social development. However, in the context of developing countries, quality improvement and the enhancement of excellence should take into consideration the need for increased access, equity and redress. These efforts are, in most instances, undermined by factors such as fiscal constraints, spatial barriers and other capacity-related limitations to delivery. As demonstrated in various contexts, information and communication technologies (ICTs) have the potential and capacity to overcome most of these barriers.

The expansion of ICTs is driving significant changes in many aspects of human endeavour throughout the world. At both micro and national levels, ICTs have increased the effectiveness and reach of development interventions, enhanced good governance, and lowered the cost of delivering basic social services.

As in other spheres of social and economic development, ICTs have improved the quality of education and training. It is for these reasons that Government has been quick to seize the opportunity presented by the practical benefits of ICTs as a key for teaching and learning in the twenty-first century.

The ICT revolution has had an impact on curriculum development and delivery and continues to pose new challenges for education and training systems around the world. These challenges can be summarised into three broad areas, namely:

○ Participation in the information society;

○ Impact of ICTs on access, cost effectiveness and quality of education; and

○ Integration of ICTs into the learning and teaching process.

These challenges present themselves within the context of globalisation and polarization. They occur in a world experiencing increasing disparities between the rich and poor, among and within nations. The use of ICTs in Africa recorded a 20% increase in 2002, mostly due to increased usage in urban areas and countries with a higher GDP per capita. However, while 72.7% of Americans currently use the Internet, only 6.4% of South Africans have access to and use the Internet.

The digital divide is not only about connectivity and infrastructure disparities, it is also about local content development in terms of the number and quality of local websites, local language content and the use of local online content by key sectors; collective knowledge generation; building a domestic knowledge economy and promoting online transactional capabilities for the consumer, business, and government sectors; developing the capacity of the workforce by improving Internet access and educational offerings in schools and colleges, creating digital libraries for universities, promoting professional training institutes, and stimulating the economy to absorb people with a variety of ICT skills; overcoming cultural inhibitions and insecurities about developing competence for surviving the breakneck speed of the Internet age and creating a risk-taking culture; co-operation and collaboration between

different sectors and also within the private sector; creating open investment climates for the incubation, launch, acceleration and initial-public-offering phases of ICT-related SMMEs; and ICTs as a core feature of innovation and competitiveness.

THE USE OF ICTS TO REDUCE POVERTY IN AFRICA

Africa is a developing continent. The lack of developed infrastructure for information and communication technologies is widening the gap between Africa and the developed world. In response to this under-development, Africa has adopted a renewal framework, the New Partnership for Africa's Development (NEPAD), which identifies ICTs as central in the struggle to reduce poverty on the continent. ICTs provide hope for overcoming barriers of social and geographical isolation, increase access to information and education, and enable the poor to participate in the making of decisions that have an impact on their lives.

Within education and training specifically, NEPAD recognises the pivotal role of ICTs in the establishment of regional distance learning and health education programmes to improve the situation in the health and education sectors. In order to realise the benefits of ICTs, Africa should develop and produce a pool of ICT-proficient youth and learners, from which the country can draw trainee ICT engineers, programmers and software developers. In pursuit of this objective, a network of training and research institutions that build high-level personal knowledge should be established and existing projects to connect schools and youth centres should be accelerated.

GOVERNMENT'S RESPONSES TO THE DIGITAL DIVIDE

If South Africans are to participate in the knowledge economy, every effort should be made to prevent social exclusion. President Thabo Mbeki issued the following statement at the Imbizo for African youth: *"We must continue the fight for liberation against poverty, against under-development, against marginalisation"* and *"... information and communication technology ... is a critically important tool in that struggle".*

In 2001 the Presidential National Commission on Information Society and Development (PNC on ISAD), consisting of representatives from the public and private sectors, was established. The Commission advises Government on the optimal use of ICTs to address South Africa's development challenges and enhance South Africa's global competitiveness. At the same time, the Presidential International Advisory Council on Information Society and Development (PIAC on ISAD) was established. The Council consists of chief executive

officers from major international corporations and experts active in the field of information and communication technologies. The role of the Advisory Council is to advise Government on addressing the digital divide. At its second meeting in September 2002, the Advisory Council identified three focus areas for developing ICTs:

o   Education;

o   Health; and

o   Small, medium and micro enterprises (SMMEs)

Through the Department of Communications, the Electronic Communications and Transactions Act (2002) lead all ICT initiatives in South Africa. It calls for the development of a five-year national e-strategy that aims to enable and facilitate electronic transactions in the public interest, including in the education sector.

Various government departments in support of integrating ICTs into teaching and learning have provided other enabling legislative and policy frameworks. The challenge is to roll out ICT infrastructure that is specifically suited to Africa. Through appropriate technologies, it is hoped that South Africa will leapfrog into the new century, bypassing the unnecessary adoption cycle, and implement a solution that works now, and has the capacity to handle future developments.

Three critical elements will determine ICTs future as an effective tool for social and economic development. The first is cost. Any solution that South Africa adopts has to be cost-effective if we are to meet our developmental demands and reach the most remote parts of our country. Second is the question of sustainability. It is no use having state-of-the-art technology unless it can be sustained. Third is the efficient utilisation of ICTs. Deployment of ICTs does not guarantee their efficient utilisation. Capacity building and effective support mechanisms should accompany deployment. Despite the difficulties that constrain the integration of ICTs into management, teaching and learning, the Ministry is determined to direct the implementation of a progressive programme for change.

It is to this end that the Department of Education will invest in national initiatives to increase access, boost the capacity of managers, teachers and learners, and provide electronic resources of the highest quality.

THE CURRENT PROFILE AND DISTRIBUTION OF ICTs IN SCHOOLS

Compiling an ICT profile for South African schools presents a challenge. Statistics are influenced by various factors, including the rapid redundancy rate, the level of usage and the sharing of ICT resources. Provinces are at different levels of ICT integration in education. Significant progress has been made with provincial implementation mainly in the Western Cape (Khanya); Gauteng (Gauteng OnLine) and Northern Cape (Connectivity Project).

Over the last five years, Government, the private sector, para-statals, and non-governmental organisations have responded positively to the challenge of bridging the digital divide. Efforts in bridging the digital divide include, among others, the following:

ICTs for Professional Development

SCOPE (Finnish Development Support), SchoolNet SA and the South African Institute for Distance Education has developed 11 Teacher Development Modules for introducing ICTs into schools. SchoolNet SA provides online, mentor-based in-service training for teachers on introducing ICTs into the curriculum and management;

The INTEL "Teach to the Future" Teacher Development Programme provides teacher training in ICT integration into teaching and learning. Mindset develops content resources and makes it available via satellite television, Internet multimedia and print supplements. An Educational Portal initiated by the Department of Education provides digital content resources.

INFRASTRUCTURE AND CONNECTIVITY OF ICT IN SOUTH AFRICA

- o The Telecommunications Act 103 of 1996 and amended in 2001, called for the development of an Educational Network and the implementation of an e-rate[62] (a discounted connectivity rate) for GET and FET institutions;

- o Microsoft has donated software and provides teacher development and support;

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[62] The e-rate, or Education Rate, was established in the American Telecommunications Act of 1996 to provide discounts to schools and libraries to connect to the Internet. According to FCC Chairman William Kennard, $3.65 billion in E-rate funds have been distributed since the subsidies began in 1998, and 1 million public school classrooms have been wired. A study released in September by the Education Department and the Urban Institute found that 75 percent of public school districts and individual schools have applied for E-rate funds, and nearly 84 percent of the money has gone to public schools. About half of public libraries and 15 percent of private schools have applied for the funds

o The Digital Partnership Programme provides 188 000 refurbished computers and 20 000 laptops;

o SENTEC is obliged to provide 500 schools with computer labs and teacher development, through licensing obligations;

o The 1800 MHz/3G Frequency Spectrum available to mobile operators obliges them to provide universal services to schools;

o Telkom Foundation has established SuperCentres[63] in more than 1 300 schools providing computers, software applications, Internet connection, monthly subscription and a rent-free telephone line; and

o Telkom Foundation, together with Telkom's strategic partner Thintana, has committed over R200m to support education and training in the areas of ICT, mathematics and science.

While such initiatives may be dispersed and uncoordinated, they represent an important base from which we can learn and on which to build. Disparities reflected in South African society also find expression in ICT integration into education. Although the number of schools with computers for teaching and learning increased from 12.3% in 1999 to 26.5% in 2002, there are still more than 19 000 schools without computers for teaching and learning. Based on data from the Education Management Information System (Department of Education, Pretoria) and information received from provinces, Figure 15 (on the following page) reflects the distribution of ICTs in schools across all provinces.

Analysis of the data 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 9 278 schools will have computers by the end of 2004.

Despite some extreme variations, schools in Gauteng, Northern Cape and Western Cape have, on average, a better ICT infrastructure than schools in Eastern Cape and Limpopo. Schools in Free State, KwaZulu-Natal, Mpumalanga and North West hold a 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

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[63] Refer to my discussion on SuperCentres later in this chapter.

resource. Internet access is becoming more common, but the use of the 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.

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%	10.4%
Mpumalanga	22.9%	12.4%
Northern Cape	76.3%	43.3%
Limpopo	13.3%	4.9%
North West	30.5%	22.9%
Western Cape	82.4%	56.8%
National	39.2%	26.5%

Figure 15: Tabulation of Schools with computers, by province (2002)
(Draft White Paper: Sept 2003)

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. Beyond the issue of access, 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.

The present situation, as illustrated above, cannot be maintained if South Africa is to address the digital divide. 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.

THE FUNCTION AND PURPOSE OF E-EDUCATION

The challenge is to go beyond the mere exchange of information and to transform e-Education into a range of learning activities that meet educational 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:

- o Apply ICT skills to access, analyse, evaluate, integrate, present and communicate information;

- o Create knowledge and new information by adapting, applying, designing, inventing and authoring information;

- o Function in a knowledge society by using appropriate technology and mastering communication and collaboration skills.

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

- o A tool for management and administration;

- o A resource for curriculum integration;

- o A communication tool;

- o A collaborative tool for teachers and learners; and

- o A learning environment that advances creativity, communication, collaboration and engagement.

ICTs, when successfully integrated into teaching and learning, can ensure the meaningful interaction of learners with information. ICTs can advance high order thinking skills such as, comprehension, reasoning, problem-solving and creative thinking. Success in the infusion of ICTs into teaching and learning will ensure that all learners will be equipped for full participation in the knowledge society before they leave further education and training (FET) institutions. Moreover, these learners are likely to utilise e-Government processes, not only to acquire and use information, but also to implement public sector reforms that can enhance transparency in government operations. These 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 lifelong 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 lifelong learning. Our education system should create graduates who use information effectively and keep abreast of technological advances.

Information and communication technologies (ICTs) represent the convergence of information technology and communication technology. ICTs are the combination of networks, hardware and software as well as the means of communication, collaboration and engagement that enable the processing, management and exchange of data, information and knowledge.

THE SIGNIFICANCE OF E-EDUCATION

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 arise from shifts in educational goals, and from new concepts in learning and knowledge creation. The Department of Education believes that developments in ICTs create access to learning opportunities, 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 individualised learning experiences.

Experience worldwide suggests that ICTs play an important role in the transformation of education and training. ICTs can enhance educational reform 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 contexts and develop creative thinking and problem-solving skills.

There is sufficient empirical evidence that investments in ICTs yield positive results for learners and teachers. Studies have demonstrated improved learner achievement in:

  o Application and production of knowledge for the real world;

o The ability of learners to manage learning;

o The ability to promote achievement for learners who experience barriers to learning;

o Accessing information that increases knowledge, inquiry and depth of investigation.

Furthermore, the use of ICTs has demonstrated improved inventive thinking skills, such as creativity, problem solving, higher-order thinking skills and reasoning, along with improved effective communication. Improvements in interpersonal skills, such as writing, public speaking, teamwork and collaboration, and improved productivity skills, including creating high-quality products, have also been reported. ICTs encourage a teaching and learning milieu, which recognises that people operate differently, have different learning styles and have culturally diverse perspectives. ICTs embrace inclusive education by providing opportunities, alternative methods of instruction and flexible assessments for learners who experience barriers to learning.

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

Professor Kader Asmal further believed that every South African learner in the general and further education and training bands would be ICT capable (that is, use ICTs confidently and creatively to help develop the skills and knowledge they need to achieve personal goals and to be full participants in the global community) by 2013.

E-SCHOOL DEVELOPMENT

In order to achieve the e-Education goal, schools will have to develop into learning organisations consisting of a community of both teachers and learners. In such schools, teachers and learners will be able to function across three dimensions:

o The Operational Dimension;

o The Cultural Dimension;

o The Critical Dimension.

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The operational dimension refers to the skills that are necessary for the use of new information and communication technologies. Demonstrated acquisition of these skills is as important as the process by which they are acquired. In order to facilitate collective learning, provincial departments will establish opportunities for schools to learn together and from each other about ICTs in education.

The cultural dimension involves stepping into the culture that supports the practice of using ICTs for educational purposes, regardless of one's level of expertise. This requires teachers to move beyond a purely instrumental role that views ICTs as an educational add-on, to regarding technology as something that poses interesting and important questions for administration, curricula and pedagogy.

The critical dimension invites teachers and learners to step outside the culture and challenge assumptions that are embedded in the success stories about ICTs inside and outside of schools. This requires a critical dialogue, analysis among teachers, and research resources to provoke and expand teachers' perspectives on the benefits of ICTs. e-Schools will therefore be characterised as institutions that have:

- o Learners who utilise ICTs to enhance learning;

- o Qualified and competent leaders who use ICTs for planning, management and administration;

- o Qualified and competent teachers who use ICTs to enhance teaching and learning;

- o Access to ICT resources that support curriculum delivery; and

- o Connections to ICT infrastructure.

e-Schools will connect with the community by:

- o Allowing community access to its computer facilities after hours;

- o Receiving support from the community and local SMMEs to maintain and sustain ICT interventions; and

- o Serving as a venue for business advisory services and training for community-based small computer and repair businesses.

The Department of Education will determine the basic ICT tools to be supplied to each institution defined as an e-school.

THE USE OF ICTs IN EDUCATION

The introduction of information and communication technologies (ICTs) in education represents an important part of Government's strategy to improve the quality of learning and teaching across the education and training system. The policy intention is to focus on learning and teaching for a new generation of young people who are growing up in a digital world and are comfortable with technology. Our schools should reflect these realities. The policy intention is not just to build technical skills, but also to use ICTs to extend and enrich educational experiences across the curriculum. The objective is to build digital and information literacy so that all learners become confident and competent in using technology to contribute to an innovative and developing South African society.

e-Learning is about learning and teaching philosophies and methodologies within the context of outcomes-based education, using ICTs in the learning environment. Enriching the learning environment through the use of ICTs is a continuum; it is a process that takes learners and teachers through learning about ICTs (exploring what can be done with ICTs), learning with ICTs (using ICTs to supplement normal processes or resources), and learning through the use of ICTs (using ICTs to support new ways of teaching and learning).

While e-learning will not replace teachers, it will enhance the quality and reach of their teaching and reduce the time spent on administrative chores. In introducing e-learning, we should make sure that we balance it with other teaching and learning methods. e-Learning should recognise that its value is linked to its suitability to individual learning and teaching styles and strategies. Learning through the use of ICTs is arguably one of the most powerful means of supporting learners to achieve the nationally stated curriculum goals. In particular, the use of ICTs for learning encourages:

- o Learner-centred learning;

- o Active, exploratory, inquiry-based learning;

- o Collaborative work among learners and teachers; and

- o Creativity, analytical skills, critical thinking and informed decision-making.

e-Learning will be introduced as an integral part of an environment where teaching is transformed and where learning is an ongoing, creative process. This requires a changing teaching and learning methodology in which teachers and learners will have access to:

- o High quality, relevant and diverse resources, beyond what school libraries are currently providing;

- o Means of communicating and collaborating with other learners and teachers; and

- o Opportunities to create and present new knowledge.

Our quest for active contextual learning to promote understanding will be supplemented by multimedia applications that require learners to create realistic contexts for problem-solving, data analysis and the creation of knowledge in the learning process. The introduction of learning through the use of ICTs is not about creating interesting tasks for learners, but rather to deepen their understanding, requiring the use of higher-order thinking skills and taking learners beyond recall, recognition and reproduction of information to evaluation, analysis, synthesis and production of arguments, ideas and performance.

Currently, schools are tackling issues of excellence and equity. They are creating new learning environments that model a spirit of inquiry, inclusiveness and interdependence with learners who represent a wide array of cultures, languages and social backgrounds. Within this context, e-learning has the potential to offer teachers and learners access to a variety of learning and teaching support material that promotes the appreciation of diversity, a collective identity across the school and begins to connect schools to the broader societal goals.

THE POTENTIAL OF E-ASSESSMENT WITHIN E-EDUCATION

Assessment is an important driver in education and, if not well managed, can become a barrier to innovation. Once ICTs are embedded in learning and teaching processes, learners will want to be assured that assessment effectively tests the level of acquisition of skills and competencies acquired through e-learning. e-Learning will require teachers and learners to reflect upon and improve their approaches and strategies to teaching and learning. The efficient use of e-learning methodologies has the potential to enhance the quality and value of assessment. Data analysis techniques can assist teachers to track learner achievements and review teaching strategies according to the insights gained. Teachers will also be able to give learners immediate feedback on progress, identify areas of weakness, and design necessary and appropriate support systems in a timely fashion. The administration of assessment is a labour-

intensive exercise. The use of ICTs in assessment has the potential to increase the efficiency and to streamline and safeguard data-transfer processes. ICTs have the potential to simplify the administration of assessment. Time saved by teachers on administrative routines can be spent on giving direct support to learners and improve the quality of contact time.

In adult education and training, online assessment has the potential to increase participation by overcoming barriers such as location, time and cost, through "on demand assessment". Adult learners who progress at their own pace and wish to demonstrate skills acquired at the workplace should not be tied down to an inflexible timetable.

USING ICTs FOR THE EFFICIENCY AND EFFECTIVENESS OF MANAGEMENT AND ADMINISTRATION IN EDUCATION

ICTs are increasingly allowing schools and school systems greater access to timely, relevant and detailed information on many of the functions of schools. More complex information can now be collected, analysed and used at both school and system levels. The rapid development of ICTs, the increased pressure for effective management of organisational performance, and a preference for self-managing schools have resulted in the development of powerful management information systems. As with other types of organisations, schools and school systems are increasingly using management information systems for planning, monitoring, improvement and accountability purposes. ICTs have the capacity to automate processes and save time, thereby freeing school managers to focus on instructional leadership.

If managerial functions at school and other levels of the education system are to be carried out efficiently and effectively, it is necessary that information of high quality is available at all times to inform decision-making. This highlights the need for a reliable information system that provides defined objectives and the right information to the right people, at the right time and in the right way. Educational leaders do not yet fully appreciate the benefits of e-learning and e-administration for schools and for provincial and district offices. It is important that educational leaders at all levels of the system are provided with the necessary support to enable them to manage the introduction of ICTs and the related change processes.

In order to increase the administration of education through the use of computerised information systems, the Department will develop standardised templates for management, statistical analysis, record keeping and reporting.

THE POLICY FRAMEWORK

The policy framework for the implementation of ICTs in education includes the following aspects:

- o Ensuring Equal Access to ICT Infrastructure;

- o Using ICTs for Capacity Building;

- o Creating Norms and Standards for ICTs in Teaching and Learning;

- o Professional Development for Management, Teaching and Learning.

Ensuring Equal Access to ICT Infrastructure

The use of ICTs in schools always involves choices about resource allocation. The drive for additional resources for schools results from prior access to information and resources. The technically able and well equipped can often make more compelling cases for re-equipping than those who have poor or no resources. Technology tends to amplify advantage. It is for this reason that the principle of equity should inform our approach and provide an alternative basis for supplying access to information and the allocation of resources. Equal access and equal competence should be the objective of our education system. The impact and effectiveness of ICT rest on the extent to which end-users (learners, teachers, managers and administrators) have access to hardware, software and connectivity. For e-learning to be successful, learners should have regular access to reliable infrastructure.

Using ICTs for Capacity Building

ICTs are most effectively applied when viewed as integral to teaching and learning by both learners and teachers. ICT integration supports outcomes-based education, which encourages a learner-centred and activity-based approach to education and training. Any ICT integration requires that teachers engage in rethinking and reshaping their engagement with the curriculum. Many teachers have grown up in environments with limited electronic technology, and thus find the adaptation to working with ICTs more difficult than their learners do. A programme that urgently addresses the competencies of teachers to use ICTs for their personal work, in their classrooms, should be developed. This will require extensive staff development and support. Thus, ICTs will be central to the pre-service training of recruits and the ongoing professional development of practising teachers.

Creating Norms and Standards for ICTs in Teaching and Learning

Current initiatives and donations of software and hardware have incited debates on issues of open source, copyright, licensing, refurbishment and inter-operability, as well as human resource capacity building. The need for national norms and standards for educational ICTs cannot be overemphasised. Calls for the scaling up of provincial programmes, in order to ensure equitable access to learning opportunities and to improve learner performance have been made repeatedly.

The aim of creating national standards for ICTs in teaching and learning is to clarify compliance requirements, responsibilities and implementation mechanisms. Standards of teacher development, content, connectivity, hardware and software and community engagement cover the following areas:

- o Teacher competencies consistent with the National Qualifications Framework (NQF) levels;

- o Educational soundness of electronic content, for example, relevance, reliability, accessibility and usability;

- o Inter-operability of hardware and software, and connectivity to promote durability, scalability (to be delivered to a large number of learners) and flexibility;

- o Rights management, for example, licensing, branding, trading and legal compliance;

- o Network and information security; and

- o Community engagement.

Educational soundness standards for content will include:

- o Content relevance and reliability - the purpose of the content is readily apparent it adds value to teaching and learning tasks, includes processes and criteria for learner assessment, and is compliant with outcomes-based education;

- o Accessibility - content is compatible and inter-operable with existing software and hardware; it complies, where feasible, with accessibility standards for learners with disabilities and barriers to learning; and

- o Usability - content is easy to use and recognise

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Inter-operability of content standards will include:

- o Accessibility - content should be accessible from many locations;

- o Inter-operability - learning components developed with one platform or set of tools can be used in another location with a different platform or set of tools;

- o Durability - technology changes can be made without redesign or recoding;

- o Scalability - the ability of a system (both hardware and software) to be distributed to large numbers of learners in diverse locations; and

- o Flexibility - the ability to use and remix learning components from a range of sources.

Rights management norms will include:

- o Equitable rights licensing - negotiation of intellectual property licensing will benefit the education sector and investment shareholders, as well as stimulate the education resource development market;

- o Branding - provisions will be made for common structure, format and expression of rights information;

- o Flexible rights trading - rights can be traded in accordance with the digital, modular and dynamic nature of learning content; and

- o Legal rights compliance - licensing rights are honoured and trading rights are supported.

PROFESSIONAL DEVELOPMENT FOR MANAGEMENT, TEACHING AND LEARNING

Every teacher, manager and administrator in General and Further Education and Training should have the knowledge, skills and support they need to integrate ICTs in teaching and learning. The Department of Education should develop a national framework for competencies for educators (teachers, managers and administrators), and the use of ICTs should be integrated into pre-service and in-service training. This will require creating an appropriate accreditation within the National Qualifications Framework, revising the Norms and Standards for Educators, and reviewing Department of Education in-service training policies and programmes to include ICTs when appropriate. Standards for professional competency in ICT utilisation will consider the following levels:

o Entry - computer literate, able to use computers and teach learners to use computers;

o Adoption - able to use various technologies, including the computer, to support traditional management, administration, teaching and learning;

o Adaptation - able to use technology to enrich the curriculum and use integrated systems for management and administration;

o Appropriation - able to integrate technology into teaching and learning activities, and use integrated systems for management and administration within a community context; and

o Innovation - prepared to develop entirely new learning environments that use technology as a flexible tool, so that learning becomes collaborative and interactive. Technology is integrated as a flexible tool for whole-school development.

The Department of Education will collaborate with the Education, Training and Development Practices SETA to access the skills levy for in-service ICT training programmes. Each school will have a dedicated teacher to manage ICT facilities and champion the use of ICTs in the school. Support in the form of incentives will encourage teachers, managers and administrators to integrate technology into their daily activities and areas of responsibility. This will facilitate technological change, experimentation with new ideas, and risk taking. The Department of Education will, in collaboration with relevant government departments, ascertain possibilities for subsidies and special loans to encourage teachers to purchase computers for personal use. The level of proficiency in the use of ICTs will become an integral part of the Development Appraisal System and whole-school evaluation.

THE USE OF ICTS FOR MANAGEMENT OF EDUCATION

To realise the e-Education goal, educational management needs to move beyond the initial stages of ICT planning and experimentation and make focused capital investments. Educational leaders at all levels (national, provincial, district and institutional) should leverage ICTs as a tool for improved educational performance and reorganise educational institutions accordingly. Ultimately, educational leaders should view ICTs as an essential transformative tool for education and training, and individually promote and support the use of ICTs in his/her institution. Institutional development plans should incorporate ICT development plans. The plans should address the initial cost of ICTs, infrastructure upgrades, security,

recurring costs, replacement costs, maintenance and support. In addition, plans should address teacher development, skills transfer, support, and additional human resource requirements. Provincial education departments will plan and budget for training district-level subject specialists in order to provide ongoing professional and technical support.

INSPIRING LEARNERS AND TEACHERS TO EXPLOIT THE FULL POTENTIAL OF ICTS

Integral to the strategy of motivating teachers and schools to integrate ICTs into their daily functions, the Department of Education will continue with its incentive programme for the Most Improved Schools Awards in the category of Technology-Enhanced Learning Award. The aim of this award will be to celebrate excellence in the creative use of ICTs and to inspire learners and teachers to exploit the full potential of this rich and exciting technology. Through this incentive scheme, models of excellent practice will be identified and used to develop and promote effective practices in the use of ICTs in teaching, learning and leadership. The award will allow the Department of Education to share good practice with the wider teaching community while rewarding individuals and teams who demonstrate exemplary practice in the use of ICTs in teaching and learning.

THE ROLE OF HIGHER EDUCATION IN INTEGRATING ICT INTO EDUCATION

The Department of Education and the provincial education departments will collaborate with higher education institutions to design and deliver in-service and pre-service training programmes for teachers, managers and administrators. The Department of Education will ensure the inclusion of ICT integration competencies for teachers, administrators and managers in accredited pre-service teacher training programmes delivered by higher education institutions. Accredited pre-service teacher training programmes will provide learners with the basic knowledge, skills and attitudes required to integrate ICTs into subjects of specialisation. This will require that each graduating teacher is able to combine knowledge of the learning process and instructional systems theory with various forms of media and learning environments, to create the most effective and efficient learning experiences. The training will model the use of ICTs as a mode of delivery, allowing for greater levels of collaboration, inquiry, analysis, creativity and content production.

THE DEVELOPMENT AND DISTRIBUTION OF ELECTRONIC CONTENT AND RESOURCES

The school curriculum in General and Further Education and Training should be supported through effective and engaging software, electronic content and online learning resources, and teachers, content developers and administrators who contribute effectively to

these resources. Conventional print media, as well as the use of devices such as conventional radio broadcast and tape recorders, will continue to be used in e-schools. However, the system has relatively under-developed digital teaching and learning resources at present. It is crucial therefore, that an education-industry partnership be developed to enhance innovative, effective and sustainable e-learning resources. In the interim, the Department of Education will initiate the collection and evaluation of existing digital, multimedia material that will stimulate all South African learners to seek and manipulate information in collaborative and creative ways. Digital content is critical to e-Education because it can be easily and randomly accessed, adapted and manipulated, and is accessible from many locations.

The *Department of Education, in collaboration with the Department of Arts and Culture,* will promote the adaptation and development of local content into indigenous languages. While there is a large amount of curriculum material and resources available on the Internet, this online content should be evaluated for educational relevance prior to adaptation and possible translation into indigenous languages.

The Department of Education will promote the generation of new electronic content that is aligned with outcomes-based education. Priority areas for national rollout include South African history, technology, mathematics, sciences and the biology of, and social behaviour associated with, HIV/AIDS.

School libraries are currently unable to support resource-based learning in outcomes-based education. The Department of Education will promote access to digital libraries. Information available in public libraries, museums and government offices should be made available in digital formats and networked applications.

DEVELOPING A NATIONAL EDUCATION PORTAL

The Department of Education, in collaboration with the provincial education departments, will initiate the development of a national education portal that is linked with provincial and privately owned portals. It will be a distributive tool and a content and information-sharing platform, hosting communications and collaboration applications for learners, teachers, administrators, managers and parents. It will serve as a nucleus for building web-based resources for teachers, learners and the community, making it possible to create new knowledge and add to the existing knowledge base.

The national education portal will require hosting services that will be distributed and decentralised in order to maximise efficiency and minimise duplication. A group of experts will oversee the content development process of the portal and drive the process.

The Educational Management Information System (EMIS) will be accessible through the national education portal. The Department of Education will improve the electronic system for the transfer of management information between GET and FET institutions, and district, provincial and national offices. This will require the identification of national-level reports and the development or procurement of administrative software packages accessible to all institutions.

ACCESS TO ICTs INFRASTRUCTURE

Every teacher and learner in General and Further Education and Training should have access to ICT infrastructure. National and provincial hardware and software requirements and rollout targets should be set by projecting the long-term technological needs of South Africa. This will be based on anticipated educational needs and objectives. The provincial education departments will establish a desired level of technology resources (hardware and software) for each GET and FET institution and assess the adequacy of existing equipment and facilities. At the very least, every GET and FET institution will have access to technology in order to:

- o Manage administrative functions;

- o Access electronic learning materials;

- o Connect to information sources outside the classroom;

- o Communicate with others in and beyond the institutional boundaries;

- o Collaborate with others in and beyond the institutional boundaries; and

- o Create and add to the knowledge base.

National and provincial managers and administrators should plan and mobilise funds for provincial, district and institutional resources to support hardware and equipment installation, as well as maintenance and repair thereof. The Department of Trade and Industry, in support of the provision of ICTs to and within schools, will review the trade policies for procuring ICT-related goods and services, as well as ensuring balance between (a) reducing import taxes and bureaucratic processes for imports and (b) developing local ICT industries, including pricing and taxation of e-services, technical support specialists, local or foreign-owned computer vendors, computer assembly plants and software manufacturers.

The Department of Education will develop norms and standards for new and refurbished hardware and software for use in GET and FET institutions and revise it annually. These standards should be consistent with the technical criteria set forth by the Information Technology Acquisition Centre (ITAC) procurement policy and procedures. Criteria for technical appropriateness include:

o   Technical requirements, including durability and ease of maintenance;

o   Systems life expectancy, that is, whether the technology under consideration or tendered is obsolete or relatively new;

o   Inter-operability, or the ability of ICTs to communicate between different tools and platforms;

o   Acceptable sources of power;

o   Safety and security of equipment; and

o   Best practices with regard to technical requirements and sustainability.

Central to equipping schools with an ICT infrastructure is the provision of electricity and a physical infrastructure. Although there are ICT provisions that use alternative sources of energy, the Department of Education will work with the Department of Minerals and Energy to prioritise the electrification programme for GET and FET institutions. The Department of Education will develop norms and standards for new and refurbished school buildings and facilities for the use of ICTs.

ENSURING THAT EQUIPMENT IS INTER OPERABLE

The Department of Education will establish minimum inter-operability standards that do not preclude new or better products, to guide the purchase of hardware, software and other technologies for GET and FET institutions within provinces. Provincial education departments should prepare guidelines for GET and FET institutions and districts for acquisition of equipment, including software that is compatible with provincial networks. The guidelines will describe how the provincial education departments will ensure that equipment in GET and FET institutions meets the highest possible level of inter-operability and open system design as per the minimum content and hardware/software inter-operability standards.

MAINTENANCE AND REFURBISHMENT OF INFORMATION COMMUNICATION TECHNOLOGY

The Department of Education will promote and support the establishment of training programmes and small business incubators for the maintenance and refurbishment of computers. This will be done in conjunction with relevant government departments and the providers of further education and training programmes, as well as higher education institutions that have computer science programmes. The Department of Education will develop norms and standards to ensure the safety and security of ICTs.

DEVELOPING A NATIONAL EDUCATION NETWORK

Every teacher and learner in General and Further Education and Training should have access to an educational network and the Internet. The Telecommunications Act 103 of 1996 and amended in 2001 makes provision for the development of a network for education (EduNet) that will connect all schools to each other and to the Internet through multimedia laboratories. The Departments of Education and Communications will initiate the development of a national education network in collaboration with other relevant government departments. The education network will be designed to serve the goal of universal access for every e-school. The education network will provide high-speed access for learning, teaching and administration. The Department of Education recognises the need for high-speed access and alternative means of access in addition to dial-up Internet access.

NETWORK SECURITY

The Department of Education, in collaboration with the Department of Communications and the State Information Technology Agency (SITA), will develop adequate measures, such as firewalls and virus protection software, to protect the security of network resources and to protect users. The Department of Education will establish standards and develop guidelines for the use of networks and rights management. The standards will address Internet safety and responsible and age-appropriate technology use.

RECURRING COSTS FOR CONNECTIVITY

The Minister of Communications will determine the formulae for apportioning of universal service funds for the payment of subsidies to GET and FET institutions for the procurement of Internet services and the equipment required to access the Internet, as stated in the Telecommunications Act 103 of 1996 and amended in 2001. The legislated e-rate, a discounted connectivity rate, is designed to ensure that the cost of basic connectivity is

affordable. Government will implement the e-rate. The discounted e-rate will be reviewed, in conjunction with the Universal Service Agency obligations, against the recurring connectivity costs.

INVOLVING THE COMMUNITY IN THE ICT PROJECT

Schools should work in partnership with families and the wider community to ensure shared knowledge about ICTs and extended opportunities for learning and development through ICTs. Community engagement in ICT planning, implementing and monitoring is crucial for the formation, maintenance and security of an e-school. The e-school will also act as a hub for multi-purpose services, such as adult continued learning, primary health care and other local government services. Moreover, community members will aspire to develop community-based small, medium and micro enterprises to provide maintenance and support services for hardware and connectivity to the e-school.

Government will support community access to e-schools. The objective will be to increase opportunities for communities to use e-school resources, develop their computer and Internet skills, and take advantage of services offered through ICTs. In return the community will support the sustainability of ICTs in the e-school. e-Schools will be encouraged to engage with the local community in order to become centres of community life and obtain support through the community. The local community will be involved in the maintenance and security of e-school ICT infrastructure, as well as supporting e-schools by availing ICT experts, specialists and champions in the community who are willing to volunteer their skills and expertise. Schools can avail their ICT laboratories as study support centres for learners and adult learners. Laboratories will have to be safe and supportive environments for after-school and work-related studies. These study support centres will become study environments for learners whose home environments are not sufficiently conducive to study.

Government will facilitate the establishment of training programmes and small-business incubators to develop community-based computer repair and maintenance businesses and other ICT enterprises. This will require co-ordination with government departments and the business sector, as well as higher education institutions and institutions providing further education and training programmes. These SMMEs will provide technical and maintenance support to GET and FET institutions on an ongoing basis.

RESEARCH AND DEVELOPMENT FOR ICT INTEGRATION

The research and development community should continuously assess current practices, and explore and experiment with new technologies, methodologies and techniques that are reliable and will support teachers and administrators in e-learning and e-administration. The best way to learn and understand how to improve practices is through research, evaluation, experimentation and collaboration. To this end, Government should bring together teachers, researchers and the ICT industry in an action-oriented research and development forum, to evaluate and develop leading-edge applications for e-learning. Research should be linked to practice. The teaching profession has an obligation to play an important role in generating ideas, testing prototypes and implementing strategies. Research for e-learning should be closely linked to other general research on learning. The Department of Education, in collaboration the Departments of Communications and Science and Technology, the teaching profession, higher education institutions and research agencies, will formulate a research agenda on ICTs for e-learning.

Cabinet has approved the concept for the establishment of an Advanced Institute for ICT (AIICT). The AIICT will undertake world-class, needs-based and applied research in ICTs, leading to development and innovation for the benefit of the economy, to advance the quality of life of all South Africans and advancement of the region as a whole. The AIICT will also contribute to the education and training of high-level ICT knowledge workers through collaboration and partnerships with higher education institutions. The work of the AIICT, through its research and high-level human resource development, will support the implementation of e-learning approaches throughout the education system.

FUNDING AND RE-SOURCING

Need for Investment

While the Ministry of Education is realistic about the fiscal constraints affecting Government, it also accepts that bridging the digital divide and building an integrated e-Education System will require greater investment in the education sector. Sustained and predictable funding sources for technology are needed in order to realise a large-scale impact over time. The initial upfront and long-term investments to achieve e-Education will be huge. The ongoing costs of providing access to technology, including teacher development, pedagogical and technical support, digital content and telecommunication charges, as well as maintenance, upgrades and repairs are enormous.

Principles for Funding and Re-sourcing

The Medium Term Expenditure Framework (MTEF) will provide a sustainable source for the implementation of e-Education, with a greater degree of predictability and accountability for the planning and funding of e-Education. Given the magnitude of the task and additional resource requirements, investment in ICTs cannot be the sole responsibility of Government. Investment from the private sector and other resources will be required to supplement Government contributions.

The programme for rolling out ICTs across the system will require a long-term planning framework linked to a funding and resourcing model. The primary objective of such a planning and co-ordination mechanism will be to ensure that the deployment of funds and resources meets the equity and efficiency objectives of the system. Implementing e-Education should ensure that available resources are maximised and utilised effectively through effective procurement, value for money, and management for sustainability. Funding models and procurement mechanisms should achieve economies of scale. Rollout plans should be affordable, scalable and sustainable, based on generic activity-based design tools for teachers and learners.

Sources of Funding

Based on the above principles, the Department of Education, with other government departments and the private sector, will mobilise additional funds and resources. Sources of funding will include the following:

- o Licensing obligations of telecommunication providers;

- o Private sector donations and support from international development assistance agencies;

- o Appropriate public-private partnerships to ensure the sustainability of the e-Education policy implementation; and

- o Identification of research frameworks for academic research and development, for research bodies and institutions to solicit funding for research in e-Education.

The Department of Education will co-ordinate, with the Department of Communications and the Universal Service Agency, the utilisation of the universal service fund, generated through universal service agreements and administered by the Universal Service Agency. The

co-ordination will involve direct subsidisation to GET and FET institutions in impoverished areas and differentiated pricing structures to enable access for all institutions.

One of the critical factors to the success of ICT implementation is sustainable connectivity and electricity services. The Department of Communications, through the Telecommunications Act 103 of 1996 and amended in 2001, called for the implementation of an e-rate for GET and FET institutions to address the recurrent costs to connectivity, which is based on ongoing cost requirements reviews. Similar rates will be negotiated for electricity.

STRATEGY FOR IMPLEMENTATION OF ICTs

A number of ICT initiatives are being implemented across the length and breadth of the country. However, these initiatives have not yet reached every school and district. Teacher access to ICTs is limited, even though, as evidence suggests, personal access has a strong influence on the quality of ICT integration into teaching and learning. Government has the responsibility to ensure that the benefits of e-learning are enjoyed by all. An implementation strategy based on the principle of universal excellence for learners, teachers, managers and schools should inform and direct all efforts. e-Learning should be the mainstream activity of every school and classroom.

The Department of Education, working with the private sector and social partners in the deployment of ICTs, will drive a system-wide campaign to maximise the benefits of e-learning to schools, classrooms, learners, teachers, managers and communities. From the initial provision of ICTs in schools, sufficient enthusiasm, understanding and expertise has been generated to justify the move to a system-wide approach that will embed e-learning in ways that will benefit all learners and teachers across the education system. The Department of Education will adopt a multi-pronged strategy for the gradual integration of ICTs at all levels of the education and training system. National targets will guide the implementation of the e-Education policy. Benchmarks and annual targets will be set for the following:

- o Number of e-schools and their level of e-readiness;

- o Number of teachers trained at various levels of ICT proficiency;

- o Type of content available to learners;

- o Ratio of learners to computers;

- o Range of technologies used in classrooms; and

o   Internet connectivity.

CO-ORDINATION AND COLLABORATION

The White Paper provides a policy framework within which government departments and other stakeholders will collaborate to ensure that institutions are supported to meet the needs and interests of learners and communities. The e-Education policy provides a strategic framework for national co-ordination with the Presidential National Commission on Information Society and Development, the provincial education departments, other governmental departments, business and industry, non-profit organisations, higher education institutions, general and further education and training institutions, and local communities to implement e-Education.

The policy directs the establishment of a Ministerial e-Education Advisory Council consisting of ICT champions from the public sector, academia, and private and civil society. The Advisory Council will deliver annual reports on the status of e-Education in South Africa and advise the Department of Education on implementation. The annual reports will track and monitor progress on investments in ICTs, as well as compare improvements in educational outcomes. The reports will reflect on issues such as the impact of ICTs upon the operation of educational institutions, the relationship between quality and effectiveness of teachers and ICTs and the impact of ICTs on learner achievement and the development of skills for the 21st century. The Advisory Council will provide advice on future directions involving ICTs in education. An e-Education inter-departmental team will monitor and manage the implementation of the e-Education policy and foster inter-governmental collaboration. The composition of this team will include senior officials from all the government departments that have key responsibilities in the implementation of the e-Education policy. Crucial to co-ordination is the development, implementation and monitoring of targets. This will be reflected in national and provincial ICT plans.

MONITORING AND EVALUATION OF ICT PROGRAMME

Regular reviews and periodic evaluations will be conducted to inform the implementation process. The direction and focus will benefit from insights gained and lessons learned from the reviews. Evidence of success will be captured against nationally agreed indicators and targets. The data collected will guide decisions and inform continuous improvement of the implementation of the e-Education policy. Each general and further education and training

institution will report data on e-school technology assessment readiness and targets (e-START). Data sets will include baseline data, and set targets to become an e-school.

The data sets will include information on infrastructure, connectivity, management, teacher development, learner achievement, assessment and educational benefits to be gained from ICT applications in e-schools. The information will be aggregated at district, provincial and national levels.

PLANNING CYCLES FOR IMPLEMENTATION OF ICT EDUCATION

The achievement of the e-Education policy goal, that every learner in the general and further education and training bands will be ICT capable by 2013, calls for a long-term strategy that will provide a framework for specific priorities and actions to be implemented over a period of time. The implementation strategy set out a multi-year programme of action, namely; Phase I - 2004/07; Phase II - 2007/10 and Phase III - 2010/13.

The targets set out in the implementation strategy will guide the initial medium-term process of integrating ICTs into e-learning, and will identify key national goals, initiatives and strategic resource allocations. A modest, sustained and systematic growth plan is preferred. During this time, realistic targets should be set and communicated upfront to the Department of Education, and the public and private sectors. The Department of Education recognises that provinces are at different levels of ICT development and that each province will set its own targets within the broader framework. Such an approach will allow the provinces time to set in place the required basics, to develop identified capacities and to develop effective growth management strategies within different timeframes.

PHASE I
Enhance system-wide and institutional readiness to use ICTs for learning, teaching and administration

- o Build an education and training system to support ICTs integration in teaching and learning;

- o Dedicated expertise is appointed and developed at different levels of the system for the planning, management, support, monitoring and evaluation of ICTs;

- o Ongoing support to managers is provided at different levels of the system;

- o Build teachers' and managers' confidence in the use of ICTs;

- Every teacher and manager has the means to obtain a personal computer for personal use, administration and preparation of lessons;

- Every teacher and manager has access to basic training in the use of ICTs;

- Technology incentives for schools and teachers to use ICTs are installed through the "Most Improved Schools Award" programme and other schemes;

- A set of case studies and examples is available to teachers and managers on how to integrate ICTs in management, teaching and learning.

Build a Framework for Competencies for Teacher Development in the Integration of ICTs into the Curriculum

- Norms and Standards for Educators are revised to include ICT use and integration;

- All pre-service teachers training in higher education institutions includes basic ICT literacy and basic ICT integration into teaching and learning;

- Teachers have access to in-service training on how to integrate ICTs into teaching and learning;

- Teachers have access to ICT technical support training;

- School managers have access to in-service training on how to integrate ICTs in management and administration;

- Provincial managers are trained in ICT integration to offer support to schools.

- Establish An ICTs Presence In Schools;

- Every school has a computer and software for administrative purposes;

- 50% of all schools have access to a networked computer facility for teaching and learning;

- 50% of all schools have signed the Microsoft agreement and use the software;

- ICT facilities are being used effectively to facilitate ICT integration into teaching and learning;

- ICT facilities are safe;

- Schools are using education content of high quality;

- Schools are using educational content that is developed according to set national norms and standards;

- Schools have access to an updated database of evaluated content resources and are able to select content for their usage;

- Schools have access to educational content on the Educational Portal "Thutong".

Schools are connected to Access the Internet and Communicate Electronically

- 50% of schools are connected to the Educational Network;

- Networks are safe and information security is monitored;

- Schools use electronic means to communicate with provincial offices;

- All schools have access to an e-rate;

- Communities Support ICTs Facilities;

- SMMEs are developed and trained to provide technical support to schools;

- Communities have access to ICT facilities and services, and in return provide assistance in sustainability of the intervention.

PHASE II

System-Wide Integration of ICTs into Teaching and Learning

- Teachers and managers integrate ICTs into management and the Curriculum;

- 50% of teachers are trained in basic ICT integration into teaching and learning;

- Teachers have access to ICT technical support training;

- 80% of school managers integrate ICTs in management and administration;

- Provinces support ICT integration into the curriculum;

- Research and evaluation inform developments and directions in ICT integration.

Widely Present ICTs in Schools

- 80% of all schools have access to a networked computer facility for teaching and learning;

- 80% of all schools have signed the Microsoft agreement and use the software;

- ICT facilities are safe, effective, designed to facilitate ICT integration into teaching and learning, and in working conditions;

o All schools with ICT facilities have a dedicated teacher to manage the facility and to champion the use of ICTs in the school.

Use of High Quality Education Content in Schools

o The Educational Portal "Thutong" provides access to resources in all learning areas in GET and all subjects in FET;

o Schools use the Educational Portal to communicate, collaborate and access content resources;

o Schools have access to digital libraries;

o Teachers are producing digital content of high quality and making it available to other teachers.

Connect All Schools to the Electronic Educational Network

o All schools are connected to the Educational Network;

o Networks are safe and information security is monitored;

o Schools use electronic means to communicate with provincial offices;

o All schools have access to an e-rate.

Involve Community Support in ICT Education

o SMMEs provide technical support to schools

o Community involvement supports schools to sustain ICT facilities

PHASE III

ICTs Integrated at All Levels of the Education System (Management, Teaching, Learning and Administration)

o All departments of education use ICTs seamlessly in planning, management, communication and monitoring and evaluation;

o All learners and teachers are ICT capable;

o ICTs are integrated into teaching and learning in all schools;

o All teachers integrate ICTs into the curriculum;

o All schools have access to a networked computer facility for teaching and learning that is safe, effective, designed to facilitate ICT integration into teaching

and learning, and in working conditions. All schools use educational software of high quality;

o All schools use the Educational Portal for teaching and learning in an outcomes-based education fashion;

o Communities are integrally involved in e-schools;

o ICT interventions are informed by research.

KZN NEWS: TECHNOLOGY BOOST FOR KZN DEPARTMENT OF EDUCATION

According to 3Com news bulletin (2004: http://www.itweb.co.za/office/3Com/0403260845.htm), The Department of Education and Culture in KwaZulu-Natal has launched a major technology upgrade initiative that will culminate in the linking, via a wide area network (WAN), of its 60 administrative offices and other sites throughout the province to its head office complex in Ulundi.

According to AM Moodley, deputy manager (Information Technology) at the department, the project will also include the Truro building and Esplanade Government Building (EGB) in Durban.

He says the department is collaborating with 3Com, through its local branch, on the design of the networks and has standardised on 3Com products throughout its network. "Apart from the fact that all our offices, including resource centres, will be linked, key benefits of the project include a more streamlined and efficient flow of information throughout the department," says Moodley. "Security has also come under the spotlight and we are confident that the handling of all sensitive material, particularly papers associated with our senior certificate examinations, will be foolproof."

Byron Ainhirn, Education Network manager at the State Information Technology Agency (SITA), revealed that the department's new 3Com network infrastructure centres on the installation of high speed, 10/100 Megabits-per-second (Mbps) links at each of the sites, complemented by a fast, 1GB core, linking enterprise, mail and terminal servers.

"The result will impact on more than 9 000 desktop workstations and will deliver measurable response and performance increases," he says.

"In designing the upgrade, 3Com's brief included an overall improvement of efficiency, increased network stability, manageability and security for our systems - which include accounting, administration, human resources management and salary systems as well as e-mail," adds Ainhirn.

The network infrastructure will also be linked to Govnet - the government network - and the proposed KZN-online education initiative, which will bring a significant number of the 6 300 schools, 80 000 teachers and more than 2 million pupils in the province into the network.

According to IPR Strategic Business Information Database, July 21, 2002, cellular phone mogul Vodacom Foundation announced it is establishing *e-learning resource centres* throughout South Africa, to bridge the existing digital divide, by donating R1.682 million to the project in which 40 'master facilitators' will train teachers in the use of information and communication technology. Foundation chairperson Mthobi Tyamzashe said Vodacom's expansion into several African countries had made it acutely aware of the need to break down the digital gap between Africa and the developed world. The E-Learning Centres are part of a unique international collaboration, known as the Digital Partnership, of which South Africa is the site of the first pilot programme. The Partnership, involving private, public and non profit-sectors across the globe, has been established to facilitate and deliver computer literacy and developing access for learning, enterprise and social development in developing countries.

KZN NEWS: TELKOM SUPER CENTRES

In 1998 Telkom, in conjunction with The Thintana i-Learn, launched a project to sponsor 10 rural schools in KwaZulu-Natal with computer centres. The purpose of the SuperCentres project is to improve the quality of teaching and learning in the selected schools through the use of Information and Communication Technologies (ICTs), and increase the number of students who are proficient ICT users.

Telkom SA sponsored the Telkom SuperCentres project. The Telkom SuperCentres Project initially aimed to install computer networks of 21 PCs with a server and dialup Internet connectivity in one hundred schools around the country. However, due to budgetary constraints, the number of schools to benefit from the project was reduced to 198 and a standard configuration for each site was amended to consist of 10 refurbished PCs and 4 new PCs with head phones, a server, modem, printer, and Uninterrupted Power Supply (UPS).

According to the Telkom SuperCentres and Thintana i-Learn Project Evaluation Report (2000: http://www.school.za/atwork/telkom_sc_ilearn.html#_ftnref46), the Thintana i-Learn and Telkom SuperCentres Projects have delivered and installed computers in schools that are in deep rural areas. Qantayi Secondary School, situated in Port Dunfort in KwaZulu-Natal, is close to 50 kilometers from Richard's Bay and about 35 kilometers from Empangeni. Besides the distances, it was clear from observation that some of the areas where the schools are situated are faced with adverse socio-economic conditions characterised by unemployment and poverty. Some schools lacked educators with ICT skills and some of the schools participating in the projects were from deep rural areas. The projects were implemented in schools that have the basic requirements to enable them to succeed

The Thintana i-Learn Project Evaluation Report of the 15th August 2002 shows that theft of equipment in schools was one of the major problems. Ambitious outcomes are found, for example, in the claim "If we equip students with information literacy skills, they will be able to: (emphasis added)

- o "Make up" their own minds

- o Work well in teams

- o Solve problems with independence and ingenuity

- o Speak, present, and write persuasively

Many schools which participate in the Thintana i-Learn project experienced many technical problems. Networks were often out of order. These schools were completely disillusioned and felt that SchoolNet has deserted them. Their frustration and anger is understandable given that their technical problems, which reportedly started late in 2001 had not been attended to.

While there is evidence to suggest that educators and learners used the computers, the above Project Evaluation Report found that most schools were not using the Internet. Where connectivity has been established reasons for not using the Internet varied. The common reason though was that educators and learners were being introduced to computers so they did not possess the necessary skills to use the Internet. Some schools said that they wanted to first develop a policy for Internet use before they allowed educators and learners to use the Internet.

The general feeling among key informants and interviewees in school is that the projects have brought about changes in various aspects particularly in rural areas. Prakash Morar, the project manager at SchoolNet said that the projects managed to have empowered lots of rural schools in ways that no one could. The projects have opened up a whole new world for the schools and have moved to closing the digital divide.

The Evaluation Report concluded by identifying the need for further research in the area of ICT integration into schools. Such research will help interested parties find out how to find methods and strategies that schools would have to use to sustain their centres.

CONCLUSION

Chapter 7 outlines a draft policy for ICT integration into the South African Schools. The policy has some very promising ideas, which require great effort by the initiator to see the mission through to its end. Unfortunately, the initiator, Proffessor Kader Asmal requested to be replaced for reasons unknown to the author.

The great dilemma that surfaces is whether the new minister will take ownership of the draft policy. This area of concern surfaced when the new minister of education immediately placed a moratorium on educator promotions, which were already in motion. The moratorium was sited after the due date for submission of applications for promotions had expired. She needed to examine the feasibility of such a project before it was concluded. Whilst there is some speculation that these posts will be re-advertised for educators to re-apply, educators are still waiting in hope that something good will materialise.

Further, with reference to the penultimate paragraph of this chapter, it is clear that offices other than schools in the Department of Education are given attention to ICT upgrades.

Chapter 8 deals with the quantitative research, which the author undertook in KwaZulu-Natal. The research is purposed to assist in entrenching a respectable ICT policy for KZN schools rather than for bureaucratic offices.

FIELDWORK

INTRODUCTION

This chapter traces the development of this study from its conception up to the research results. An account of the questionnaire, which was used in the research, is presented and this is followed by a discussion of the fieldwork that was carried out for the purposes of this study. The procedure used to process data from questionnaire to data tables is also explained.

THE NATURE OF THE RESEARCH

This project was analytic in nature. The qualitative aspect entailed empirical literature study. The quantitative study entailed research methodology based on sampling techniques, fieldwork, questionnaires, and the appropriate form of statistical quantification using the analytical program, SPSS, and the interpretation of the results in terms of parameters of significance projected by SPSS.

RATIONALE FOR QUANTITATIVE ANALYSIS

In September 2003 Professor Kader Asmal (former minister of education- SA) released a Draft White Paper on e-Education where he also invited "stakeholder bodies and members of the public with an interest in Information and Communication Technologies in Education and Training to comment on the draft e-Education White Paper". The document proposed that submissions be done under the following headings:

- o Introduction;

- o Policy Framework;

- o Funding and Resourcing;

- o Implementation Strategies;

- o Other issues;

- o Recommendations.

The draft proposal gave the current profile and distribution of ICTs in schools. Only 10.4% of KwaZulu-Natal schools were equipped with computers for teaching and learning.

Further to the above in South African Country report (2004: website[64]) South Africa's score on learners' cross-cultural skills is below the score of the WorLD[65] impact program. WorLD cited the following causes to the above problem:

- o The South African has the lowest learner-to-computer ratio among all WorLD countries;

- o Educators cited a lack of national policy for computer use as an obstacle, and they reported that they lack time to implement new ICT pedagogies.

Thirdly, the author conducted interviews with relevant stakeholders in education in order to be able to make relevant recommendations for ICT education in KwaZulu-Natal. Dr. Skosana (Senior Education Manager – Zululand Education District) issued the following statements:

- o The 2003 Draft White Paper on ICT education has been shelved until further positive recommendations are submitted to pursue its necessity;

- o The Department of Education is instead focusing on creating more classrooms in order to ensure that teaching is not done under trees.

In order to make consistent comments and contributions to the Draft White Paper on e-education the author had to make a reliable assessment of e-education in other countries, undertake substantial literature study of ICT education and also take on a study of the current status of ICT education in KwaZulu-Natal. Since is was not the author's intention to redo what the previous Minister of Education did, the author undertook an exploratory study to evaluate the status and quality of e-education that existed and the mindset of learners, parents and teachers with regard to e-education. This exploratory study enabled the author's current supervisor to initiate a more intense survey[66] of e-education in KwaZulu-Natal since the problems that surfaced were too numerous to be carried out by one study (refer to the problems as listed in chapter 1).

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[64] http://64.233.161.104/search?q=cache:JyYvdqTXiOEJ:www.worldbank.org/worldlinks/english/assets/World Links-SouthAfrica.pdf+percentage+of+schools +that+have+computers+ in+ south+africa&hl=en&ie=UTF-8),

[65] World Links for Development (WorLD) Organization was established as a non-profit organization separate from the World Bank Institute.

[66] Refer to Research Procedure. Chapter 1, page 5.

For reasons stated above, the exploratory survey was constructed using a convenient sample of 266 learners from previously disadvantaged public schools along the coast of KwaZulu-Natal.

FIELDWORK

An anonymous questionnaire targeted at pupils of the general education and training phase was developed. Fellow postgraduate Communication Science students of the University of Zululand (who had just completed a course on research and field work methodology) assisted in disseminating, administering and collecting questionnaires from previously disadvantaged public schools. At the outset respondents were informed that this was an anonymous survey and that their responses would remain confidential. Learners were informed that their participation in the survey was voluntary but that their assistance, through their participation, was needed.

The following is a detailed breakdown of the types of questions that were posed to respondents in this survey: The questionnaire had three parts:

o   Part 1 asks permission to use student's responses for academic research;

o   Part 2 asks general personal particulars like age, gender and home language. In particular Questions 1 - 5 focus on demographic information regarding age, gender, the area where they grew up, and race of the respondents;

o   Part 3 focuses on e-learning and the impact of e-learning on education.

In particular Questions 6 – 11 ask respondents to explain in their own words what they think e-learning is and whether they have access to computers. Questions 12 – 19 relates to whether respondents have access to the Internet. Questions 20 to 25 are used to determine the rate of computer literacy and the availability of assistance in becoming computer literate in the community.

Questions 26 and 37 ask respondents about the purpose of available computers and their preferences relating to teaching and learning styles. Questions 38 to 49 are used to determine how respondents rate the importance of computers in education and the need for funding by government and non-government organisations.

The questionnaire takes into account all the key aspects of this survey i.e. the views of learners, parents and educators about e-education and the availability of electronic resources in

the community. It examines how computers are implemented if they are available and whether communities who do not use computers show any initiative in acquiring computers to foster e-education. Of the 300 questionnaires, which were sent out, 266 were returned.

DATA PROCESSING FROM QUESTIONNAIRES TO DATA TABLES

During the survey session each respondent was required to read questions in the questionnaire and mark their responses by placing a tick or a cross in the appropriate spaces, or by writing down the appropriate information where required. The responses were then entered into the SPSS 11.5 programme.

Setting up the Encoding Parameters in SPSS

There are two views (worksheets) in SPSS 11.5. These are the "variable view" and the "data view" (as indicated in figure 16).
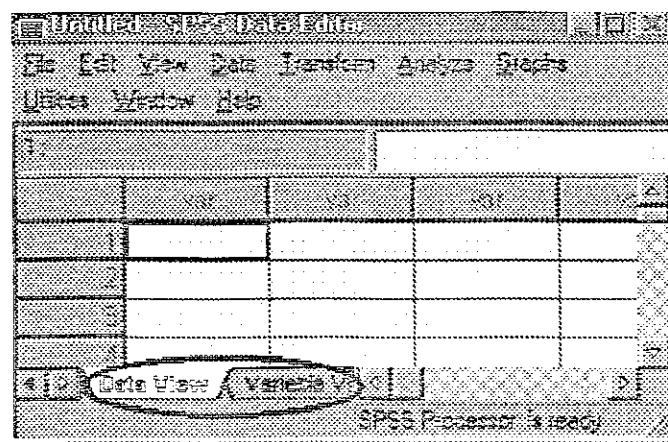
Figure 16: The two modes: Variable and Data

The parameters of the data, which were gathered from the returned questionnaires, are set up in the variable view (as indicated in figure 17 below).
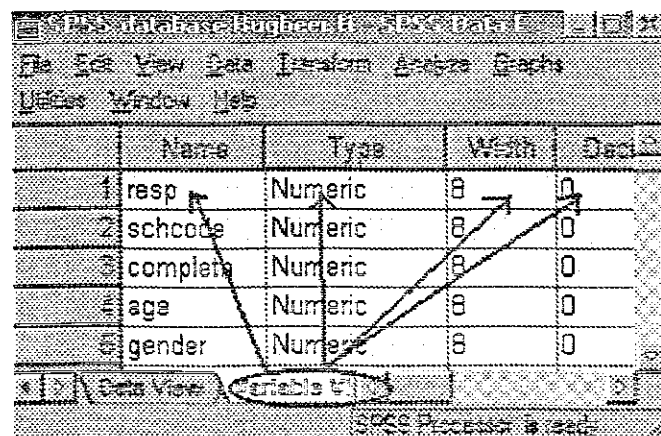
Figure 17: Variable mode

Following this, the "values" dialogue box was activated by clicking the appropriate cell as indicated by the red circles in figure18 below:
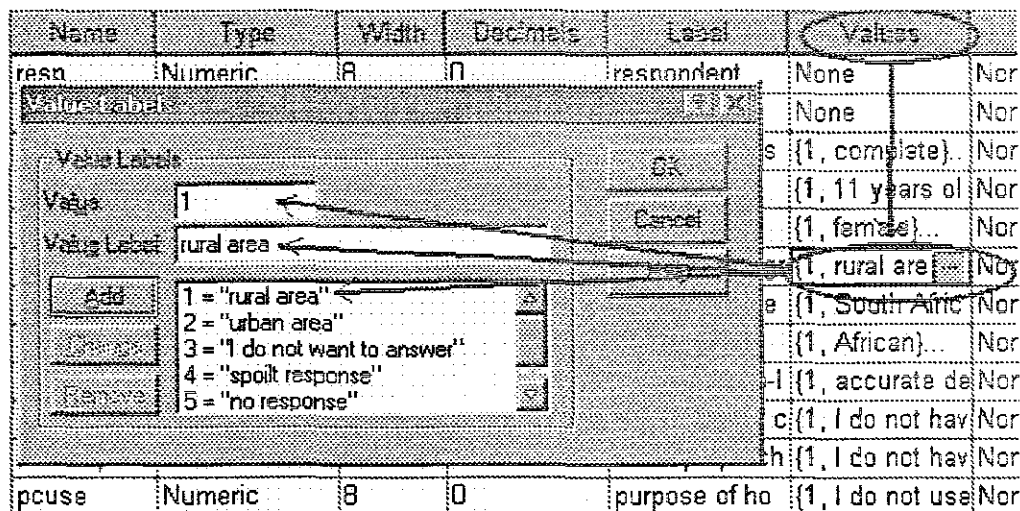
Figure 18: Setting the correct value label

The questionnaire statement, "I grew up in ____", was typed into the *value label* slot. Thereafter, entering the appropriate data code and its relevant area range into the value label slot set the coding parameters. In the above example the author first typed the number 1, followed by "rural area" in the *value label* slot. Thereafter this coding parameter was established by clicking on the "Add" key. This had to be done for each of the location variables. The "Add" key is used to add each location variable to the list of location variables. This process had to be followed for each question in the questionnaire.

Types of measurement used

There are three types of measurement used in quantitative research, namely scalar, ordinal and nominal measurement (as indicated in figure 19 below). The type of measurement will dictate the statistical procedures that will be used in processing the data and to achieve inferential analysis. Measurements are quantified so that means, modes and medians can be determined. The types of measurements are:

- o Scalar measurement is appropriate when respondents express preferences, attitudes, opinions, etc. measured on a gradually changing continuous scale such as Never—sometimes—often—constantly;

- o Ordinal measurement is appropriate when respondents make value judgements such as X is taller than Y; X is more expensive than Y. Ordinal measurement is

where various pieces of data are brought together and ranked in either higher or lower values than each other;

o Nominal measurement is appropriate when respondents select a particular subcategory within an overall category such as age, gender, race, etc. According to Leedy 1997:40, when nominal measurement is used data is usually restricted or limited. For example when we measure gender, we divide into two groups, namely, male or female.
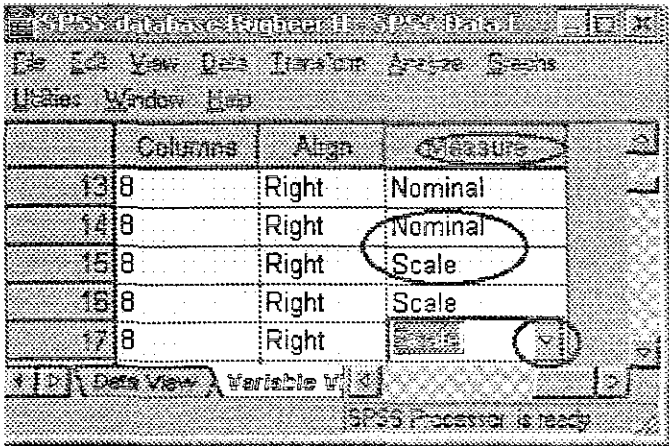
Figure 19: Choice of measurement is done under the "measure" column

Entering the Data from Each Questionnaire in SPSS

Once the parameters are set in the variable mode, the necessary headings and columns are then generated in the data view (as indicated in figure 20 below). This is where data is entered. In the data mode, shorthand codes are used as column headings. These headings appear as labels in graphs and tables.
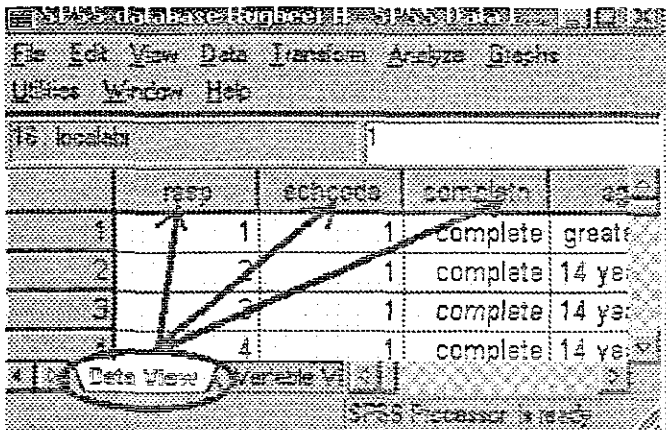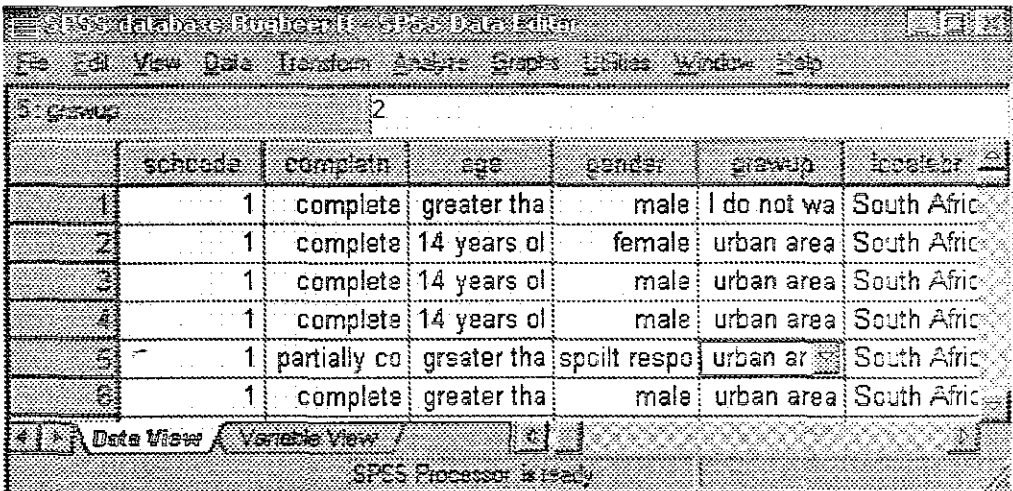
Figure 20: Data mode

Entering the Data

Each question in the questionnaire is assigned a particular column in the database. The appropriate code variant for the individual respondent is entered in the column that deals with that question. A screen shot of the database for this study is displayed in figure 21 below. It indicates that numeric as well as abbreviated alphabetical codes were used to represent particular responses.

Figure 21: Enter data

Verifying the Accuracy of the Coding Process

The accuracy of the encoding process was verified by double-checking each code that had been entered after the questionnaire was encoded onto the database.

Determining the Statistical Significance of the Results

According to Leedey (1997: 252), *Descriptive Statistics* is a branch of statistics that describes what data looks like. He further states that statistics that takes small samples of a population and from those samples make inferences by *estimating and predicting* the general characteristics of a population are inferential. In making inferences in this survey, the author used significance testing and measures of variation to validate his claims. Significance relates to similarities within groups and differences between groups with regard to particular responses. Statistics can be used to determine whether there are significant similarities in responses to questions within demographic groups, as well as significant differences between demographic groups. High levels of similar responses within groups, correlated with high levels of dissimilar responses between groups are shown as levels of significance on data tables. The nearer the decimal fraction is to 0 (zero) the higher the level of significance. Stringent measurements of significance consider 0.05 to be significant and 0.01 as highly significant. A level of significance

of 0.05 therefore means that there is practically no chance that the variable being tested is irrelevant.

According to Leedey, 1997: 254, one degree of freedom in a deviance means that in a normally distributed population, 68% of the population is represented. The standard deviation which was generated by the SPSS 11.5 data-base for specific variables (or combination of variables) was used to explore the extent of deviation for reliable estimating and predicting.

With the fully encoded database, the author used the general linear model feature of SPSS 11.5 to determine the levels of significance for each question. This was possible by selecting the multi-variate option in SPSS.

VISUAL REPRESENTATION OF DATA

Pie charts, bar graphs and statistical tables are used to visually describe results of this survey. Pie charts are particularly appropriate to represent a sub-population of a larger group. It is typically used to represent nominal measurement. While many researchers have a tendency to use bar graphs to represent scalar measurements, bar graphs can be used with great success in representing nominal measurements. Significance and general tables are also used to make inferences in this study as described in the previous paragraph.

The SPSS 11.5 program generated over one hundred highly significant correlations. Not all correlations will be evaluated or analysed in this study. Only those correlations, which have relevance to the problems, stated in Chapter 1 will be scrutinised. Significance tables are used to make deductions, inferences and estimates. Significance tables such as the one below will be located in addendum one for references purposes.

Correlations

		how good are you with using computers	access to a computer
how good are you with using computers	Pearson Correlation	1	.200**
	Sig. (2-tailed)	.	.001
	N	266	266
access to a computer	Pearson Correlation	.200**	1
	Sig. (2-tailed)	.001	.
	N	266	266

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 22: Access to a computer Vs Degree of computer literacy

The significance table (in figure 22 above) indicates that there is a strong correlation between "access to a computer" and "computer literacy". The table indicates a bi-variate correlation. This means that we are getting the same results in two cells that are being compared. Further, it is an indication that there is a causal relationship between the two variables which are being tested. By comparing this finding with other similar surveys and literature studies substantial conclusions and recommendations are possible.

The pie chart below (figure 23) is an example of a chart that is used to display all results of a scenario with the ability to highlight certain crucial aspects of the final result. This chart indicates that less than 10% of learners have access to computers at their schools and more than 38% of learners have no access to computers at all.
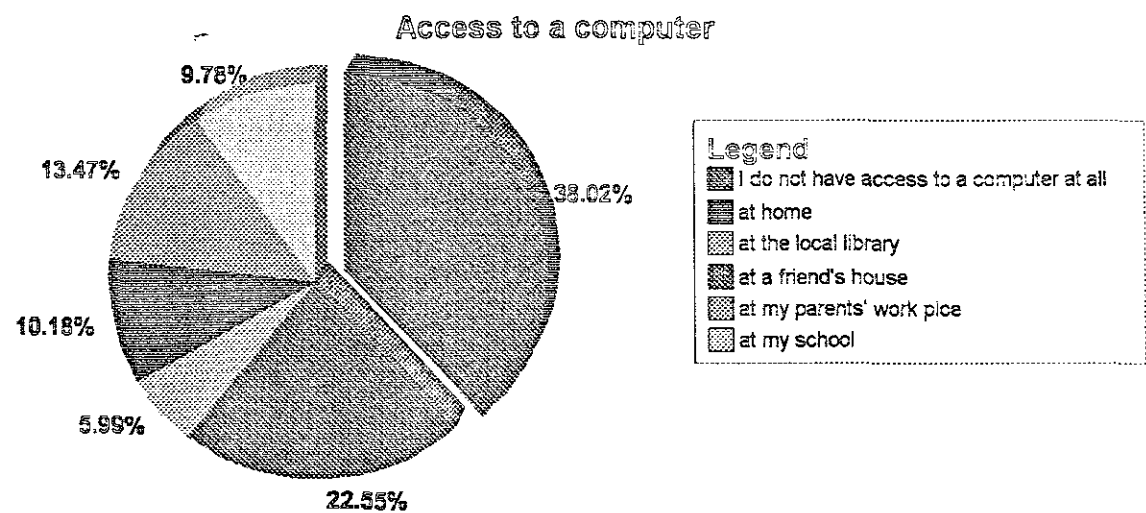
Figure 23: Do you have access to a computer?

The bar graph in figure 24 below indicates that only 10% of learners in Kwazulu-Natal have computer access in their communities which coincides with a national survey done in 2002 (Draft White Paper on e-education: 2003).
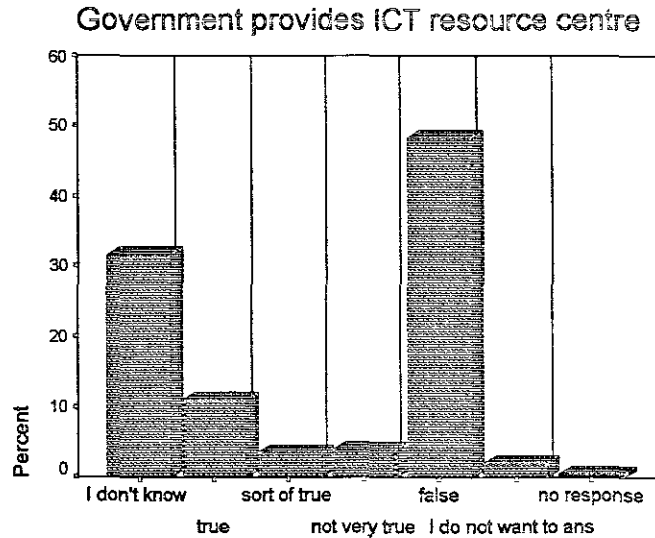
Figure 24: Does the government provide ICT centres in your community?

Some graphs have a legend along it to explain what each colour means.

CONCLUSION

In this chapter the procedure that was followed when conducting this survey is explained. A breakdown of the questions that formed the questionnaire and an overview of the fieldwork, which was carried out during this study, were presented. Further, the author explains how the survey was conducted. He also gives an account of the steps that were followed when encoding data into the SPSS programme. Following this, statistical significance and its relevance to this study is explained. Thereafter, the author explains how he will be using visual representation to illustrate his analysis of data. The results of this study are presented in the following chapter.

ANALYSIS

INTRODUCTION

In the previous chapter the author explains various aspects of the research methodology of this study. In this chapter he presents and interprets the results of the quantitative component of the study, mainly by presenting and interpreting a series of bar graphs and pie charts. The results are presented in an easy to read manner to enable stakeholders at grassroots level to implement results and recommendations. Below is an overview of the key findings from this level of analysis. Where necessary some tables, which are used to make an analysis, are made available in addendum one.

GENERIC PROFILES OF THE RESPONDENTS

Before presenting the statistics relating to this study, a general profile of the respondents is provided in the form of pie charts. This profile relates to gender, age, ethnic group and area where respondents reside.

Gender Distribution of Respondents

Figure 25 (below) provides a graphical representation of the percentage of males and females who participated in this study. Approximately 42% of the respondents were males and approximately 53% of the respondents were females.
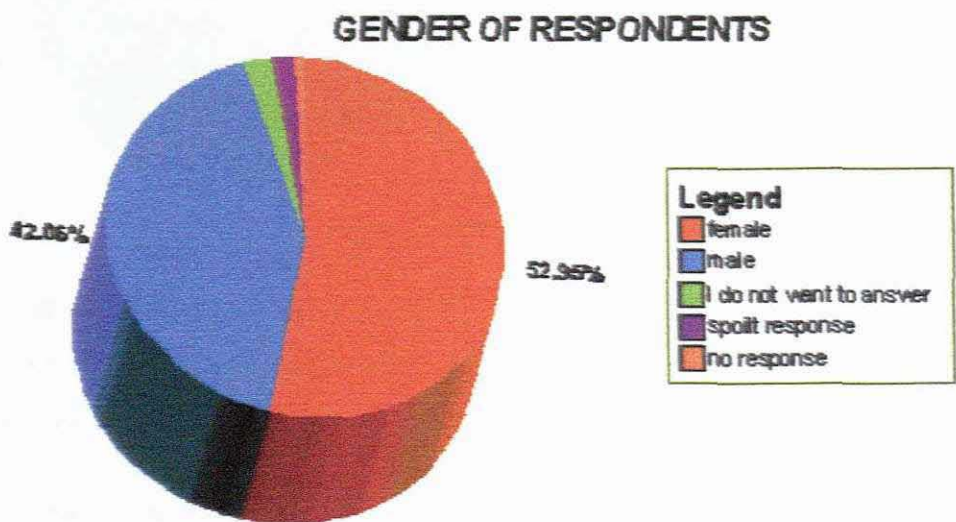
Figure 25: Gender of Respondents

Just over 2.3% respondents did not want to indicate their gender. Almost 1.9% of the responses were spoilt responses and 0.8% did not respond. Being negligible figures, the "Spoilt Response" and "No Response", to the statement "I am a male / female", will not be considered for the purposes of my study. In subsequent analysis, these responses will also not be considered if the range of the response is miniscule.

Although there were approximately 10% more females than males, this representation of gender distribution is a suitable representation for the study.

Age Distribution of Respondents

The pie chart below (figure 26) is a representation of the age of the respondents who participated in this survey. The respondents are learners from the General Education and Training phase of schools. This phase of schooling houses learners who are predominantly from the 13 and 14-year age groups. Approximately 14% of learners were greater than 14 year old. Slightly more than 17.11% of learners were 12 year olds. A large percentage of learners, (more than 34%) were 14 year olds. Almost 33% of learners were 13 year old.
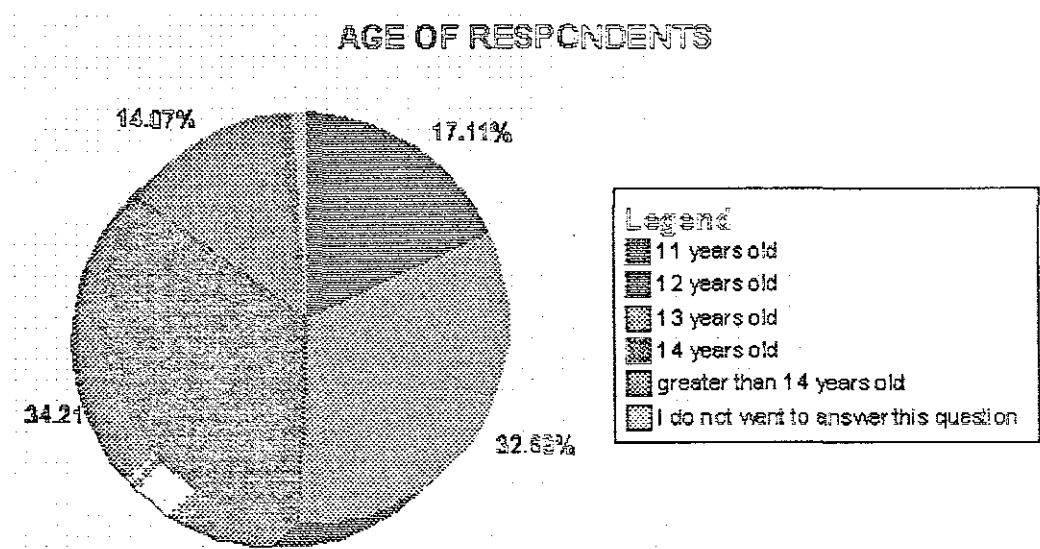
Figure 26: Age of Respondents

The General Education and Training (GET) phase of school in South Africa includes learners who are in grades seven, eight and nine. The ages represented above are a fair representation of learners who fall into the GET phase of schooling.

Racial Distribution of Respondents

Figure 27 outlines the following statistics about the racial distribution of the respondents:

    o   60.5% of respondents were African

o   7.9% of respondents were Coloured

o   25.6% of respondents were Indian

o   0.4% of respondents were Jewish

o   0.4% of respondents were from another group

o   0.8% of respondents did not want to answer this question

o   4.1% responses were spoilt

o   0.4% of respondents did not respond to this question
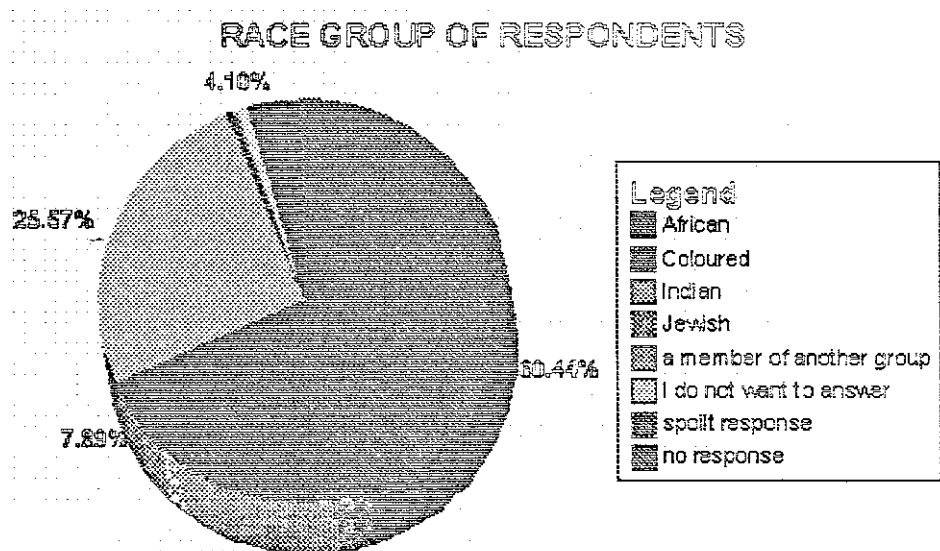
Figure 27: Race of Respondents

This study focussed on previously disadvantaged schools. In terms of the demographics of the country, the large number of African learners that formed part of this study suitably represents the previously disadvantaged schools of rural and urban areas.

Urban versus Rural Distribution of Respondents

Figure 28 outlines the area in which the respondents live.

Area of respondents

	Count	Col %
rural area	39	14.7%
urban area	173	65.0%
I do not want to answer	36	13.5%
spoilt response	6	2.3%
no response	12	4.5%

Figure 28: Area of Respondents

A large number of respondents (13.5%) did not want to divulge the area where they live. This is an indication that many learners are sensitive about their locale. Many urban schools were willing to participate in the survey. These schools returned almost all questionnaires whereas many rural schools failed to return questionnaires. Some of the rural schools indicated that the questionnaires were lost.

RESPONDENTS' ACCESS TO INFORMATION COMMUNICATION TECHNOLOGY

In spite of some deviations, schools in KwaZulu-Natal are not displaying a noteworthy development in e-education. Some schools appear to be fitted with resources for a small degree of computer literacy rather than aiming for composite e-education.

Table 29 below indicates that learners' perceptions of access to computer technology for academic purposes is still miniscule. When compared to statistics provided by the previous minister of education (Prof. Kader Asmal[67]), over a year ago, pupils perceive no increase in computer technology at schools. Internet and e-mail facilities are being used more extensively in many schools as a management and administrative tool rather than as a teaching resource.

ALL LEARNERS AND TEACHERS AT MY SCHOOL HAVE ACCESS TO COMPUTERS

	Count	Table %
I don't know	57	21.4%
true	20	7.5%
sort of true	23	8.6%
not very true	6	2.3%
false	155	58.3%
I do not want to answer this question	1	.4%
spoilt response	3	1.1%
no response	1	.4%

ONLY OFFICE STAFF AT MY SCHOOL HAVE ACCESS TO COMPUTERS

	Count	Table %
I don't know	17	6.4%
true	157	59.0%
sort of true	8	3.0%
not very true	4	1.5%
false	73	27.4%
I do not want to answer this question	5	1.9%
spoilt response	1	.4%
no response	1	.4%

Figure 29: Learners' perception of the purpose of computers at school

According to figure 29, slightly more than 16% of respondents say that learners and their teachers have access to computers at school whereas 62% of learners believe that only office staff at their school have access to computers.

When figure 29 (below) is compared to figure 30, it becomes obvious that a great disparity exists in terms of learner access to information technology and existence of communication centres at certain schools.

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[67] Draft white paper on e-education, 2003.

MY SCHOOL HAS A COMPUTER CENTRE

	Count	Table %
I don't know	25	9.4%
true	80	30.1%
sort of true	75	28.2%
not very true	5	1.9%
false	73	27.4%
I do not want to answer this question	1	.4%
spoilt response	7	2.6%

Figure 30: My School has a Computer Centre

Figure 30 shows that over 58% of learners identified some sort of ICT at their schools while figure 29 shows that under 17% of learners and teachers have access to ICTs. This would suggest that schools are using computers mainly for administration purposes. There is an indication that a large number of school management teams assume that Information Communication Technology has a greater purpose in administration tasks rather than as a teaching / learning tool.

Schools without computers will probably experience shortage in equipment such as VCRs, radios, and tape recorders and data projectors. Probable factors, which inhibit schools from acquiring computers, are:

- o Lack of understanding about the purpose of computers in education;

- o Isolation[68] from the global world and its economy;

- o Lack of funding;

- o A lack of available of trained staff;

- o Insufficient building space;

- o An absence of electricity;

- o Poor security.

EFFECTIVELY PREPARING LEARNERS AT THE GET LEVEL

Learners require guidance in selecting and evaluating information. The object of education in the GET phase is to prepare learners to penetrate the job market. Current trends in the

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[68] This form of isolation can be self induced or from external factors.

economic sector require that new entrants into the job market possess some experience in information communication technology. Acquiring expertise in the skills of selecting and evaluating information (by using new technology) enable learners / job seekers to have the necessary tools to apply themselves diligently into the employment sector. Figure 31 below, shows that less than 20% of learners who were targeted display a significant degree of computer literacy.

COMPUTER LITERACY

	Table %	Count
I don't know anything about computers	47.4%	126
I can do very basic things on computers	17.3%	46
I am relatively good with computers	8.3%	22
I am quite good with computers	14.3%	38
I am very good with computers	5.6%	15
I do not want to answer this question	5.6%	15
spoilt response	1.1%	3
no response	.4%	1

Figure 31: Perception of computer literacy

In the General Education and Training phase, the teaching of basic computer principles and word processing skills require much attention since these are the basic tools, which facilitate e-learning. Further, these are skills which learners require in order to take up positions in the economic sector of the country. It would be appropriate to re-examine the purpose of the General Education and Training phase and to identify what "general education and training" really signifies. An apt description of *general education* would include all aspects of vocational training. This should include basic computer literacy.

THE POSITIVE CONTRIBUTION OF ICTS TOWARDS EDUCATION

Effective use of ICTs in education refers to the positive contribution ICTs make towards the process of teaching and learning. Effective use of ICTs requires the establishment of ICT capability and infrastructure that is conducive to teaching and learning. An established infrastructure means that basic ICT resources are in place. It also means that educators are present who are equipped with the skills, knowledge and confidence to creatively insert ICTs into the teaching and learning process.

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Figures 46 and 47 in addendum 1, indicate that there is a strong correlation between availability of computers (or computer centres) and positive attitudes of teachers. Schools with computers have computer literate teachers and these teachers also support the idea of knowledge sharing.

This analysis also indicates that there are a number of hurdles towards the use of ICTs in schools (e.g. lack of funds). It is more likely that educator attitudes towards ICT usage will also be negative. According to Averweg, 2004:38, the Technology Acceptance Model (TAM), which is used as a scale to measure the level of acceptance of computer technology, effectively predicts the level of adoption of this technology. Averweg further states that computer technology in South Africa is "being treated as somewhat of a step-child". While attitudes towards this technology may be low, positive attitudes to ICTs in schools appear to have been enhanced through the access educators have had to relevant training. The survey data also shows that schools that have had greater access to professional development are those that possess a high level of resources.

.Figure 32 below shows that less than 6% of learners perceive that they are confident and competent with computers, less than 41% of them see themselves as average computers users and more than 48% of learners have no computer literacy at all.

HOW GOOD ARE YOU WITH USING COMPUTERS?

5.69%

14.52%

8.43%

17.58%

48.12%

Legend
- I don't know anything about computers
- I can do very basic things on computers
- I am relatively good with computers
- I am quite good with computers
- I am very good with computers
- I do not want to answer this question
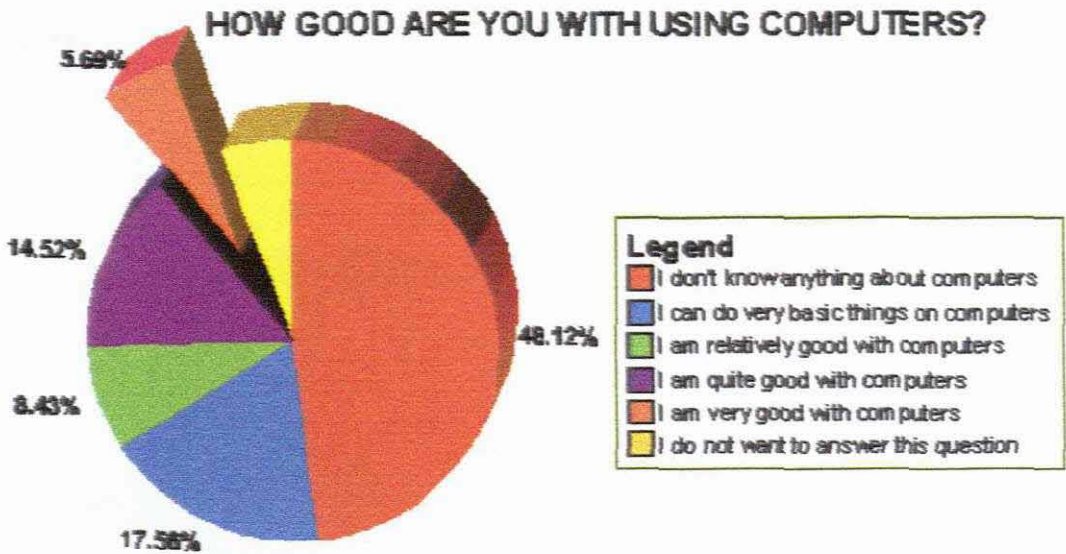
Figure 32: Computer Literate Learners

There are indications that there is a need to increase innovation and improve integration of ICTs into the process of teaching and learning as a whole. Evidence in this study (figure 32

There is an indication that learners and teachers are not relying on schools to provide computer literacy or e-education. It also suggests that a substantial percentage of the population has a strong desire to become computer literate and is funding this need individually. It is also possible that larger percentages of people aspire to become computer literate but cannot afford the education.

ICTs, the Government and Funding

The principal factors that prevent schools from using computers as a tool for teaching and learning would be:

- o Lack of a properly constituted government policy on computer literacy

- o Insufficient funds and insufficient number of computers

- o Lack of computer literacy among educators

- o Lack of subject educators trained to integrate computers into different learning areas

- o The absence of a properly developed curriculum for teaching computer skills

Effect Of Funding On Computer Accessibility

With reference to figure 35, the majority of learners (72.9%) identified that their schools needed funding to start up computer centres.
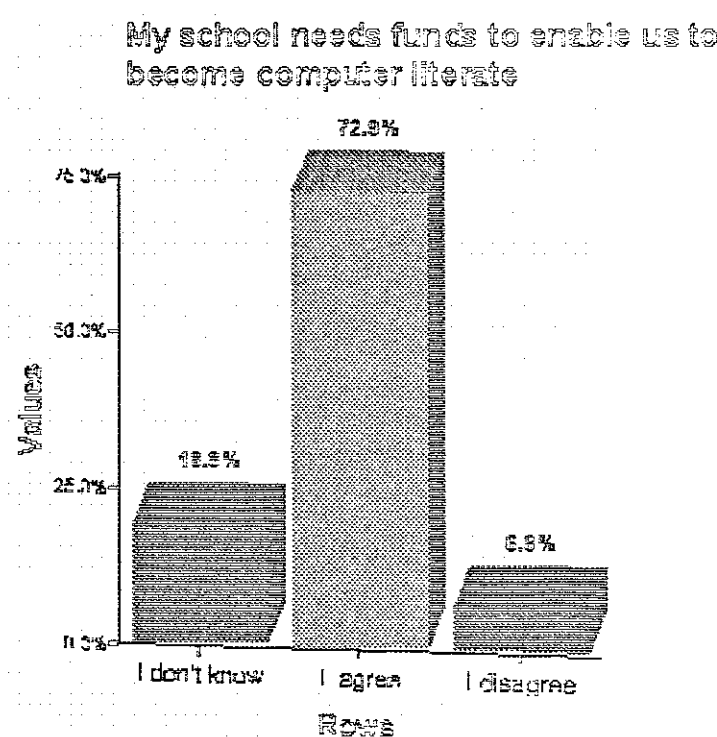
Figure 35: The need for funding at schools in KZN

Initiatives such as that provided by the Indian government could be used as models to indicate how social corporate investment could be exploited to generate funds (refer to discussion in chapter 6 and7). Also the concept used by India in communities providing a single centre (possibly mobile unit) to service a group of schools could be explored.

The Government and the Private Sector

Fewer than 15% of learners (figure 36) identify some sort of government funded ICT centres in their communities.
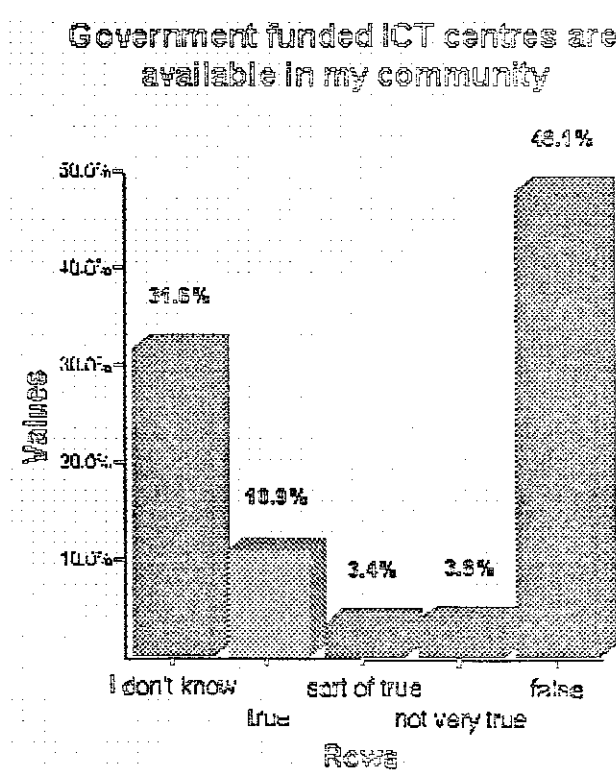
Figure 36: Availability of Government communication centres.

According to figure 37 (below) more than 83% of learners felt that the government needs to participate in implementing ICT education in their schools.

The Government has an important role in implementing ICT in education.

8.15%

Legend
- I don't know
- I agree
- I disagree
- I do not want to answer this question
- spoilt response

83.20%
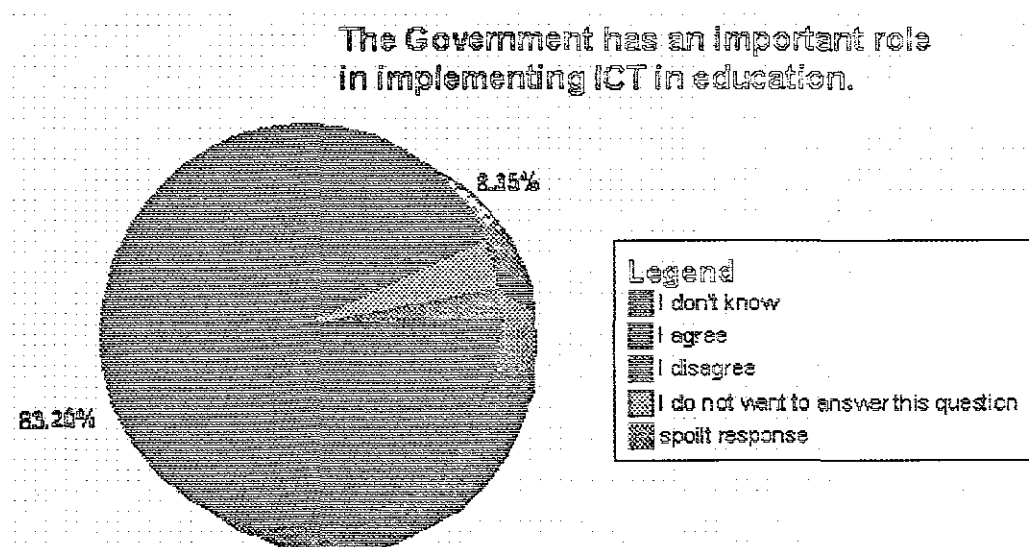
Figure 37: Should the government take an active part in promoting e-education?

Private sector involvement with ICTs in South African schools is budding at this stage. There needs to be an established cooperation between government and private sector involvement in education. In this regard we should examine America's policy of *"America goes back to school"*, where the government has initiated the idea of the entire country becoming involved in education (Riley et.al.1997: PDF).

With respect to innovative offerings and contracts with schools, Microsoft offers schools products that can be licensed at reduced rates. Similarly, major suppliers, distributors or retailers of computers that specifically target the educational market for primary and secondary schools need to be identified. Schools also, should be devising creative ways of exploring this market.

Educator Confidence

The attitudes of educators towards the use of computers in education are positive in schools where there is evidence of computer technology. According to learner perception schools that lacked computer technology also lacked computer skilled staff.

Learner's perspective of availibility of computer literate teachers

16.50%

10.50%

50.80%

13.50%

7.10%

Legend
- I don't know
- true
- sort of true
- not very true
- false
- I do not want to answer this question
- spoilt response
- no response
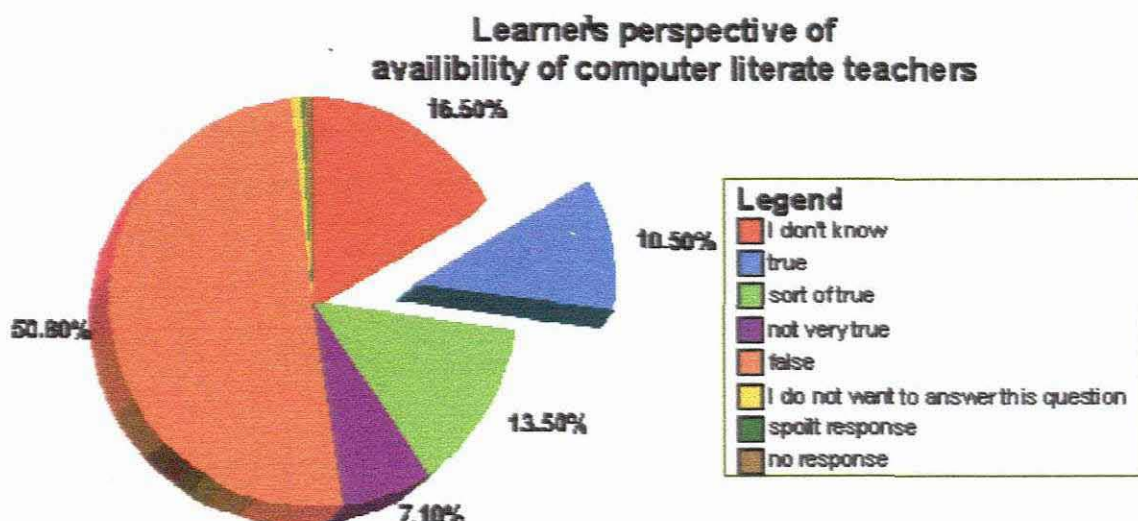
Figure 38: My school has sufficient computer literate educators.

Figure 38 illustrates that more than 50% of learners believe that there is a lack of computer literate teachers. A majority of learners identified the lack of trained staff as the major hindrance to their effective use of computers. The availability of trained staff and the availability of computers cannot be separated. The availability of trained staff needs to precede the availability of computers for those schools / areas that are still without computers. It is hoped that these teachers would spearhead the development of computers in their respective schools / communities.

Capacity: building human resources for ICT capability

The lack of suitably trained staff remains a hurdle to the start-up and effective use of ICTs. Even though this is a long-term responsibility of the Department of Education there is also a need for schools to be encouraged to include educator training by implementing capacity building workshops.

The practice of developing human resource capacity also involves the development of guidelines and criteria for the training of educators in this area and to support educators in the application of ICTs in their schools. At provincial level, educators, education managers and NGOs are social partners that should be centrally involved in the planning and implementation process. At every level this requires effective consultation and consensus about the process that should be followed to mobilise available resources so that they are directed at the creation of equity and the enhancement of quality.

The graph below (figure 39) indicates the degree of community involvement by the schools. The question posed was: My school offers computer lessons to adults in my community. Only 4.5% of learners felt that their schools were offering computer literacy classes to their communities.
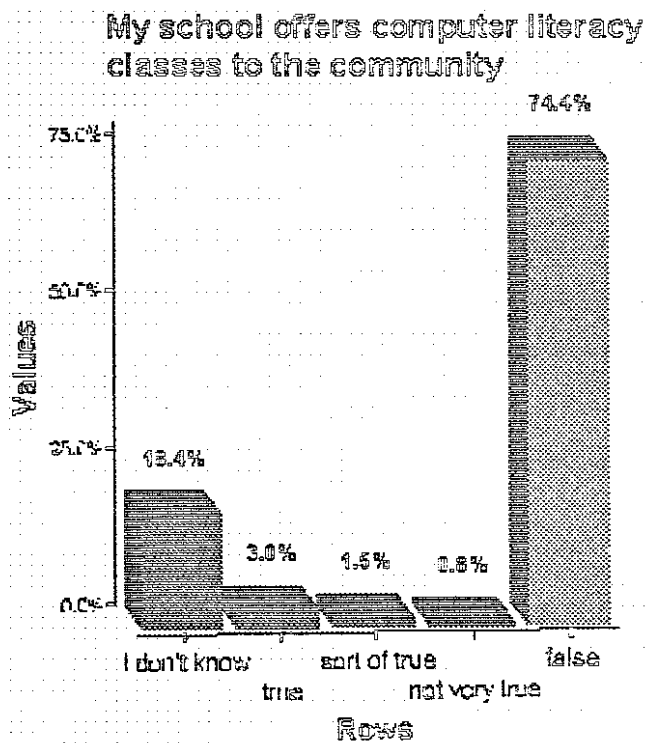
Figure 39: Community capacity building efforts.

After hours computer use is being done to a very slight extent. This could suggest that the community does not require computer education or the school is not focussing on community development.

Schools with well-equipped computers centres should be encouraged to promote the development of ICT capability in under-developed schools of their community. This could be achieved through a range of strategies including the sharing of resources, the offering of support, the transference of skills and facilitating linkages with existing service providers. The private sector ought to be encouraged to develop appropriate partnerships with schools, NGOs and even sectors of government in the field, particularly at a provincial level. It is imperative that each stakeholder and interest group seizes the initiative to develop immediate and strategic partnerships that can sustain ICT capability.

Learner and Educator Views on e-Learning

Figure 40 shows responses to the statement "It is important for all learners to learn how to use computers". Almost 90% of learners agreed with the statement.

It is impotrant that learners use computers for school work.

89.22%

Legend
- ☐ I agree
- ☐ I disagree
- ☐ I do not want to answer this question
- ☐ Other

3.82%
4.02%
2.94%
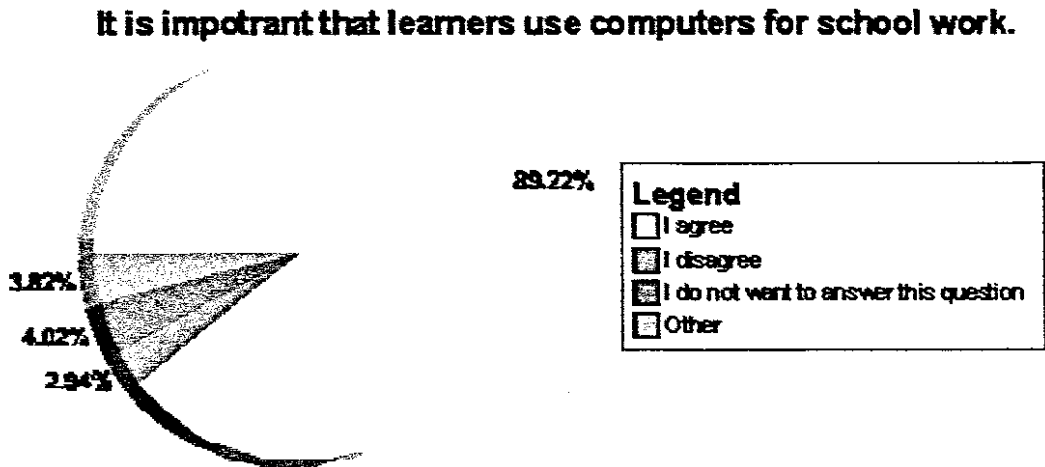
Figure 40: Learner's view of ICT

Further to the above statistics, figure 41 below shows learners' study preferences. More than 55% of learners indicated that they would prefer to use electronic means of study.

How do you prefer to study?

	Count	Col %
I don't know	31	11.7%
I will prefer to use the electronic textbooks and material	148	55.6%
I will prefer to use the ordinary textbooks	46	17.3%
I am not sure	33	12.4%
I do not want to answer this question	5	1.9%
no response	3	1.1%

Figure 41: Do you prefer using computers to do school work?

In chapter 3 the author showed that computer games are the new development of story telling. Further, these games allow the learner the opportunity to reside within the artificial virtual environment and engage in roles as an active participant of the game. Also in Chapter 4 it was demonstrated that when learning is combined with games and entertainment, it underplays failure and rewards success emotionally. If this premise is combined with the enthusiasm that learners are projecting in figures 40 and 41, then teaching and learning could become an enjoyable experience.

Figure 42 illustrates that despite the lack of resources, educators at schools generally express positive feelings about the value of computers at schools.
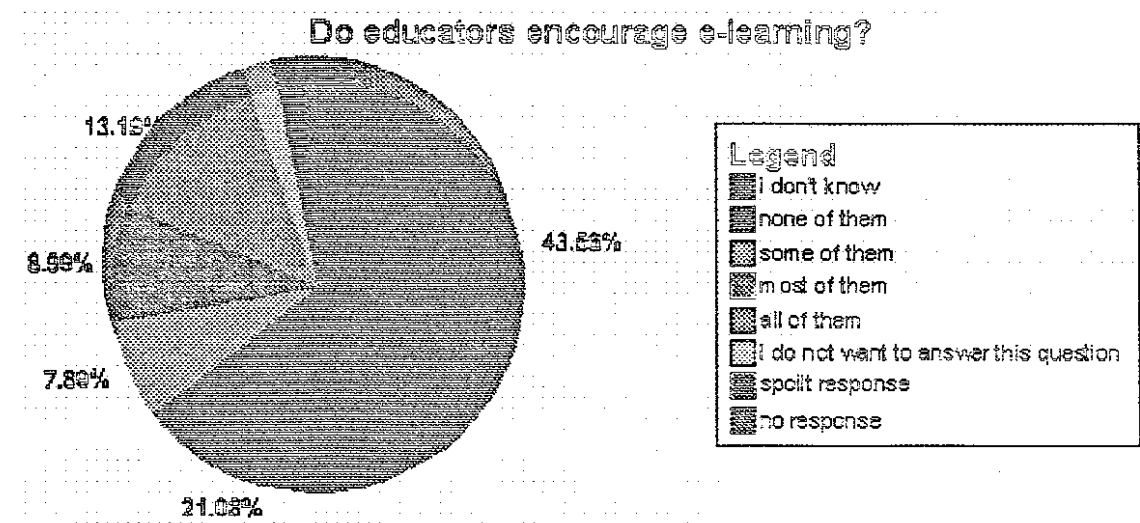
Figure 42: Do educators encourage e-learning?

Educators at most schools in the survey are keen to participate in the management and development of computers at their school. Learners also perceived that there was a need at their schools for educators to be trained to use computers before the school starts to use these.

Analysis of the Research Findings

Schools that cannot obtain the basic resources for teaching and learning are unlikely to be successful in attaining ICTs. Furthermore, schools that meet the necessary conditions for using ICTs in teaching and learning require support and involvement from outside agencies. Support agencies include the national and provincial departments of education, businesses and NGOs as well as other nearby schools that are already using ICTs effectively. Schools that successfully acquire and use ICTs demonstrate a number of enhancing conditions and capacities.

Figure 43 (below) illustrates that learners who are using computers have a favourable perception of computer education. Similarly, learners who are not exposed to computer education fail to notice that which they do not have. The comparison of schools without computers and those with computers shows clearly that the former group is disadvantaged in ways that make effective start-up nearly impossible.

Correlations: Learners who use computers VERSUS their perception of importance of ICT

		how good are you with using computers	it is important for all learners to know how to use cmputers
how good are you with using computers	Pearson Correlation	1	.177**
	Sig. (2-tailed)	.	.004
	N	266	266
it is important for all learners to know how to use cmputers	Pearson Correlation	.177**	1
	Sig. (2-tailed)	.004	.
	N	266	266

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 42: Correlation: Learners who use computers versus their perception of the importance of ICT

According to Dr. Skosana[70], the most basic infrastructure conditions (electricity, inadequate classrooms, and insufficient security) are not present in large numbers of schools. Added to this are large classes, lack of funding to acquire computers and a lack of trained staff to manage ICTs. Larger proportions of schools do not meet these basic minimum conditions is an indication of the huge challenge that South Africa faces if it wishes to transport its learners into the information age. This challenge is coupled with the reality that where relatively high levels of ICT resources exist, these have largely been paid for through parent's contributions. This has important implications not only for the start-up of ICTs but also for the creation of equity between schools.

Enabling Effective ICT Laboratories

Consideration to infrastructure development in schools should be regarded as essential to ICT commencement. Given the existing financial burden of schools, parents and the Department of Education, it is crucial that resources for ICT development are appropriately targeted towards the private sector. Both human and material resources that are necessary for initiating ICT laboratories should be directed towards those schools without computers from the healthier resourced schools. This does not imply that the healthy resourced schools should be neglected but they should be exemplified to be used as pedestals for assisting the disadvantaged communities.

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[70] Senior Education Manager: Zululand Education District. KZN.

CONCLUSION

The results of the quantitative aspect of this study were presented in this chapter. Interpretations were based on a series of graphs, charts and tables. The initial sets of graphs were used to establish general profiles of the respondents. They provide information about the availability of ICT infrastructure at selected schools.

Subsequently a series of graphs were used to provide a more detailed characterisation of the schools. In the central section of this chapter, arrays of graphs were used `to determine the level of e-education in KZN.

In the next chapter the author makes recommendations about how to reduce apathy to ICT use in KwaZulu-Natal and practical strategies to ensure adoption of e-education into our schools.

Chapter 10

RECOMMENDATIONS

PREAMBLE

In this chapter the author provides an overview of the situation of e-education and suggestions to overcome obstacles of implementation. Each proposal is provided under a different heading.

According to the South African Country report (2004: website[71]), South Africa's score on learners' cross-cultural skills is below the score of the WorLD[72] impact program. Many educators in South Africa felt that participation in the WorLD program has increased learners' employment potential. However, the country's score on the learner employability benchmark is lower than the African and WorLD averages.

WorLD cited the following conclusions and recommendations:

o The South African has the lowest learner-to-computer ratio among all WorLD countries;

o Educators cited a lack of national policy for computer use as an obstacle, and they reported that they lack time to implement new ICT pedagogies;

o They also reported that there have been only low levels of collaboration among educators and learners using ICT.

Further, given the history of the WorLD project in South Africa and the data from the educator survey, the Department of Education officials should consider the following:

o Articulate a national policy on educational uses of technology. Ultimately, any substantive change in the classroom use of ICT will need encouragement from the Department of Education, and that encouragement is perhaps best achieved

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[71]http://64.233.161.104/search?q=cache:JyYvdqTXiOEJ:www.worldbank.org/worldlinks/english/assets/World
LinksSouthAfrica.pdf+percentage+of+schools +that+have+computers+ in+ south+africa&hl=en&ie=UTF-
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[72] World Links for Development (WorLD) Organization was established as a non-profit organization separate
from the World Bank Institute.

against a backdrop of a national policy. Educators and schools stand to benefit from an articulated national mission on ICT use, along with concomitant financial support for new technologies and for systems of incentives for school districts to encourage educators to use new technologies in their classrooms;

o Continue to invest funding in new equipment and infrastructure to provide full access;

o Although South African schools have the lowest learner-to-computer ratio among all WorLD countries, there is still a need to address equipment obsolescence. Strategic planning for the use of ICT in South Africa should address the maintenance and replacement of old equipment, as well as increasing access to ICT. Consideration should also be given to high-speed leased lines among schools to improve the reliability of Internet access;

o Offer incentives to strengthen educator commitment to Program goals. As a step beyond announcing a national policy toward educational ICT use, the South African Department of Education may wish to create incentives for educators to engage in professional development and to share their technological skills with one another. Creating on-site mechanisms and structures that would free up time for educators to plan together and collaborate is one way to promote greater sharing among educators;

o Establish long-term plans for training educators and administrators to use ICT. Educators will benefit also from focused training in the areas of technology integration across the subject areas and collaborative learning projects. Consider ways to prepare new educators and administrators to use ICT while they are receiving university training;

o Encourage collaborative projects through local and national goal setting. This is one area where the South African project's scores fall below the scores of the region and the WorLD program overall, yet it is a key goal of the WorLD Program. The importance of collaborative learning activities should be underscored and efforts should be made to provide incentives and recognition for educators and schools that step beyond their own classrooms in designing collaborative projects.

DEVELOPING INTELLECTUALLY CURIOUS LEARNERS

Cultivate Information Communication Technology literacy is different from being able to integrate technology into teaching to enhance learning. Being computer literate means not only knowing how to use the communication technology, but also knowing how to construct knowledge of significance with those tools. Teachers do not need to learn about technology; they need to learn how to use technology to enhance their learners' understanding and critical thinking skills. Enhancing basic information and communication skills, like reading, writing, and speaking should be the focus of using ICTs in education, not simply ICT literacy.

CULTIVATING RESEARCH SKILLS

The author's experience as an educator and this investigation confirm the need for learners to develop basic research skills. Learners need guidance in selecting and evaluating information. Since the aim of the GET phase is to train learners to be able to fit into the job market, these learners need to have some experience with information communication technology to become relevant in the technologically developed job market. Acquiring expertise in the skills of selecting and evaluating information (by using new technology) enable learners / job seekers to have the necessary tools to apply themselves diligently into the current employment sector.

LEARNER MOTIVATION

Many learners think computers are fun and exciting. ICTs provide a forum for cultivating research skills and intellectual curiosity. Learning involves more than just motivation. Once one has the learners' attention, it does not mean they will learn better because one is using technology. It is important to use learner motivation as an opportunity to design learning experiences that require learners to use technology as a tool to help them build and demonstrate understanding.

THE USE OF TECHNOLOGY IN EDUCATIONALLY MEANINGFUL WAYS

The author's personal experience, consultation with colleagues at schools and a combination of this study reveal that given time and access to computers with no guidance allow learners the tendency to explore their interests in pop culture and play games. When coupled with school work and learner-centred direction, time and access to ICTs can enhance learning because learners can practice researching, and specifically have the opportunity to explore academically relevant information not available in school libraries.

USING ICTs TO BOOST CO-CURRICULAR ACTIVITIES

Co-curricular themes are not given the same amount of time and priority as core curriculum subjects. ICTs can add to the learners' and teachers' motivation to work on these important themes, and provide them with access to resources not readily available in print at most schools.

HOW TO COPE WITHOUT THE INTERNET

Microsoft currently donates educational compact discs to schools upon a written request by the school. These compact discs contain a complete package of operational and application software. Further to the normal office suite, the package includes the full version of the Encarta encyclopaedia. CD-ROMs can be used as tools for accessing information in core subject areas. In addition, CD-ROMs simulate the web experience, and by using them, learners can develop relevant web navigation skills.

THE INCORPORATION OF COMPUTERS INTO THE CORE CURRICULUM

Some previous model C schools such as John Ross College in Richards Bay do not offer Computer Studies as a subject in their course choice but promote the idea of using ICT in all subjects. This ensures that the use of computers is not for an elect few but motes the idea that ICT integration into the entire curriculum is essential for acquiring a multiple of skills in all fields of study. Contrary to the above scenario, there are still principals and teachers who assume that the best way to use computers at their schools is through teaching courses based upon the Computer Science curriculum. While this may help a select group of learners prepare for a career in Computer Science, this approach to computer training for the average learner is similar to teaching learners every part of a pencil before allowing them to draw. The problem is that, it brings the learners to view computers as exceedingly complex pieces of electronics without giving them any particular idea of how to effectively use them toward any valuable end in the real world. Most computer science educators complain that the Computer Science curriculum is outdated because it requires learners to master such skills as using DOS commands and obsolete design software.

Learning how to use a computer should be accomplished before learners enter the GET phase so that they may use it effectively to manage knowledge at later stages of learning.

Utilising ICTs as Educational Tools

ICTs are not being integrated into teaching that is linked to the curriculum. While it is positive that a few learners are using computers to enhance their extra-curricular interests, many learners remain ignorant about how computers can assist them with enhancing their learning and developing relevant and meaningful life skills through their academic studies. Outcomes Based Education is ideally placed to integrate the use of ICTs meaningfully into cross-curricular education.

Public Access Points

The Department of Education's current stance and priority to upgrade school buildings and to eliminate the use of trees as classrooms, especially in rural and sub-urban areas, may be a noble idea but this will not improve access to information unless learners are set free from boundaries that isolate them from the globe. Tailoring the Indian concept of public access points to suit local needs could be an innovative part of the current project of brick and mortar classrooms. For example, public access points with a hand full of computers could be placed at the strict control of the principal in rural schools so that teachers, learners and parents can have controlled access to information. Some information could be made available to principals via CDs for dissemination to the relevant individuals. A system of loan could from an integral part of disseminating information. Microsoft normally donates the Encarta library free to schools. Educators and learners could book regular time to do research or become familiar with this public access point or this "virtual library".

The Role of the School Leadership

School leadership is frequently cited as among the most important factors in implementing education reforms at both the school and classroom levels. The principals' interest and involvement in ICT integration is key in determining how ICTs will be used in schools and which learners and teachers will be afforded time and access to the school's technologies.

A particular emphasis of the course will also be on exploring how to integrate technology into the design of curriculum so that classroom teachers will have better ideas about how technology and cross-curricular themes can enhance understanding.

Computer Science is a much-specialised course, and perhaps only a select group of learners who want to go into computer programming should take this course. If other learners want to

find out how to use computers, there should be opportunities for them to learn how to use computers in other academic subject areas.

SOCIAL CORPORATE INVESTMENT

Stakeholders who aspire to engage in community technology projects need to include in their feasibility study, the study of social implications of new technology and of prime importance is the question of sustainability.

Principals, learners, parents or non-government organisations that see the need to develop ICT education in their schools should suitably educate their respective community on the full impact of its implementation. Issues such as funding, maintenance, operation, security and sustainability should be fully explored and recorded so that necessary steps to address these problems are undertaken.

The question of internal motivation versus external motivation requires serious consideration before attempting restructuring.

It is imperative that investors research the social phenomenon of a community before attempting major technological changes. Further, it is essential that the targeted community is well educated about e-education before planning implementation. The community should be educated about how to initiate the project by expressing some sort of interest in the project and also by making some initial investment so that they can take responsibility and ownership of the project. This initial feasibility study and educating process will improve later maintenance and sustainability.

GENERAL CONSIDERATIONS

Technology in education should remain a national priority. It ought to be at the heart of the educational experience, not at the periphery. Emerging technologies allow us to develop new content to address evolving conceptions of the skills and knowledge needed to succeed in today's global society. Technology will enable new teaching strategies and tools to increase learner acquisition of necessary skills and knowledge. It will also offer dramatic improvements in how we measure learner progress in attaining the necessary skills and knowledge. If technology is to achieve genuinely transforming improvements in schooling for all learners, it should be at the centre of school reform and improvement efforts. Good leadership is of the essence in preparing the way forward. Now is the time for us to renew our commitment to the future of education so that all of our nation's teachers and learners will have the opportunity

to take advantage of the power of new and emerging technologies for widespread improvements in teaching and learning today, tomorrow and far into the future.

The disadvantages of inequitable access to technology in schools and classrooms are compounded by the fact that learners with limited access to technology in school are also less likely to have access to computers and the Internet at home. Although the percentage of homes with computers is increasing, household income clearly determines the likelihood of learner access at home.

School leadership is frequently cited as among the most important factors in implementing education reforms at both the school and classroom levels. My research experiences suggest that principals' interest and involvement in ICT integration is key in determining how ICTs will be used in schools and which learners and teachers will be afforded time and access to a school's education technologies

RECOMMENDATIONS

The Draft White Paper on e-education presented by Professor Kader ASmal in 2003 should be implemented with the following amendments:

Even as the Department of Education has given priority to the upgrading of school buildings to ensure that all learners are housed in appropriately constituted classrooms, it should not lose sight of the importance of ICT integration into education. The integration of ICTs into education is a global phenomenon, which is spreading at a phenomenal rate and cannot be overlooked in the presence of other obligations. The importance of ICT and its global education value cannot be over emphasized.

In making recommendations the author has taken note of the two important challenges, which the Department of Education is faced with. These are financial constraints in implementing ICT education and also the question of maintenance and sustainability of ICT infracture. The author acknowledges the financial implication of widespread ICT integration into all schools and communities and therefore suggests a generic development plan based on the following criteria:

- o Education and Information;
- o Advice and strategy;

- Funding;

- Assistance and Support;

- Create / Encourage Partnership.

1. Education and Information

The Department of Education should immediately act as a source of information on all issues of e-education and ICT integration to educators, school governing bodies and all who have an interest in assisting to implementing ICT education into specific schools. They should develop a curriculum and even provide a generic syllabus for ICT implementation into the Senior Primary and General Education and Training Phase of education. Implementation of ICT education should initially be motivated by community aspirations. The Department of Education should be able to provide information on recommended type of infracture, sources of funding and strategies for development and maintaining ICT education. The Department of Education should be a reliable guide and reputable source of reference to those who have an interest in ICT implementation at schools.

2. Advice and Strategy

The idea behind this proposal is to shift the bulk of the financial burden away from the Department of Education without repressing the importance of ICT integration into our education. The Department of Education should set up a panel of advisors who will be placed in charge of propagating the idea and importance of ICT integration into education. They should be well informed about all aspects of ICT and also about the financial constraints of the country.

These advisors will initially hold workshops with schools management teams and SGBs to counsel them on how to develop ICT education in their schools. The task of each advisory team will be to:

- Educate the school governing bodies and education management teams on the significance of ICT education;

- Identify sources of funding and create partnerships appropriate sources of funding;

- Set up basic workshops on computer application in education;

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o Train a few educators (facilitators) from each district in ICT education and its application so that they can act as facilitators of information to their respective districts / schools.

The panel of advisors should be responsible for the development of a skill-building and innovation-generating program. They should aim at generating a skilled (e-literate) teaching force who can become intrinsically motivated to adopt the ICT route in teaching and learning. Further, they should develop and / or identify projects that focus on the integration of ICTs into the curriculum at the Senior Primary and General Education and Training phase of education.

The Department of Education, via the panel of advisors should ensure that Information and Communication Technology serve the educational needs and interests of learners, teachers and administrators.

3. Funding

The panel of advisors should exploit the idea of social corporate investment. They should identify reliable sources of funding from the non-government sector that are willing to partnership with education. A reservoir of such sources should be "banked" and linked to those SGBs and school management teams who show an interest in ICT education. This will ensure a controlled mechanism of funding and sustainability of resources.

Further, the panel of advisors should also identify organisations locally and abroad who are willing to supply schools with new or refurbished technology at an e-rate (reduced prices). Here too, the panel of advisors should act as a link between schools and these service providers.

The Department of Education should also make available a small budget to assist extremely disadvantaged schools on a pro rata basis. For example if a certain school, A, shows an interest in introducing ICT education then they should be linked to an organisation that can supply them with refurbished technology at an e-rate. If the school A manages to come up with 70% of the funds then the panel of advisors should decide whether the Department of Education should subsidise the remainder of the funds from a specific pool of funds.

The panel of advisors should provide incentives to schools and non-government organisations that show interest in ICT education. They should encourage projects that will contribute to school-based capacity building.

The panel of advisors should also promote projects that reinforce the school's links with the community. Many meaningful projects are strongly anchored in the school's local community. Projects that provide opportunities for the school principal or the personnel to find community resources and to benefit from those resources help strengthen the connection of the school with its local community.

4. Assistance and Support

Teacher support, including training, resource guides, etc., should be developed to help teachers facilitate integration of ICT education across the curriculum. The panel of advisors should ensure that there is adequate and ongoing teacher facilitator and/or technical support to ensure teachers can use technology effectively.

The Department of Education should encourage and support research, including teacher researchers, participating in basic research about the uses of technology in education. Department of Education funding for research in technology should focus on understanding and communicating what is happening in ICT learning environments. There should be a process of identifying ongoing ICT-related research needs at the district and school levels.

Strategies should be developed to ensure equitable access to ICT for learners of both genders and access for learners faced with economic, geographic and other barriers. The Department of Education needs to collect necessary data to support these strategies. District programs that meet the needs of young women, as well as young men, should be undertaken.

Information and communication technology should contribute to the goals of education (intellectual, social and personal development of all learners) and should be used in ways that are consistent with the principles of learning (active participation, different learning styles, individual and group learning processes). Information and communication technology should contribute to gender, cultural, geographic and socio-economic equity to enable participation in a democratic society.

5. Create / Encourage Partnership

The important influence of partnerships on the success of schools ICT plans should be recognised and should be built on in future ICT programmes and developments. Opportunities for continuing and future partnerships to support ICT in schools should be explored by the Department of Education and social partners and implemented in a timely and effective manner. Communities should be encouraged to be actively involved in the school's ICT plans. They should be given the opportunity to maintain, support and protect "their" ICT laboratories. They should also be given the responsibility to decide how these laboratories can be used feasibly after school hours.

6. General Aims

Strategies should be developed to contribute to the achievement of the following aims for learners:

- o Learners in Senior Primary and the General Education and Training phase of education should be able to acquire a basic level of fluency with ICT regardless of gender, geographic, cultural or socio-economic circumstances. Learners' continued growth and the development of ICT-related skills, attitudes and knowledge should be supported;

- o Learners should have access to a variety of current electronic tools, on-line services and instructional materials/resources;

- o Inequities related to information and communication technologies, particularly with respect to gender, cultural, geographic and socio-economic disparities should be identified and addressed;

- o All learners should be able to develop basic fluency with ICT through the integration of current technologies within their program;

- o Schools should prepare learners to examine critically what they find in digital environments. While engaged in ICT-related activities, learners should develop an understanding of what constitutes ethical interactions;

- o Through electronic media, learners should have access to South African and global content;

- o Learners should have an active role in their own learning, including the role and direction of ICT in their program;

o Communities should be educated on safety and security and should take responsibility of this area of concern.

CONCLUSION

Although the main findings of this research suggest that ICT integration is not happening systematically in KZN, technology cannot be the focus of professional development efforts. The focus rather needs to be on professional development that will model educational shifts and will lead teachers to identify how they should use technology to help their learners develop and demonstrate understanding, critical thinking, reading, and writing skills.

Partnerships between the central role players such as government, the private sector and NGOs appear to be crucial. Prevailing inequalities and pressures on the education system have the potential to undermine effective ICT development. Of particular importance are factors such as:

o Rural/urban disparities;

o Poorly trained educators;

o The reliance on school fees for meeting non-personnel costs in schools such as ICTs; and

o Struggles of the province to manage many changes, processes and policies with which they are confronted.

It is against this background that the findings of the study need to be considered and addressed.

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Correlations: Availibility of computers VERSUS availibility of computer literate staff

		my school has a fully fitted computer centre	my school has enough computer teachers to help leaners become computer literate
my school has a fully fitted computer centre	Pearson Correlation	1	.269**
	Sig. (2-tailed)	.	.000
	N	266	266
my school has enough computer teachers to help leaners become computer literate	Pearson Correlation	.269**	1
	Sig. (2-tailed)	.000	.
	N	266	266

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 43: Availability of computers versus availability of computer literate staff

Correlations: Access to computers, computer efficiency (learners), and teacher attitudes

		how good are you with using computers	acccess to a computer	teachers who are computer literate offer support to teachers and pupils who are not
how good are you with using computers	Pearson Correlation	1	.200**	-.209**
	Sig. (2-tailed)	.	.001	.001
	N	266	266	266
acccess to a computer	Pearson Correlation	.200**	1	-.227**
	Sig. (2-tailed)	.001	.	.000
	N	266	266	266
teachers who are computer literate offer support to teachers and pupils who are not	Pearson Correlation	-.209**	-.227**	1
	Sig. (2-tailed)	.001	.000	.
	N	266	266	266

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 44: Availability of computers versus availability of computer literate staff

THE RESEARCH QUESTIONNAIRE

FOR OFFICE USE ONLY: Respondent Code: _____School code:_____

VOLUNTARY QUESTIONNAIRE FOR LEARNERS IN GRADES 7, 8 AND 9
"How important computers are in learning at home and at school."

Department of Communication Science
University of Zululand (Durban Campus)
Researcher: Hemduth Rugbeer
Study Leader: Prof. R.M. Klopper

Notes to the respondent

- Using computers to learn is known as e-leaning (electronic learning).

- We need your help to determine how many people are aware of e-learning and what impact this form of learning has on how they are learning.

- Although we would like you to help us, you do not have to take part in this survey.

- If you do not want to take part, just hand in the blank questionnaire at the end of the survey session.

- What you say in this questionnaire will remain private and confidential. No one will be able to trace your opinions back to you as a person.

The questionnaire as four parts:

- <u>Part 1</u> asks your permission to let us use your responses for academic research.

- <u>Part 2</u> asks general personal particulars like your age, gender and home language.

- <u>Part 3</u> asks about e-learning.

- <u>Part 4</u> asks about the impact of e-learning in how you are learning.

How to complete the questionnaire

- Please answer the questions as truthfully as you can. Also, please be sure to read and follow the directions for each part. If you do not follow the directions, it will make it harder for us to do our project.

- We are only asking you about things that you and your fellow students should feel comfortable telling us about. If you don't feel comfortable answering a question, you can indicate that you do not want to answer it. For those questions that you do answer, your responses will be kept confidential.

- You can mark your responses by making a tick (√) or a cross(X) for each appropriate response, or by drawing a circle around it with a PEN (not a pencil), and by filling in the required words or numbers.

Thank you very much for filling in this questionnaire.

NB: Mark only one option per question, or fill in the required information.

PRACTICE QUESTIONS

A. I am a learner in grade 8:

❑ True ❑ Sort of true ❑ Not very true ❑ False

B. I like to work with a computer:

❑ True ❑ Sort of true ❑ Not very true ❑ False

PART 1: PERMISSION TO USE MY RESPONSES FOR ACADEMIC RESEARCH

We need this information to show that a real person completed the questionnaire. Your particulars will be kept strictly confidential. Your personal identity will not be revealed to anyone, also when the results of the survey are published.

I hereby give permission that my responses may be used for research purposes provided that my identity is not revealed in the published records of the research.

Initials and surname _____

Postal address: _____

_____

Postal code: _____

Contact numbers: Home: _____ Cell: _____

PART 2: GENERAL PERSONAL PARTICULARS
Please tell us a little about yourself

1. How old are you:

      ❑   11 years old

      ❑   12 years old

      ❑   13 years old

      ❑   14 years old

      ❑   greater than 14 years old

      ❑   I do not want to answer this question

2. I am a: ❑ female ❑ male ❑ I do not want to answer this question

3. I grew up in: ❑ a rural area ❑ an urban area

❑ I do not want to answer this question

4. I grew up: ❑ in South Africa ❑ abroad: _____

      ❑   I do not want to answer this question

5. I am:

☐ African ☐ Coloured ☐ Indian ☐ Jewish ☐ Oriental ☐ White

☐ a member of another ethnic group: _____

☐ I do not want to answer this question

Part 3: What is e-Learning?

6. Briefly explain in your own words what you think e-Learning is and for what it could be used:

_____

_____

_____

_____

_____

_____

☐ I do not want to answer this question

7. I have access to a computer

    ☐ I do not have access to a computer at all

    ☐ At home

    ☐ At the local library

    ☐ At a friend's house

    ☐ At my parents work place

    ☐ At my school

    ☐ I do not want to answer this question

8. If you have a computer at home, indicate how long ago it was purchased.

    ☐ I do not have a computer at home

    ☐ Less than six months ago

    ☐ Between six months and two years ago

    ☐ More than two years ago

    ☐ I do not want to answer this question

9. If you have a computer at home, what do you use the computer for?

- ☐ I do not use a computer at home
- ☐ I use it to play games and to do school work.
- ☐ I use it to do school work only.
- ☐ I use it to play games only.
- ☐ I use it to create graphics (pictures and drawings)
- ☐ I use it for another purpose:

_____

10. If you have a computer at home, indicate who uses it:

- ☐ I do not have a computer at home
- ☐ All members of the family
- ☐ Mainly my parents
- ☐ Mainly the children ☐
- ☐ I do not want to answer this question

11. List 4 of the most popular games that you play on the computer:

- ☐ I do not play computer games
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____

12. How good are you with using computers to do schoolwork, or to use learning programs like an encyclopaedia and a maths tutor program.

- ☐ I don't know anything about computers
- ☐ I can do very basic things on computers
- ☐ I am relatively good with computers
- ☐ I am quite good with computers
- ☐ I am very good with computers
- ☐ I do not want to answer this question

How true are the following statements?

13. Most people in my suburb have access to computers and the Internet.
    - ☐ I don't know
    - ☐ True
    - ☐ Sort of true
    - ☐ Not very true
    - ☐ False
    - ☐ I do not want to answer this question

14. Most people in my suburb have access to cell phones which can connect to the Internet.
    - ☐ I don't know
    - ☐ True
    - ☐ Sort of true
    - ☐ Not very true
    - ☐ False
    - ☐ I do not want to answer this question

15. My school has a fully fitted computer centre.
    - ☐ I don't know
    - ☐ True
    - ☐ Sort of true
    - ☐ Not very true
    - ☐ False
    - ☐ I do not want to answer this question

16. At my school teachers and learners have access to computers connected to the Internet.
    - ☐ I don't know
    - ☐ True
    - ☐ Sort of true
    - ☐ Not very true
    - ☐ False
    - ☐ I do not want to answer this question

17. There are government funded learning centres in my community that allow learners to gather information from the Internet, receive tutoring and homework help

    ☐ I don't know

    ☐ True

    ☐ Sort of true

    ☐ Not very true

    ☐ False

    ☐ I do not want to answer this question

18. There is at least one Internet cafe in my community that allow learners to get information from the Internet, receive tutoring and homework help.

    ☐ I don't know

    ☐ True

    ☐ Sort of true

    ☐ Not very true

    ☐ False

    ☐ I do not want to answer this question

19. There are religious-based facilities in my community, which allow learners to get information from the Internet, receive tutoring and homework help.

    ☐ I don't know

    ☐ True

    ☐ Sort of true

    ☐ Not very true

    ☐ False

    ☐ I do not want to answer this question

20. My school has enough computer teachers to ensure that all learners have the opportunity to become computer literate.

    ☐ I don't know

    ☐ True

    ☐ Sort of true

    ☐ Not very true

    ☐ False

    ☐ I do not want to answer this question

21. All learners at my school, whether they are doing computer studies or not, have access to computers.

      ❏ I don't know

      ❏ True

      ❏ Sort of true

      ❏ Not very true

      ❏ False

      ❏ I do not want to answer this question

22. Pupils at my school who are computer literate assist other pupils who are not computer literate (peer support).

      ❏ I don't know

      ❏ True

      ❏ Sort of true

      ❏ Not very true

      ❏ False

      ❏ I do not want to answer this question

23. Teachers at my school who are computer literate assist other teachers and pupils who are not computer literate.

      ❏ I don't know

      ❏ True

      ❏ Sort of true

      ❏ Not very true

      ❏ False

      ❏ I do not want to answer this question

24. My school offers computer technology support to neighbouring schools in the community that require assistance.

      ❏ I don't know

      ❏ True

      ❏ Sort of true

      ❏ Not very true

      ❏ False

      ❏ I do not want to answer this question

25. Only those learners who pay their school fund have access to computers at my school.

- ❏ I don't know
- ❏ True
- ❏ Sort of true
- ❏ Not very true
- ❏ False
- ❏ I do not want to answer this question

26. Does your school issue computer-generated report cards, or handwritten report cards?

- ❏ I don't know
- ❏ Computer generated
- ❏ Handwritten
- ❏ No report cards
- ❏ Type written
- ❏ I do not want to answer this question

27. I prefer face-to-face communication to internet communication.

- ❏ I don't know
- ❏ True
- ❏ Sort of true
- ❏ Not very true
- ❏ False
- ❏ I do not want to answer this question

28. I prefer traditional teacher led learning to computer based learning.

- ❏ I don't know
- ❏ True
- ❏ Sort of true
- ❏ Not very true
- ❏ False
- ❏ I do not want to answer this question

29.   The Internet offers me personalized information, rather than information that I do not really need for my projects/ assignments/ tests.

- [ ] I don't know
- [ ] True
- [ ] Sort of true
- [ ] Not very true
- [ ] False
- [ ] I do not want to answer this question

30.   You are able to locate and access information from the internet with ease.

- [ ] I don't know
- [ ] True
- [ ] Sort of true
- [ ] Not very true
- [ ] False
- [ ] I do not want to answer this question

31.   Teachers/ coordinators at your school offer lessons to those adults in your community who are not computer literate.

- [ ] I don't know
- [ ] True
- [ ] Sort of true
- [ ] Not very true
- [ ] False
- [ ] I do not want to answer this question

32.   Only the office staff at my school use computers. Pupils have no access to it.

- [ ] I don't know
- [ ] True
- [ ] Sort of true
- [ ] Not very true
- [ ] False
- [ ] I do not want to answer this question

33.   Your parents are very involved in helping you access information from the Internet for your homework/projects.

- ☐ True
- ☐ Sort of true
- ☐ Not very true
- ☐ False
- ☐ I do not want to answer this question

34.   Which form of communication do you prefer other than internet communication?

- ☐ Direct face-to-face communication
- ☐ Internet communication
- ☐ I like both forms of communication
- ☐ I haven't made up my mind yet
- ☐ I do not want to answer this question

35.   How many teachers at your school encourage you to use computers (at school or at home) to help you with your school work?

- ☐ None of them
- ☐ Some of them
- ☐ Most of them
- ☐ All of them
- ☐ I don't know
- ☐ I do not want to answer this question

36.   How many teachers at your school use computers (at school or at home) to find learning materials that you use in class or during homework?

- ☐ None of them
- ☐ Some of them
- ☐ Most of them
- ☐ All of them
- ☐ I don't know
- ☐ I do not want to answer this question

37.   It is important for all learners to learn how to use computers, even if they do not pursue
careers in computer technology.

- ☐   I strongly agree
- ☐   I agree
- ☐   I disagree
- ☐   I strongly disagree
- ☐   I do not want to answer this question

38.   My school needs funding to ensure that we become computer literate.

- ☐   I don't know
- ☐   I strongly agree
- ☐   I agree
- ☐   I disagree
- ☐   I strongly disagree

39.   Computers are important, even to the small business in the rural town.

- ☐   I don't know
- ☐   I strongly agree
- ☐   I agree
- ☐   I disagree
- ☐   I strongly disagree

40.   With computers learners learn more in less time.

- ☐   I don't know
- ☐   I strongly agree
- ☐   I agree
- ☐   I disagree
- ☐   I strongly disagree

41.   There is a demand for computer and Internet learning because of a shortage of university and technikon places. Would e-learning be beneficial to those who cannot gain access to universities?

        ☐   I don't know

        ☐   I strongly agree

        ☐   I agree

        ☐   I disagree

        ☐   I strongly disagree

42.   At universities and technikons there are campuses with lecture halls. If you could attend university or technikon lectures electronically over the Internet, or on your TV, which would you choose?

        ☐   I don't know

        ☐   I want to attend lectures in person

        ☐   I want to attend electronic lectures

        ☐   Not very important

        ☐   I do not want to answer this question

43.   Workers could get the information they want without having to leave their office by connecting on to the Internet. Do you believe that connecting to the internet is effective?

        ☐   I don't know

        ☐   I strongly agree

        ☐   I agree

        ☐   I disagree

        ☐   I strongly disagree

        ☐   I do not want to answer this question

44.   Computer technology makes information accessible to people with disabilities.

        ☐   I don't know

        ☐   I strongly agree

        ☐   I agree

        ☐   I disagree

        ☐   I strongly disagree

        ☐   I do not want to answer this question

45. Do you believe that the Government has an important role to play to ensure continued progress in using computer technology effectively for education?

☐ I strongly agree

☐ I agree

☐ I disagree

☐ I strongly disagree

☐ I do not want to answer this question

46. Computer technology provides access to information and resources to meet learners' individual needs.

☐ I don't know

☐ I strongly agree

☐ I agree

☐ I disagree

☐ I strongly disagree

☐ I do not want to answer this question

Please answer these general questions

47. If you had the opportunity to use a computer to download electronic textbooks and other electronic learning information that would take the place of paper-based textbooks, would you prefer to use it or would you prefer to use paper-based textbooks that we buy at a book store?

☐ I don't know

☐ I will prefer to use the electronic textbooks and electronic information

☐ I will prefer to use the ordinary textbooks

☐ I am not sure

☐ I do not want to answer this question

48. Do you use educational CD's (compact discs) for studying (example: Maths tutoring programmes)?

☐ I use educational CD's

☐ I do not use educational CD's

☐ I am not sure

☐ I do not want to answer this question

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