

**INFORMATION AND COMMUNICATION TECHNOLOGY DRIVEN
TEACHING AND LEARNING OPPORTUNITIES
IN SUPPORT OF
ENVIRONMENTAL EDUCATION PROCESSES:**

**A CASE OF THE *ENO-ENVIRONMENT ONLINE* PROGRAMME AT
TREVERTON PREPARATORY SCHOOL, SOUTH AFRICA**

A half thesis

by

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PREFACE

This study represents original work by the author and has not otherwise been submitted in any form for any degree or diploma at any other university. Where use has been made of the work of others this is duly acknowledged.

Janet P. Snow

March 2008

ABSTRACT

This research looks at a global virtual web-based programme for environmental awareness and education for sustainable development (ENO-Environment Online). It is a case study of Treverton Preparatory school in South Africa, one of several schools where the programme is implemented. One of the themes within the programme (“This is our culture”) is highlighted.

A mixed method, interpretive case study methodology is used. Research methods include two focus group interviews with a selected group of learners, observations of four computer-based lessons and one practical session, document analysis of the three forms of learners’ submissions (‘blog’ site submission, presentation of material and ‘chat’ session), and two interviews conducted with the Treverton form teacher and ENO programme co-ordinator.

The research views the Treverton ENO activities in relation to: academic rigour in Information and Communication Technology (ICT) use, the teacher’s role in ICT pedagogy, and active learning in ICT applications. As the theme is culturally based with a global perspective, the research also considers these activities from the perspectives of education for cultural knowledge (multicultural education) and in terms of mobilising indigenous knowledge and global education. These perspectives on the ENO activities are analysed in relation to dimensions of teaching and learning guidelines pertinent to Education for Sustainable Development in a southern African context.

The research shows that the ENO theme supported a variety of learning contexts, a sense of community, modelling of behaviours and actions, debate, sharing of information and improved communication skills. Learners were exposed to cultural diversity, contradictory cultural values, cultural and global inclusivity. Knowledge of social cultural practices and indigenous knowledge was shared. Academic rigour in the ENO theme was noted with reflection being the predominant activity. Based on these key findings, recommendations to the ENO programme, schools and teachers have been made. These include: exploring possibilities for increasing focus on sustainable development actions, improving access to relevant information, encouraging critical debate and critical engagement with cultural diversity.

Keywords: ICT, ENO-Environment Online, global virtual web-based programme, Environmental Education, Education for Sustainable Development

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Charles Swindel said that attitude:

is more important than facts. It is more important than the past, than education, than money, than circumstances, than failures, than successes, than what other people think or say or do. It is more important than appearance, giftedness, or skill. It will make or break a company ... a church ... a home.

I would like to add to Swindel's perspective by incorporating "it will make or break an individual". The processes of motivating for acceptance to a Masters level qualification, completing the course-work, writing the exams and writing this thesis, highlighted for me how fortunate I have been (throughout my life) to be surrounded by people with remarkable attitudes who have 'made' me.

The attitudes and insights of those in my family ensured that I stayed focused and on track (despite the many derailing attempts). One can only accomplish one's goals with support and wisdom like: "Mom, it is not what you have to do for us but what we can do for you to ensure you achieve your objectives". Words will not express my appreciating to my four men (Tim, Byron, Fergus and Kyle) for their invaluable support, encouragement and assistance, without which this dissertation would not have been completed. Mom, Dad, Duncan, Fiona and Catriona: "you raise me up, so I can stand on mountains. You raise me up, to walk on stormy seas". Your focus on strengths "raised me up to more than I can be. I am strong when I am on your shoulders."

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LIST OF ACRONYMS

CAI	Computer assisted instruction
chat	derived from IRC – Internet Relay Chat
ENO	ENO-Environment Online (full name of programme includes acronym ENO, as Eno was the village in Finland in which it originally began)
ESD	Education for Sustainable Development
ICT	Information and Communication Technology
IK	Indigenous Knowledge
ILS	Integrated Learning Systems
IRC	Internet Relay Chat
IT	Information Technology
REEP	Regional Environmental Education Programme
RHP	River Health Programme
SADC	Southern African Development Community
SASS	South African Scoring System
UNDESD	United Nations Decade of Education for Sustainable Development

CHAPTER 1 INTRODUCTION TO THE RESEARCH

1.1. INTRODUCTION

This research looks at the use of Information and Communication Technology (ICT) as a vehicle for environmental education projects within South African schools. The research focuses on the case of an international virtual programme for environmental awareness and sustainable development, for learners aged 12 – 18 years old, known as “ENO – Environment Online” (ENO).

1.2. MY INVOLVEMENT AND INTEREST IN THE ENO PROGRAMME

I have been involved in the ENO programme since its inception in 2000, at various levels, and am currently facilitator of the programme for the Grade Seven classes at Treverton Preparatory School in KwaZulu/Natal. Over the years there has been an exponential growth both in the programme’s content and in the number of schools throughout the world participating in the programme. My impression (backed by other teachers involved in the programme at Treverton) was that ENO is not only enjoyed by the learners but addresses some of the educational challenges in South Africa. These factors, together with an interest in the ability of ICT to address environmental education requirements, encouraged me to explore this programme in my research.

1.3. ENO – ENVIRONMENT ONLINE PROGRAMME

1.3.1. THE PROGRAMME IN GENERAL

ENO is a global virtual web school for environmental awareness and sustainable development (<http://eno.joensuu.fi>). It is an international Internet programme with over 300 schools participating throughout the world. The age of the participants of the programme ranges from 12 – 18 years (equivalent to the South African Grade 7 – 12 schooling levels).

The programme overview states that the emphasis is on local action and/or research with the intention to report the findings or actions into the global forum using information and communication technology (ICT) (ENO-Environment Online, n.d.). The programme coordinates four themes during one European academic year. These are:

1. "The place we live in" – an orientation theme where learners describe their physical and social environment.

2. "This is our nature" – the ecological theme which covers environmental issues related to specific topics like water, forests, climate change, endangered species etc.
3. "The way we lead our lives" – a theme that focuses on our way of living and consumption patterns and includes ecological footprints, environmental and consumption audits.
4. "This is our culture" – the final theme that introduces the concept of cultural sustainability as an important part of sustainable development at the same time as developing an awareness and respect for cultures around the world (ibid., n.d.).

Each theme lasts between 10 to 12 weeks during which time learners collect information about the topic within their local environment using different online and/or offline activities. Each theme concludes with learners sharing their findings with their local communities and other ENO-participating schools via web submissions. Analysis of other learners' findings throughout the world is encouraged.

The programme was created, and is developed and coordinated by educationalists supported by the Finnish National Board of Education. The University of Joensuu provides backing and is the supporter of the programme contents.

1.3.2. THE ENO THEME "THIS IS OUR CULTURE"

A study of the entire ENO programme was beyond the scope of this research project, thus it was decided to restrict the study to one of the themes. The ENO year runs according to the European academic calendar (September to June). The first two themes were conducted prior to the onset of this research. Theme three was conducted whilst the research proposal was being developed. For logistical reasons therefore, the fourth theme – 'this is our culture' – was the only component which could practically be researched. Hard copies of the webpages of this theme are attached (Appendix 2).

1.3.3. THE ENO PROGRAMME AT TREVERTON PREPARATORY

Treverton Preparatory includes environmental education as a focus throughout the school. In the Grade 7 year it is a stand-alone subject. The ENO programme is conducted as and when appropriate and as an extra component to the environmental education programme in that Grade. I conducted the ENO lessons with the form teacher and ICT teacher often present and available to facilitate when and where required.

1.4. PREVIOUS AND/OR CURRENT ICT-BASED ENVIRONMENTAL EDUCATION PROGRAMMES WITHIN SOUTH AFRICA

In Lotz-Sisitka's (2006) report on the consultation process of the Southern African Development Community Regional Environmental Education Programme's (SADC REEP) participation in the United Nations Decade on Education for Sustainable Development (UNDESD) she stated that one of the noted features was the "complete lack of attention given to Information Communications Technologies (ICTs)" (p. 28).

In the *ESD Practice in Southern Africa, Report 3* (Lotz-Sisitka et al., 2006) it was noted that the "use of ICTs did not receive much attention in the ESD [Education for Sustainable Development] consultations, but it was recognised that this is an area that will require ongoing attention in the region, given the nature of the global knowledge economy" (p. 75).

The Internet has been used in South African projects as a medium for sharing school-based research processes. For instance, the 'Mini SASS' was a miniature version of the more sophisticated SASS (South African Scoring System) (Umgeni Water, 2000, p. 1). According to the *River Health Programme [RHP] Newsletter No 7* "... Mini SASS [was] specifically designed for school groups and others, who are not sufficiently skilled to carry out a full SASS assessment" (p. 1). A dedicated website was set up for schools to join the national monitoring programme but at the time of writing, the RHP Mini SASS programme was no longer available on the web.

The World School Network (established in 1994) advocated using ICT to facilitate environmental educational activities in schools and groups around the world, allowing for exchanging of reports and opinions over the Internet. The network claimed that this promoted environmental learning for school children. Nomura (2004) reported that the participating groups for 2003 hailed from Japan, U.S. and "17 from other countries such as France and **South Africa**" [n.p., my emphasis]. However, at the time of writing, on investigation of the World School Network site there was no evidence of participation by a South African school.

1.5. RESEARCH QUESTION

How can ICT driven teaching and learning opportunities in the ENO programme contribute to ESD processes as outlined for the southern African region?

1.6. GOALS OF THE RESEARCH

The goals of this research are:

- To investigate the academic rigour of the ENO programme.
- To explore educational processes specific to the ENO “This is our culture” theme.
- To relate the above-mentioned academic rigour and educational processes to southern African ESD principles and practice.

1.7. RESEARCH INTENTION

The research was conducted with a view to:

- Investigating the appropriateness of using the ENO-Environment Online programme as a means of implementing an environmental educational programme in a southern/South African context.

1.8. CHAPTER OUTLINE

An outline of the remaining chapters and their contents is given in Table 1.1 below.

Table 1.1: Breakdown of chapter contents

Title and chapter	Chapter Details
CHAPTER 2 Key ideas informing the research	In Chapter 2 previous literature and insights pertaining to relevant ICT and environmental education processes are reviewed. The ICT orientation incorporates ICT and the digital divide, the disadvantages and pernicious effects of ICT, ICT in education including academic rigour within ICT, the teachers' role within ICT pedagogy and ICT as a medium for environmental education. Active learning is reviewed. Dimensions on strengthening Education for Sustainable Development teaching and learning processes are also reviewed. This is followed by a review of educational processes relating to multicultural education, indigenous knowledge and global education.
CHAPTER 3 Methodologies and Methods	The research methodologies (mixed method interpretative case study) and methods (focus groups, observations, document analysis and interviews) are discussed here and include an explanation of the reason for using these particular approaches drawing on insights from various authors. The means of presenting the data is shown. Issues of validity and ethical considerations are discussed.
CHAPTER 4 ENO programme and ICT context	In Chapter 4 the particular ENO theme being researched is described, with a summary of the ENO activities conducted at Treverton Preparatory. This is followed by data presentations and discussions on the disadvantages and pernicious influences of ICT, ICT skill requirements from the teachers' and learners' perspectives, and ICT use noted during the research process.
CHAPTER 5 Teaching and learning through ICT	Chapter 5 explores, and discusses, data relating to academic rigour, teachers' roles and active learning in ICT.

CHAPTER 6 Environmental Education Teaching and Learning processes	In this chapter data relating to relevant environmental education teaching and learning processes is presented and discussed. These processes are multicultural education, indigenous knowledge and global education.
CHAPTER 7 Relevance of the ENO programme to ESD teaching and learning processes	Chapter 7 reviews the data and discussions presented in Chapters 4,5 and 6 in relation to eight dimensions of strengthening ESD practices in teaching and learning processes in a report of the Southern African Development Community (SADC) Regional Environmental Education Programme (REEP) <i>ESD [Education for Sustainable Development] practice in southern Africa: Supporting participation in the UN Decade of Education for Sustainable Development</i> (Lotz-Sisitka et al., 2006).
CHAPTER 8 Conclusion	The concluding chapter gives a summary of the research, recommendations for ENO and a critique of the research process.

1.9. INFORMATION AND COMMUNICATION TECHNOLOGY TERMINOLOGIES

An explanation of the ICT related terminologies and acronyms used are presented in Table 1.2 below.

Table 1.2: ICT related terminologies and acronyms

ICT	Information and Communication Technology ICT “is an umbrella term encompassing any technical communication devices or applications, including radio, television, cellular phones, computer and satellite systems” (http://searchcio-midmarket.techtarget.com/sDefinition/0,,sid183_gci928405,00.html).
IT	Information Technology ICT has predominately replaced the acronym IT although in some situations these two terms are seen as synonymous. ICT “has now largely replaced IT in educational terminology” (Imison and Taylor, 2001, p. 73).
CAI	Computer Assisted Instruction (Imison and Taylor, 2001) Appears to be used with slightly different connotations to ICT, that of pertaining to any form of education using or ‘assisted’ by computers.
e-learning	Referring specifically to technology aided learning (as a gerund).
e-education	Technology aided education.
‘chat’	Derived from Internet Relay Chat (IRC), lines which are “open connections where a group of people can communicate virtually instantly and individual messages can be seen by all members of the group” (Grey, 2001, p. 79).
‘blogs’ or ‘blogging’	Stems from the term weblog which is a type of website where entries like journals or diaries, can be created.

CHAPTER 2 KEY IDEAS INFORMING THE RESEARCH

2.1. INTRODUCTION

This chapter looks at some of the previous literature written on topics relating to ICT, and environmental education processes relevant to the research. Data from the interviews with the programme co-ordinator and school form teacher are included as a means of elaborating on and supporting emerging understandings of, and motivations for the research.

As the programme being investigated is ICT-based, I highlight relevant ICT concepts before looking at the disadvantages and pernicious influences of ICT, including the concept of the digital divide. I then reflect on the use of ICT in education, academic rigour, and the teachers' role within ICT. This is followed by a consideration of ICT as a medium for environmental education.

Dimensions on how to conceptualise and strengthen Education for Sustainable Development practices in teaching and learning processes in a southern African context are highlighted. In accordance with the theme “this is our culture”, I review multicultural education or education for cultural diversity and indigenous knowledge learning processes. As the ENO programme is an international one, global education is highlighted.

2.2. INFORMATION AND COMMUNICATION TECHNOLOGY/COMPUTER ASSISTED INSTRUCTION

2.2.1. DIGITAL DIVIDE AND INFORMATION GAP

In 1983 a Connecticut market-research firm, International Resource Development, highlighted the growing technology gap between rich and poor children (Oppenheimer, 2003). This delineation has been coined the “digital divide” within a global context.

Jain (2006) pointed out that ICT use in Africa has specific limitations with some examples including: high cost of access to telecommunications, under-use of existing technologies, digital illiteracy, lack of skilled and trained manpower, inadequate IT exposure in schools, ignorance of IT benefits and resistance to change. Organisations and corporate bodies in South Africa are attempting to reduce (or “bridge”) the digital/information gap. For instance, organisations are supporting schools to obtain ICT equipment and training as part of the organisations' social responsibility programmes. Some international organisations are developing projects to address the issue, for

example the “One Laptop Per Child” project which encourages wealthy countries to purchase their low-cost, rugged and versatile laptops on a “Give 1 Get 1” campaign and then distributes the donated computers in developing countries (One laptop per child, n.d.). Others are supplying support in other forms, for example, Telkom (national telephone company) is reducing charges to schools. These are all factors which are increasing computer availability and accessibility within schools.

In a South African report to the United Nations Economic Commission for Africa (UNECA) in the section *Education and Life Skills – Information and Communication Technology (ICT)*, it was stated:

... Due to the repressive past, there exists in South Africa an information gap that becomes more apparent when one examines the status of the vulnerable sectors of which youth forms a group. It is important to use ICT as a tool to reduce this information gap to facilitate youth becoming active citizens of the knowledge economy.

(UNECA, 2006, p. 10)

Jain (2006) supported this statement in his paper entitled *Empowering Africa's development using ICT in a knowledge management approach*. Jain showed that the role of ICT in knowledge management approaches can play a vital role and consequently facilitate empowering Africa's development. Jain suggested that ICT use in Africa has specific limitations and constraints which include:

high cost of access to telecommunications, Government policy towards ICT, under utilisation of existing technologies, limited indigenous base, digital illiteracy ... lack of skilled and trained manpower, inadequate IT exposure in schools ... ignorance of IT benefits, expensive ICT equipment and resistance to change.

(p. 56)

The school at which the case study is conducted is a well-resourced school which is extensively equipped with high digital literacy, skilled and trained manpower, extensive IT exposure and a general acceptance of the benefits to ICT educational processes.

2.2.2. DISADVANTAGES AND PERNICIOUS INFLUENCES OF ICT

Some of the disadvantages of ICT or technology are well known, especially those pertaining to technical failures. Grey (2001) divided these obstacles into practical matters and web content. Under practical obstacles he highlighted power cuts, Internet being ‘down’, teachers’ limited ICT skills and variable skills amongst the students.

Grey (ibid) pointed out that:

if you [teacher] lack confidence in your own computer skills you will function less well in a stressful classroom situation. Many teachers find teaching more stressful in a computer room than in a more conventional class-room.

(p. 22)

He further suggested that the “answer to your problem of your own low skills is obvious: practice makes perfect and constant practice brings a familiarity which leads to confidence” (p. 22).

The variable computer skills among learners can be related to variations in general skills such as literacy and numeracy, as well as variations in training in computer skills. Grey (2001) attributed the computer skills variance to patchy training, partly due to the rapidly changing field where teachers find it difficult to keep up and partly due to individuals being reliant on training themselves or attending expensive courses. Computer availability varies, ranging from occasional use to methodical teaching in well-equipped network rooms.

Imison and Taylor (2001) pointed out that one challenge or disadvantage to the use of ICT is the difficulty in drawing the line with regard to what is acceptable and what is unacceptable material and learners’ inclination to ‘surf’ the Internet without a specific aim.

Grey (2001) noted, however, that the Internet is not saturated with inappropriate material and tables the strengths and weaknesses of the Internet at schools (shown in Table 2.1).

Table 2.1: Adaptation of Grey’s Internet’s strengths and weaknesses (2001: 34)

Strengths	An infinite number of resources and quantity of information
	A two-way communication at little expense
	Developing rapidly into multimedia
	International information, mainly in English
	Constantly updated
	In digital format, so can be easily edited
	Encourages links to other sources
	Spontaneous, innovative, knows no national boundaries, ungovernable, untameable and unstoppable
	Information is free
Weaknesses	No framework or format – a jumble – no central catalogue
	Can be hard to find what you want – and too easy to be distracted to find things you don’t want
	Encourages browsing rather than serious searching or reading
	Resources of variable quality, no vetting, no editing, no quality control
	Slow to load graphics, movies and sounds
	Difficult to censor unsuitable material
	Contains bias, prejudice and error
	Spontaneous, innovative, knows no national boundaries, ungovernable, untameable and unstoppable.

Although the Internet is enabling information to be more available and allowing for increased worldwide communication networks, this medium also permits anti-social

behaviour (as highlighted by Grey) and has certain pernicious influences. Grey (2001) categorised these into sexually explicit material, other illegal material (including drugs and violence), racist and prejudiced views, propaganda sites, hoaxes, misinformation, deliberate untruths, extracting money by deceit, urban legends, computer viruses and unsuitable content.

During Interview One (In1), the form teacher expressed his own concern about the possible abuse of technology in general and pointed out that this is a concern of many teachers. In his opinion the ability for the learners to participate in meaningful ICT related communication was seen as a benefit. He stated “because we were there and monitoring it ... none of them were doing bad things. [This enables them to] see there is a value to this kind of technology”. He highlighted the responsible use of the technology, especially as the process could be monitored in a disciplined and guided situation.

Pernicious effects can be seen in the use of ‘chat’ sites on the Internet. This medium of communication is open to indecent suggestions and banality. One means of reducing the pernicious effects of these ‘chats’ is via specific programmes (e.g. Yahoo Messenger) which uses a secure, password-protected means of allowing defined groups of people to ‘chat’ (Grey, 2001). Grey indicated that “chat has worked well with our partner schools” (p. 79), with the topics and questions agreed upon prior to the ‘chat’. The most difficult factor is the arranging of a common ‘chat’ time but “schools with more flexible scheduling ... find this easier” (p. 79). He proposed that the pernicious effects can be combated by systems that can vet the information via filtering software. Through his comment the “only real solution apart from writing it yourself ...” (p. 25), he implies that writing your own Internet (or intranet) site is the most appropriate means of reducing the pernicious effects.

2.2.3. ICT USE IN EDUCATION

With my research interest in teaching and learning opportunities provided by ICT, it seemed appropriate to consider ICT as an educational tool.

Imison and Taylor (2001), who used a case study of the manner in which one successful comprehensive school uses ICT throughout the entire school, pointed out that in their experience ICT “gives lessons high status ... students and teachers become very proud of their work, increase their motivation and become actively involved in their own learning and progression” (p. 6). They highlight this by saying:

The enthusiasm with which most students approach all forms of ICT is frequently observed and commented upon by teachers and is backed-up by research (Cox, 1997). This indicates how this not-so-new technology can still captivate the imagination and motivate learning.
(p. 48)

In the interview with the form teacher it was noted that ENO retains an interest appeal with the learners ("It kept its novelty", "It keeps the interest levels") (In1-2.1). He also noted the love the learners seem to have for technology as a medium of instruction (In1-3.3).

Imison and Taylor (2001) pointed out that "it [ICT] allows them [students] to think in a different way" thus supporting other literacy skills and "students see ICT as a non-threatening tool" (p. 58).

Jensen and Simovska (2005) introduced a case study on 'Young Minds' which used ICT and Cross-Cultural Collaboration to learn about food and nutrition. They stated:

ICT was used as a communication and collaboration platform for pupils as well as teachers from the different classes. This enhanced the actuality of the project by providing fast and effective means to include different perspectives on the subject content; providing means for communication with the world outside the classroom, and allowing for play and experimentation with different forms of representation of ideas, opinions and information.
(p. 317)

Buchanan (2006) indicated that a predominant position taken is that, as computers form such a major part of society they "will, by default, be part of education" (p. 18). He cautions against looking at ways of implementing technology in the curriculum as opposed to looking at the aims of the curriculum and finding the best way to reach those aims. He points out that the appropriate use of technology takes place when one is not focusing on the technology itself.

Imison and Taylor (2001) described the "real power [of] ICT" as a "tool for providing learning experiences previously impossible, previously impractical or simply previously beyond our imagination" (p. 52). They pointed out that a "way in which ICT can assist movement around the learning cycle (see 2.2.5.1) comes from the quick implementation of basic tasks [as] time is made available for higher-order thinking and questioning" (p. 56). This is reiterated when they state "tasks that would be slow to accomplish manually can be done quickly, allowing time for questions to be posed and answered, and more complex tasks to be tackled" (p. 59). Fridman, Dasoo and Basson (2003) backed this when they showed the effect CAI has on learner performance. They showed that

learners were “able to perform and work faster on the computers than when doing it manually” (p. 28).

The educational benefits of ICT were highlighted by Imison and Taylor (2001) when they pointed out that ICT is “an increasingly powerful means to enhance our abilities to think, to learn, to communicate and to use our brains creatively and logically” (p. 1). Fridman, Dasoo and Basson (2003) backed this by stating: “learners ... were forced to think and work things out for themselves” and “could assess and evaluate their own performance more accurately” (pp. 28-29).

It is important that the ICT application is extended beyond the mere technical skills component and dissemination of knowledge. This is highlighted by Oppenheimer (2003) when he pointed out:

.... Private school students were often engaged in sophisticated simulations or were off on field trips, tying technology to complicated, real-world inquiries. Students at poor schools, meanwhile, tended to get stuck trying to master the technology itself. ... when they did get around to doing projects or papers with computers, the work tended to lack academic rigor.

(p. 56)

This was backed by the Draft White Paper on e-Education (South Africa. Department of Education, 2003) which reported that:

The introduction of learning through the use of ICTs is not about creating interesting tasks for the learners, but to deepen their understanding requiring the use of higher-order thinking skills, and taking learners beyond the recall, recognition and reproduction of information to evaluation, analysis, synthesis and production of arguments, ideas and performance.

(p. 23)

Aivazidis, Lazaridou and Hellden (2006) pointed out that “students need capabilities and skills for locating, evaluating and selecting **relevant and appropriate** [my emphasis] information” due to the large volume of information available. The predominant motivation for incorporating ICT into schools is to “develop a new learning environment appropriate for educating the skills of communication, critical thinking, independence, and responsibility”. They did, however, point out that: “It is not enough to install even the most updated software and hardware at schools if the issue of **effective learning is not addressed** [my emphasis]” (p. 45). They continued to emphasise this by stating:

Technology-mediated learning settings should guide educators to reengineer meaningful and relevant activities and tasks according to contemporary pedagogic principles, rather than repackage the course content into electronic forms. ICT can only enable effective learning to happen; they do not cause it to happen.

(p. 53)

This sentiment was echoed by Jain (2006) when he stated that although web-based technologies are popular, the key is not associated with the latest IT but rather if these technologies are to facilitate a culture of “information sharing, relationship building and trust” (Malhotra, 1999, as cited in Jain, 2006, p. 55). Jain refined this by stating “in other words, it is not what you have but how you use it” (p. 55). The information-sharing concept was reiterated by Nomura (2004) when he stated that the use of a web-based communication for promotion of environmental education enhanced learning processes in an interdisciplinary and participatory manner which included communication, discussions and exploration (n.p.).

Imison and Taylor (2001) referred to academic rigour as a higher-order process. They pointed out that ICT should not be seen as a means of typing-up but as an aid which can be used to facilitate basic tasks. For instance graph plotting, which can be efficiently performed on the computer, allows for more time for higher-order activities like “interpretation, hypothesising and modelling” (p. 55).

Imison and Taylor (2001) used a computer/user “balance of control” continuum as a means to examine the learning environments of a particular programme. They stated that “different ICT applications offer the user different levels of control” (p. 70). They developed a continuum to give an indication of these levels. At one end of the scale the computer is in control (for example, a demonstration programme) and at the other end of the scale, the user is in control (for example, when creating a newsletter using a word processing programme). They pointed out that “most applications lie somewhere between these two extremes and identifying the balance of control is useful when evaluating their potential for learning” (p. 70). Figure 2.1 is an adaptation of their continuum table to represent this balance of control.

	Computer Controlled			User Controlled
User	Passive/receptive	Responsive/selective	Decisive/investigative	Creative/instructive
Computer	Instructive/demonstrative	Informative/responsive	Co-operative/receptive	Constructive/adaptive

Figure 2.1: Adaptation of Continuum diagram of ICT learning environments – balance of control (Imison and Taylor, 2001, p. 71)

The characteristics and examples of the four stages along the continuum are:

- ❖ User passive/receptive, computer instructive/demonstrative (watching a CD-ROM presentation, playing arcade-type game, answering questions set by computer).
- ❖ User responsive/selective, computer informative/responsive (using adventure game to collect clues and solve puzzles, browsing web).
- ❖ User decisive/investigative, computer co-operative/receptive (searching database using search statements, using software to control movements of a robot).
- ❖ User creative/instructive, computer constructive/adaptive (creating newsletter using word processing programme, designing ICT model of real situation, creating computer programme).

(pp. 70 – 71)

Imison and Taylor (2001) stated that “the balance of control ... will vary according to the design of the ICT application itself, the context in which it is being used, and the characteristics of the user”. To add to the complexities of this method of measurement, it was pointed out that some applications “are designed to promote several different activities and could therefore occupy more than one position on the continuum. For example, a simulation program may include demonstration and also investigation” (p. 70). They were, however, able to use this continuum scale to measure the constructive learning environment where the learner is in the ‘driving seat’ (right of table). They pointed out that this does not imply that the passive instructive or demonstrative computer controlled (left of table) end of the scale does not offer learning opportunities (p. 72). They noted that “the further to the right along the continuum an activity is placed, the software used tends to be more generic” (p. 71).

Buchanan (2006) pointed out that it is often assumed that the increased availability of technology in the classroom would lead to increased use, which would lead to better teaching and learning. However, it is not realised that this could be a continuation of what has been previously achieved and thus reduces the computer to a word processor

and an Internet search engine. He highlighted that academic improvements can be achieved in “carefully crafted learning program[m]es] which show students how to interpret information and make up their own minds” (p. 18). In identifying the role of computers in the curriculum he pointed out that we must differentiate between “the study of technology as a subject” (as in one of the specific learning areas) and “the use of technology as a tool to enhance learning” (p. 19).

Buchanan created a system of “thinking quadrants” as his measure of academic rigour in the use of ICT (an adapted version is represented in Figure 2.2).

The Collect Quadrant refers to locating information easily, such as “cut-and-paste” type activities. The Organise Quadrant refers to activities where information is easily available, but where the learner is “required to carry out a significant amount of reorganising of the information into a format/structure different to that of the source” (p. 37) (for example, spreadsheets). This requires increased levels of synthesising of information. The Analyse Quadrant requires discernment on the validity of the information for that specific task. It includes appropriate search criteria, suitable sites and sifting information for relevant portions. The Evaluate Quadrant requires higher levels of sifting and reworking, at the “upper end” of the searching and reorganising scales. Here information is continually being evaluated to ensure synthesis with the task.

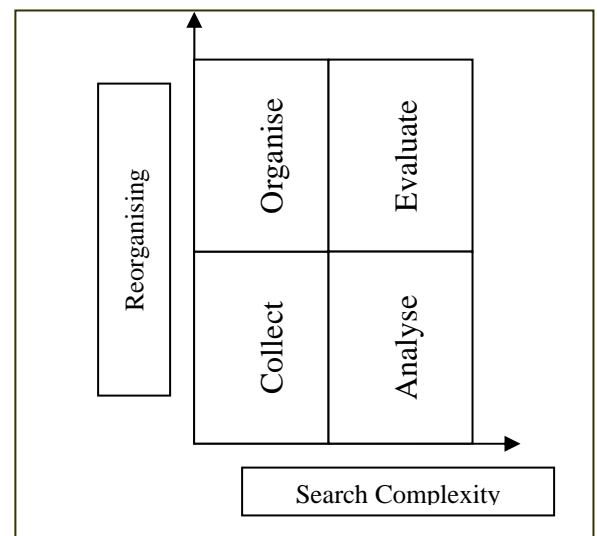


Figure 2.2 – Adaptation of “Thinking Quadrants” (Buchanan, 2006, p. 37)

Amongst ICT educational tools there are two forms of software, namely generic or specific. These forms of software can be used separately within the parameters of the software or they can be used in a combination of the two types. Generic software refers to the general purpose programmes, e.g. word-processing, spreadsheets etc. These programmes have no specific subject matter and are content-free for general purposes and productivity. These programmes are used for general tasks, like creation of tables, browsing the Internet, graphics etc. “Such programs are often described as emancipatory, as they can free the user from otherwise tedious and time consuming work, leaving time for development of ideas and higher-order tasks” (Imison and Taylor,

2001, p. 61). The generic software programmes can, however, create restrictions as they may only be used within specific parameters.

Where the content is specifically built into the programme, the software is termed 'specific'. These programmes are predominantly used (in education) to teach "concepts and skills by presenting them in various ways and involving students in activities" (Imison and Taylor, 2001, p. 61). These may be subject specific (e.g. mathematical), question and answer based, simulations (making decisions which change the outcomes) and information sources (in CD-ROM form, World Wide Web, video etc). The specific software used by the ENO programme is an integrated learning system (ILS). ILS software programmes are "complete systems, [with a] wide range of skills and concepts taught, mainly 'instructional' but becoming more interactive, diagnostic, individualised to pupil's needs, [and] can produce reports of pupil progress" (Imison and Taylor, 2001, p. 62).

2.2.4. TEACHER'S ROLE WITHIN ICT PEDAGOGY

Imison and Taylor (2001) pointed out that the use of ICT "does not in any way imply a reduced role for the teacher" (p. 60) but rather that the teacher's role is pivotal. They suggested that the teacher's role includes "identifying appropriate learning outcomes, choosing appropriate software and activities, and structuring and sequencing the learning process" (Pachler, as cited in Imison and Taylor, 2001, p. 61). They pointed out that one of the major challenges facing a teacher when using ICT is to "help everybody when one-to-one assistance is needed" (p. 64). They pointed out that this problem decreases as students become more skilled on the computer system.

Jensen and Simovska (2005) commented on the teacher's role when using ICT. They said

... if it [ICT] is to be used as more than a tool, it demands new teaching strategies which take place in a hyper-room and which include encouraging non-linear learning, asynchronous as well as synchronous communication, critical selection and reflexivity and experimenting and playing as part of the learning. Teachers need to know how to use online resources to stimulate groups of learners. ... In addition to social and personal competence as well as the competence to improvise if technology fails, this kind of teaching requires higher level of subject content competence of the teachers.

(p. 326)

Buchanan (2006) stated that "computers can ..., if used correctly, ... free the teacher from mundane tasks [thus enabling] them to better fill the role of facilitator" (p. 17).

2.2.5. ACTIVE LEARNING WITHIN ICT APPLICATIONS

2.2.5.1. ICT active learning cycle

Nomura (2004) motivated for the use of ICT as a critical instrument and states that “web-based communications enhance the knowledge and learning motivation of children, resulting in the promotion of action-based learning” (n.p.). Jensen and Schnack (1997) differentiated between involving learners in practical activities versus actions which address solutions of the problem being studied. Practical activities can help with motivation and the acquisition of knowledge, while actions help with improving the environment.

Imison and Taylor are proponents of ICT as a powerful tool for active learning due to the active nature of working with the technology and the wide variety of activities. Added to this, the computer becomes “an active partner in the children’s learning, giving them important feedback which encourages them to review their decisions” (Cook and Finlayson as cited in Imison and Taylor, 2001, p. 49).

Imison and Taylor (2001) expanded on this with a repeated cycle, which consists of four stages, as represented in Figure 2.3:

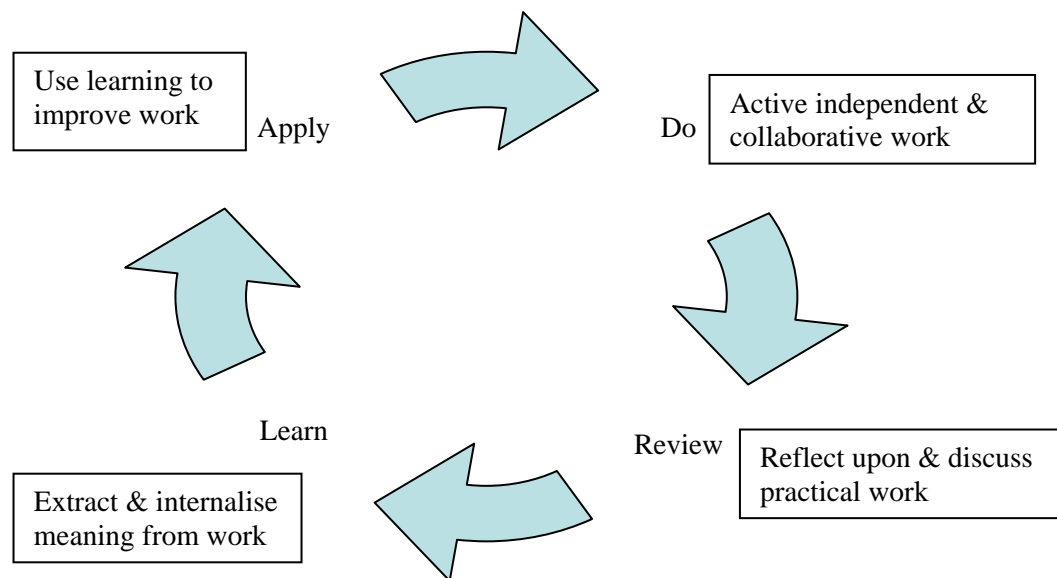


Figure 2.3: Adaptation of ICT as a tool for active learning – the learning cycle
(adapted from Imison and Taylor, 2001, p. 54)

Imison and Taylor (2001) described the four stages within the ICT context as:

- The *do* stage, or carrying out activities as an introduction to new skills and/or concepts. This is where the ICT is the “vehicle for [the] active independent or collaborative work” (p. 54).
- The *review* stage, or reflection and discussion stage which “may be reached automatically ... or could be prompted by peer or teacher intervention”. Imison and Taylor point out that this is a crucial point in ICT use where “particular ideas that have been developed in the activity are compared with other ideas that the student has” (p. 55). These ideas may be shared with other participants in the learning process and may consist of consideration of information collected or received. Through this exploration and prediction various results can be formulated, analysed and interpreted to obtain the relationships and patterns therein.
- The *learn* stage or making sense and internalisation of the previous stages. They point out that this is the most difficult stage to describe. They explain that:

Having experimented with ideas and then compared and shared them with others, a student might be expected to develop new ideas which build on the originals. When information has been gathered and sifted, some of it will be absorbed, if only temporarily, so that it can be used and applied in later tasks.
(p. 56)

They indicate a second manifestation of the learning stage is that of formulation of answers to key questions raised during the practical work stage. Thus in the use of ICT for exploration and prediction, the interpretations and conclusions that are drawn might lead to more exploration and predictions.

- The *apply* stage or applying what they have learnt in the task at hand or in future tasks.

Imison and Taylor pointed out that the transfer of knowledge and skills between tasks is not always straightforward. ICT can be used to facilitate this transfer. With these stages in mind they indicated that “another way in which ICT can assist movement around the learning cycle comes from the quick implementation of basic tasks” (p. 56).

This active learning framework from the ICT perspective was used as one of the means of reviewing academic rigour (see section 5.3.1). It was decided to use this active learning framework because it seemed to offer greater depth in terms of understanding learning processes, rather than the active learning framework which is generally referred to in the environmental education literature which focuses more on methods for structuring learning processes.

It is significant to note that during the interview with the form teacher (In1), he also highlighted the importance of active learning (In1-5.2). He suggested that the real test would be if ENO is able to encourage internalisation within the learners and alter the “way [they] do things” and the way they “think about things”, i.e. the learners are transformed by the interactions on the ENO programme (In1-2.2).

2.2.5.2. Instruction, construction and co-construction learning

Imison and Taylor (2001) highlighted three types of learning: instructional, construction and co-construction, which are prevalent in ICT use. Learning by being shown or told is referred to as instruction learning, “drawing upon behaviourist theories of conditioning and reinforcement” (p. 65). The type of ICT programmes which predominately use this form of learning are the specific software using a drill and practice method. Integrated learning systems (described in section 2.2.3) predominately rely on this form of learning but not necessarily entirely. Construction learning is “building meaning from active experiences, rooted in cognitive theories of information processing and constructivism” (p. 65). Generic software programmes are the predominant form of CAI used for this type of learning, “whereby information and ideas can be collected, developed and processed in order to build understanding” (p. 66). Co-construction incorporates “socio-cultural theories of communication and interaction with others”, and thus involves “learning within and as part of a community of learners” (p. 66). This form of learning requires pupils working together in groups (or pairs) while engaging in discussions and/or reflection. Imison and Taylor claimed that “co-construction has less to do with the software itself than the context the teacher creates for its use” (p. 66).

Imison and Taylor’s co-construction is in line with the concept of collaborative learning within the use of ICT for environmental education which was highlighted by Nomura (2004). He stated that online networks “can promote indirect experiences of various environmental issues by sharing experiences, if a network of like-minded participants is created” (n.p.). Imison and Taylor (2001) incorporated collaborative work as an element of their “do” stage in the active learning cycle (shown in section 2.2.5.1).

Collaborative learning can also apply to teachers and learners, with roles of teacher and learners being interchanged on occasions in all forms of education. This is particularly prevalent in the ICT field where teachers might have to become the learners to keep up with the ever changing technological advances and with students becoming the leaders in the learning processes. Fridman, Dasoo and Basson (2003) highlighted this role by

stating: “computer-assisted instruction transformed the teacher into the role of ‘guide or supervisor’, leading learners to discover information for themselves, rather than the learners being the passive recipients of information obtained from the teacher” (p. 28).

2.2.6. ICT AS A MEDIUM FOR ENVIRONMENTAL EDUCATION

In the *ESD Practice in Southern Africa, Report 3* (2006) it is pointed out that UNESCO (2005) noted that ICT has particular implications for Education for Sustainable Development (ESD). Some of these implications were:

- ICTs offer new learning modes and spaces, and can contribute [to] the effectiveness of distance learning opportunities. The Internet in particular offers new avenues for connectivity and participating in the economy and in knowledge networks.
- ICTs also provide opportunities for global dialogue
- ICTs contribute to the development of essential life skills in modern economies.

(p. 57)

Ojeda-Barcelo (2005) stated that “ICT tools are of prime importance in Environmental Education for Sustainability (EEfS). Nevertheless, very few studies have evaluated the effectiveness of the educational programs that have implemented these resources” (p. 2). One of Ojeda-Barcelo’s conclusions in the study which he conducted on the ENO programme was that “the globalization of the use of computer tools and the ever more extended use of Internet offer new routes for teaching and learning which can not be ignored by EEfS” (p. 11).

Aivazidis, Lazaridou and Hellden (2006) conducted a study in Greece on the comparison between traditional means of environmental educational programmes versus online programmes. Their purpose was to compare the knowledge and attitudes before and after junior high school learners participated in two environmental education programmes. One programme was presented in a traditional, lecture-based manner with PowerPoint presentations and the school laboratory (Group 1). The second group’s sessions were conducted using online CAI means (Group 2). A third group which received no related lessons was tested simultaneously as a means of control.

The outcomes of the study showed that “student knowledge scores increased significantly after exposure to either of the patterns of the EE program” (p. 48) and “students’ environmental attitudes became more positive after exposure to the EE program” (p. 49). But more notably, as far as this research is concerned, they found that scores for positive attitudes of the group which had received CAI were significantly

higher. They stated that “students completing the course online had higher knowledge scores on average than did those taught with the traditional way” (p. 51).

According to Aivazidis, Lazaridou and Hellden (ibid.), although “the findings of this study offer some insight about the effectiveness of ICT in EE” they warned that “educators should use caution when interpreting them” (p. 53). They did suggest, though, that “if ICT can promote the effectiveness of EE, educators should carefully consider it” (p. 53). They also pointed out that this use of ICT must be relevant and appropriate for effective learning (discussed in 2.2.3).

In a case review on the use of IT/ICT for environmental education, Nomura (2004) suggested that “advances in ... (ICT) can be utilized for environmental education by facilitating information gathering and dissemination” (n.p.). Nomura (2004) pointed out that “on-line networks can develop the feeling of inter-relatedness on environmental issues between people in physically distant areas, which is a major objective of environmental education” (n.p.). He motivated for education ‘in’ environment as a means of raising environmental awareness, but cautions that time and financial constraints are often limiting factors which prevent students from directly experiencing environmental issues and nature. He motivated for the “**effective** use of ICT in a **supplementary manner** [my emphasis] to the direct experience method [to] enhance the curriculum of environmental education” (n.p.). He stated “that to make the project successful, partnership for offline activities as well as IT/ICT technology is essential. The information obtained is enhanced by field experience, which in turn encourages ICT-based learning and information dissemination” (n.p.).

2.3. RELEVANT ENVIRONMENTAL EDUCATION/ ESD TEACHING AND LEARNING PROCESSES

2.3.1. EDUCATION FOR SUSTAINABLE DEVELOPMENT TEACHING AND LEARNING PROCESSES

In Chapter 1 it was shown that the ENO programme “is a global virtual web school for environmental awareness and sustainable development” (section 1.3.1). The *ESD [Education for Sustainable Development] practice in southern Africa: Supporting participation in the UN Decade of Education for Sustainable Development* (Lotz-Sisitka et al., 2006) identified eight dimensions of teaching and learning interactions significant to ESD practice in the southern African region (pp. 13 – 33). Below I discuss these dimensions and draw on them in Chapter 7 to analyse the teaching and learning

processes within the ENO programme as a means of determining its significance for ESD in the southern African region.

Dimension 1: Involving people in sustainable development actions

This dimension refers to people “contributing to the development of viable development strategies or to meaningful poverty alleviation and improved quality of life”. A focus on practical action was identified within the southern African context (p. 13).

Dimension 2: Active and learner-centred methodologies

This dimension calls for the implementation of active learning and learner-centred approaches. A challenge identified in this dimension was “ensuring suitable learning and teaching materials are available for use” and “accessing relevant information for use” (p. 18).

Dimension 3: Working with different learner groups in different learning environments or different contexts

It was reported that ESD practitioners in southern Africa were working with a diverse range of groups in diverse learning environments which resulted in different contexts in which ESD practices take place.

Dimension 4: Dealing with complex issues

This dimension incorporated the development of a number of skills and abilities to deal with complex issues, including: “Conflict, tensions and contradictions” (p. 23). Examples cited were: “human rights culture is often in contradiction with cultural values” and sustainability concerns can be “in conflict with traditional cultural values and practices”. It was highlighted that “one of the major challenges facing ESD practitioners is to develop the skills and abilities to deal with complex issues”. It was noted that “ESD practitioners are often faced with dealing with sensitive and contradictory topics such as gender-related concerns” (pp. 22-23).

Dimension 5: Working with values, ethics and cultural diversity

Strategies were suggested for engaging learners in discussions dealing with values, ethics and cultural diversity. These were: (a) “involving learners in, useful community projects, modelling of behaviours and actions, and appropriate role models”; (b) “creating platforms for dialogue and debate”; (c) “engaging people in reflections on existing values, actions and alternatives”; (d) “building relationships, forming groups and attending to group dynamics”; (e) managing, accommodating and embracing diversity was noted with particular reference to

cultural diversity; (f) language diversity or multi-lingual strategies. It was noted that “all these issues bring *mediation* in the learning environment to the fore” thus drawing attention to the educators’ mediation role (pp. 25-26).

Dimension 6: Creativity and critical thinking

Here the importance of creative and critical thinking was highlighted with one of the challenges being the “lack of appropriate teacher education programmes that promote critical and creative thinking” (p. 29).

Dimension 7: Working with different ways of knowing (particularly indigenous knowledge and local knowledge)

Indigenous, traditional and local knowledge were seen as important. It was identified “that mobilising indigenous knowledge ... was a very important feature of ESD practices in southern Africa”. A key challenge identified was the lack of capacity for mobilising IK in education in the context of ESD issues (pp. 30-32).

Dimension 8: Ensuring inclusivity in ESD practice

This dimension pertains to inclusion of learners with disabilities as well as the inclusion of cultural, linguistic and marginalised groups.

2.3.2. MULTICULTURAL EDUCATION/EDUCATION FOR CULTURAL KNOWLEDGE

Lotz et al.’s (2006) consideration of ESD on teaching and learning processes (2.3.1) included a focus on working with cultural diversity. Managing, accommodating and embracing diversity was noted with particular reference to cultural diversity with “ESD practitioners [having to be] sensitive to cultural diversity” (p. 26). As the ENO theme under research is “this is our culture”, multicultural education is briefly reviewed below.

Ramsey, Williams and Vold (2003) pointed out that environmental education along with other movements which were originally distinct from multicultural education, have now come under the multicultural umbrella. These movements incorporated a multicultural education focus and have become part of the growth in breadth and depth of the multicultural education field.

Van Niekerk (2000) pointed out that those who are not exposed to other views usually hold conservative, traditional and conventional values with rigid attitudes due to their isolation. This stagnation of values can lead to stereotyping and prejudice. She showed that this situation was exacerbated in the South African situation by isolation at an international level and intra-national isolation creating alienation and suspicion among ethnic groups. Van Niekerk pointed out that more open-mindedness is found where people are exposed to other people’s points of view. She states “it is ... advantageous

for human beings to live in a situation of cultural diversity to counteract prejudice and stereotyping. Exposure to the Other and the different often serves as a balancing factor” (p. 7).

Mda (2000) has shown that cultural diversity (otherwise known as cultural pluralism or multiculturalism) is due to differences which are based on race, culture, ethnicity, language, social class, religion, gender, disability or exceptionality. Mda warned, firstly, that in “labelling and classification [of cultures] there are also dangers in lumping groups together that do not exactly form a homogenous group” and secondly, that “with classifying or identifying others ... the term or the classification criteria used may not be acceptable to them even when it is precise or correct. Sometimes ... the criterion may even be regarded as derogatory” (p. 20).

Claassen (2000) provides a different perspective on cultural identity arguing why it is important. Both perspectives are important for guiding multicultural learning processes. He described the increase in attachment to cultural groups as a counter reaction to globalisation, termed localisation. As people become more international and lose their national attachments they are “becoming more attached to their primary cultural group. This group may be ethnic, religious or linguistic, or a combination of these” (p. 30). Claassen indicated that the reason for localisation “is perhaps that the global environment is ... too impersonal” (p. 30) and that there is a desire for tangible identities within a group where individuals can feel secure. He points out that an educational tool used to “develop a common culture and to give citizens a shared national identity ... the overall aim of national education system was, and still is to a large extent, *citizen formation*” (p. 28).

Mda (2000) explained that, within South African schools particularly, there are misconceptions about the real meaning of the term multicultural education. It should not be seen as a desegregated school, but rather as a form of a programme within a school or a focus on education for diverse populations. Some of the goals of a multicultural education programme or focus should include: developing the ability to identify with and relate to other groups and develop multicultural knowledge, attitudes and skills.

Ramsey, Williams and Vold (2003) defined multicultural education as “process-oriented learning experiences that foster educational equity, awareness of and respect for the diversity of our society and world, and commitment to create a more just and equitable society for all people” (p. xi). They indicated that the concept multicultural education has

progressed from the “desegregation and ethnic studies”, to an understanding that “all children must learn to live in a diverse world” (p. xi).

Ramsey, Williams and Vold (2003) referred to content integration which deals with teachers using examples and content from a variety of cultures. They contrasted this with knowledge construction which refers to teachers helping “students understand, investigate, and determine how the implicit cultural assumptions, frames of reference, perspectives, and biases within a discipline influence the ways that knowledge is constructed” (p. 154).

This was reiterated in *ESD practice in Southern Africa: Supporting participation in the UN Decade of Education for Sustainable Development* (Lotz et al., 2006) which stated that “educators need [to] ... allow for [cultural vantage points] to be deliberated, debated and evaluated in local cultural contexts” (p. 27). The report identified “conflict, tensions and contradictions which need to be **mediated** ... For example, a human rights culture is often in contradiction with cultural values”. Another example given was “sustainability concerns are in conflict with traditional cultural values and practices” (p. 23).

2.3.3. MOBILISING INDIGENOUS KNOWLEDGE (IK)

In 2.3.1 above the *ESD practice in southern Africa's* (2006) dimensions on teaching and learning processes incorporated working with different ways of knowing and in particular indigenous and local knowledge while a lack of capacity for mobilising indigenous knowledge was identified. The report stated that one of the practices which must be considered for the “way forward for ESD practice in southern Africa ... [is that] indigenous, tradition and local knowledge need to be foregrounded in ESD programmes” (p. 73).

Jain (2006) described indigenous knowledge (IK) as “local knowledge that is unique to a given culture or society. It is a basis for local-level decision making in ... food preparation, ... and a host of other activities in rural communities”. He pointed out that “IK is also termed as the knowledge that people in a given community have developed over time, and continue to develop” (p. 58). He added that this knowledge is culture specific and suggests that IK is dying with the development of society. He suggested that people are tending to forget their roots, their culture and traditions.

In an interview, as part of a study conducted by Wane (2000), with an old Kenyan rural woman in connection with her knowledge, the woman could not perceive why Wane

would be interested in that knowledge. The woman was “illustrating clearly the widely held belief that knowledge comes from formal schooling” (2000, p. 54). In the introduction to the edited book in which Wane wrote, the editors (Sefa Dei, Hall and Goldin Rosenberg, 2000) highlighted that:

Critical voices both in the academy and in local communities are drawing attention to the situation that subordinate peoples’ knowledges, histories, and experiences have been left out of ... classroom pedagogies.

(p. 3)

Sefa Dei et al. reiterated that “Indigenous knowledges within academy are more than content. They are more than a course to be added to the curriculum” but are rather “about uncovering the aboriginal story” (p. 155). They pointed out that indigenous knowledge pertains to “location, politics, identity, and culture” (p. 4). They remind us that indigenous knowledges “have been and still are transforming a variety of social practices in our societies” (p. 213).

O’Donoghue and Neluvhalani (2002) explored “mobilising [of] indigenous knowledge within environmental learning activities in the school curriculum” (p. 121). They pointed out that one of the principles for Environmental Education for Equitable and Sustainable Societies (adopted by the International NGO Forum at the Earth Summit in Rio de Janeiro, 1992) was that: “Environmental education must recover, respect, reflect and use indigenous history and local cultures” (p. 123). O’Donoghue and Neluvhalani (2002) examined methods and materials used to mobilise indigenous knowledge within environmental learning activities. These included: (1) Mobilising prior knowledge (or “tuning in”). They described this as “useful for orientating learners in context” which could result in probing of ideas, investigating more widely, debating ideas and testing propositions. (2) Using indigenous technologies. This involves “actions that can be used to probe the wisdom of old” (p. 133).

2.3.4. GLOBAL EDUCATION

As the ENO programme is an international programme, global education, which will inform the data collection, is briefly reviewed below. Simonyi (n.d) stated that global education has five dimensions:

- ❖ whole sphere (focusing on the whole globe),
- ❖ whole time (learning to think in centuries and long-term responsibility for future generations),
- ❖ whole human (focusing not only on material needs but mainly on development of human personalities),

- ❖ whole creature (beyond the human responsibility towards other creatures and environment), and
- ❖ whole methodology (formal and non-formal systems of education and informal frames, for example Internet and media).

Gough (1997) suggested that global education be included in environmental education as globalisation impacts on “economic concentration ..., cultural homogenisation ... and transnational social movements (including environmental ... movements)” (p. 1).

During the interview with the form teacher (In1) he expressed the opinion that some of the positive effects of the ENO programme pertained to the learners seeing the school’s local environmental programme in the global context, their ability to see that environmental issues are pertinent throughout the world and the exposure of learners to global concepts (In1-4.3). Although the cultural theme was based on local information, the communication of that information globally was seen (by the interviewee) as a way of encouraging an appreciation for culture in general (In1-4.2). A further interesting point was highlighted by the interviewee. He said that although the “world is shrinking” thanks to technology (In1-4.3), many of the learners are “confined” in a limited sphere of influence and experience, in a “narrow world”. He says ENO opens them up globally (In1-4.4).

Claassen (2000) pointed out that globalisation is seen as an economic, market-driven response to the changes which have occurred in the world. He showed that globalisation has created changes to traditional patterns of education including student exchanges, internationalisation of qualifications, distance education, school partnerships and multicultural curricula. Claassen stated that “an approach to education, called *global education*, has been devised for this purpose” (p. 34). He highlighted the general effects of education and globalisation by stating that “globalisation will make and ... has already made changes to traditional patterns of education provision” (p. 34). These patterns include “curriculum which reflects global context ... [and] is not confined to localised facts” (p. 34). He indicated that global education “requires an understanding of the values and priorities of the many cultures of the world” (Brown-Guillory and Guillory, 1989, p. 58 as cited in Claassen, 2000, p. 34).

Claassen commented that global education has “less to offer in terms of preparing oneself for a role in the community and ... becom[ing] more focused on preparing one for ... the global economy” (p. 34). Claassen showed that many countries have reformed

their education systems to “enable learners to adapt to the ever-changing demands of the workplace” (p. 38) with the new curricula providing opportunities for developing “creative thinking and problem-solving skills instead of mere rote learning” (p. 37). Claassen referred to this as skills formation. He indicated that technology is one of the strong influences of this global education context, stating that proficiency in this discipline (along with mathematics and science) “is a prerequisite for economic success” (p. 34).

The programme co-ordinator (In2) explained that one of the primary reasons for creating the ENO programme was to encourage greater global interaction (In2-5.5). Ojeda-Barcelo’s (2005) qualitative research on the teachers’ perspectives of the ENO programme showed that the teachers ranked “to create global awareness and internationality” as the most important goal of the ENO programme. During the interview with the form teacher (In1), the interviewee expressed his thoughts on the value of the ENO programme. Those with a global connotation were: learners seeing the local environmental programme in the global context (“what we do on a small scale here at Treverton ... and it puts it in the big world”), learners being able to see that environmental issues are pertinent throughout the world (“that kids can see that kids overseas are also thinking about these things”), and exposing learners to global concepts (“get them to think of something outside of their immediate sphere of influence or sphere of experience”) (In1-2.1).

2.4. CONCLUSION

It was shown in this chapter that Africa has specific limitations in relation to ICT use. The chapter also discussed the growing digital divide between the rich and the poor. It further considers practical challenges of ICT use such as teacher and learner skills and considers web content which may have disadvantages in terms of anti-social or pernicious influences.

The chapter also discussed how the use of ICT allows for fast and effective implementation of activities, communication opportunities and experimentation (this can also be enhanced by the use of generic software programmes which speed up otherwise tedious tasks). ICT enhances the ability to think and learn beyond the mere technical, skills component and dissemination of knowledge, to higher-order thinking or academic rigour, and the chapter considered how specific software programmes can be designed to develop a range of knowledge and skills which would support such thinking. A number of methods of examining academic rigour within an ICT programme were reviewed, that

is: the balance of control between the learner and the computer; “thinking quadrants” which consider the thinking skills which learners are challenged to develop; the dimensions of active learning which also represent a range of skills; and whether the learning unit reveals a variety of instructional, constructive or co-constructive teaching and learning processes.

Another important point made was that the use of ICT does not reduce the role of the teacher. This role includes choosing, structuring and sequencing learning processes. A computer can free teachers from mundane tasks, enabling them to play more of a facilitation role. One major challenge for teachers is to assist with one-to-one facilitation.

Eight dimensions were discussed regarding the conceptualisation and strengthening of ESD teaching and learning processes from a southern African perspective. Multicultural education was highlighted with a contrast made between cultural content integration and cultural knowledge construction. Uncovering and highlighting the importance of social practices around indigenous knowledge was highlighted by the ESD Dimensions. Due to the global nature of the programme global education was reviewed with a particular emphasis on global context, citizen formation and global inter-relatedness.

3.1. INTRODUCTION

This chapter presents the methodological approaches and the methods used in the study. It includes explanations of the reasons for using these particular approaches, drawing on insights from a variety of authors. Ethical and validity considerations are also presented.

3.2. METHODOLOGY

3.2.1. MIXED METHOD APPROACH

Dabbs described the differentiation between quantitative and qualitative methodologies of research by stating: “the notion of *quality* is essential to the nature of things. On the other hand, *quantity* is elementally an amount of something” (Dabbs, as cited in Berg, 1989, p. 3). Greene, Kreider and Mayer (2004) explained the differentiation as quantitative being numerical and qualitative as being narrative while they termed a mixture of qualitative and quantitative methodologies as mixed-methods. This they defined as a “use of two or more different kinds of data gathering and analysis techniques” (p. 274). They pointed out that “different methods can be implemented concurrently or separately for important conceptual reasons or for reasons of practicality” (p. 276). These explanations have helped me to classify my research methodology as mixed-method with a predominantly qualitative approach.

3.2.2. INTERPRETATIVE PROCESS

The specific methodological approach adopted was interpretive. Connoles (1998) stated that an “... interpretive perspective places primary emphasis on [the] process of understanding. From this, the researcher can identify patterns of meaning” (p. 14). This is backed by Terre Blanche and Kelly’s (1999) statement that “the interpretive approach is characterized by ... understand[ing] others’ experiences by interacting with them and listening to what they tell us” (p. 123).

Terre Blanche and Kelly (1999) highlighted the fact that “interpretive research, ...relies on first-hand accounts, tries to describe what it sees in rich details and presents its ‘findings’” (p. 124). This was reiterated by the statement that “interpretive researchers want to make sense of feelings, experiences, social situations or phenomena as they occur in the real world, and therefore want to study them in their natural setting” (p. 127). They pointed out that “in interpretive research it is the researcher who is the primary

instrument for both collecting and analyzing the data” (p. 126). I was directly involved in the programme being researched, was telling the story from first-hand experience and I was the only collector and analyser of the data.

Terre Blanche and Kelly (1999) stated that “interpretive research methods ... try to describe and interpret people’s feelings and experiences in human terms rather than through quantification and measurement” (p. 123). As I have utilised some quantitative processes within my research, this could imply that I am not conducting a true interpretive study. However, the quantitative methods were implemented concurrently as a means of defining and strengthening the qualification processes. The emphasis was not to ensure ‘mathematical proof’ (Neuman, 2000, p. 73). Rather, these methods were introduced as a self-corrective technique to check the credibility of the data as a means of minimizing the personal bias (Kamarowsky, as cited in Lather, 1986. p. 65).

Terre Blanche and Kelly (1999) emphasized that it is of “importance to consider interpretive research as a process rather than as a set of distinct procedures” (p. 127). Segments or categories were adopted in response to the findings as a means of reporting on the findings and they were not a ‘set of distinct procedures’ predefined before the research process began. The categorisation process was a means of interrelating, and identifying patterns of meaning to facilitate understanding (Connole, 1998), as well as being a means of ensuring a systematic technique for gathering and analyzing the data (Gold, 1997).

3.2.3. CASE STUDY

The research can be defined as a case study based on features of a case study identified by Sisitka (2006). These are namely, that it was conducted within a localised time and space, focusing on a specific educational programme, and with the intention of informing judgements of the policy makers and practitioners involved in the programme.

Cohen, Manion and Morrison (2000) explained that an interpretive approach to educational research is naturally suited to case studies. They indicated that case studies will have temporal characteristics, geographical parameters and boundaries, and may be shaped by organizational arrangements. This research was conducted on the ENO programme (‘boundaries’), during a specific theme within an academic year (‘temporal characteristics’) and conducted at Treverton Preparatory (‘geographical parameters’). Both the ENO programme arrangements (logistically the only theme which could be

studied was the cultural theme) and Treverton arrangements (e.g. 'Zulu Day' activities) shaped the research.

3.3. METHODS AND DATA COLLECTION TOOLS

The following methods and data collection tools were used:

3.3.1. FOCUS GROUP INTERVIEWS

Fontana and Frey (2005) categorised group interviews according to the setting in which they are conducted, the role of the interviewer, the question format and the purpose of the interview. Using their categorisation system my group interviews could be classed as both focus group interviews - where the setting is preset and the role of the interviewer is directive; and brainstorming - where the question format is unstructured and the purpose is exploratory.

Kamberelis and Dimitriadis (2005) stated that focus groups are “complex and multivalent articulations of instructional, political, and empirical practices and effects”. This allows for a variety of possibilities for critical inquiry. They emphasised this point by stating:

We place three histories or genealogies of focus group activity ...: dialogic focus groups as critical pedagogical practice, focus groups as political practice, and focus groups as research practice.

(p. 889)

I found that the dynamics and progress of the focus groups (in particular the first focus group discussion) shifted slightly from pure enquiry or research practice to a pedagogical practice. My interpretation of the scenario relates to the automatic inclination to guide the discussion towards a greater understanding of the topic under discussion, together with the principle of “working *with* people and not *on* them” (Kamberelis and Dimitriadis, 2005, p. 889) to explore their depth of knowledge and not as a means of ‘extracting’ the information from the participants.

Kamberelis and Dimitriadis (2005) stated that:

Focus groups also facilitate the exploration of collective memories and shared stocks of knowledge that might seem trivial and unimportant to individuals but that come to the fore as crucial when like-minded groups begin to revel in the everyday.

(p. 903)

And

Focus groups afford researchers access to the kinds of social interactional dynamics that produce particular memories, positions, ideologies, practices, and desires.

(p. 904)

They also pointed out that focus groups “take the interpretive process beyond the bounds of individual memory and expression” (p. 903). Fontana and Frey (2005) reiterated Kamberelis and Dimitriadis’ (2005) point of collective memories and shared stocks of knowledge by stating that “group interviews can also be used successfully to aid respondents’ recall or to stimulate embellished descriptions of specific events or experiences shared by members of a group” (p. 704). They pointed out one of the advantages of group interviews over individual interviews is that “they can be stimulating for respondents and so aid in recall” (p. 705).

I found these insights to be of particular importance with regard to my focus group discussions. The learners’ collective energy prompted mobilisation of their prior knowledge and an appreciation that day-to-day activities could supply significant and relevant information. This might not have been as successfully achieved with individual interviews.

I conducted two focus group interviews with the learners participating in the ENO-Environment Online Programme. Focus Group One (coded FG 1) was conducted prior to the onset of the theme under research. The objective was to obtain an understanding of the learners’ level of prior knowledge on the theme within the programme under research. Focus Group Two (coded FG 2) was conducted once the theme had been completed (but just before the final activity of the practical lesson, that is the judging and eating of the traditional meal) with the objective of assessing the learners’ personal opinions and experiences of the lessons on the theme and the programme as a whole.

Seven learners participated in Focus Group One. The selection of participating learners was left entirely to the form teacher. This teacher has an understanding of the background, intellectual capabilities and articulation abilities of each learner. He informed me (during an informal discussion) that he had chosen the participants based predominately on cultural background, thus representatives from Xhosa, Zulu, South African English and Afrikaans cultures were present. He also utilised academic capabilities (“she is sharp”) as a criterion (Chaperon, personal communication, April 20, 2007). The focus group discussion was conducted for 13 minutes.

Focus Group Two was held with the same participants from the first focus group interview except for one learner who was absent on the day (thus six learners participated in the interview). This discussion was conducted for 14 minutes.

The focus groups were video taped, transferred into electronic format ('DVD') and transcribed (Appendix 1 – FG1 Tr and Appendix 12 – FG2 Tr). The transcriptions were analysed to “establish patterns of meaning” (Connoles, 1998, p. 14) and coded according to categories identified (as explained in 3.5 below).

3.3.2. OBSERVATIONS

Terre Blanche and Kelly (1999) defined observations as the second most popular form (the first being talking to people) of collecting data in interpretive research. This “takes place while things are actually happening”. They state that “because the interpretive approach emphasizes studying phenomena in a naturalistic way, observation most often takes the form of **participant observation**, where you as researcher become fully involved in the setting being studied” (p. 134).

Angrosino elaborated on participant observation (2005) by pointing out that there is an increasing willingness (predominately on the part of ethnographers) to “affirm or develop a ‘membership’ identity” (p. 733) as expressed by Adler and Adler. They introduced the ‘membership role’ concept based on the understanding that “pure observation is, first, nearly impossible to achieve in practice and, second, ethically questionable” (Angrosino, 2005, p. 733). Adler and Adler (1987) defined three member roles including complete membership researchers with the sub-category of “complete membership – opportunistic” where “... researchers study settings in which they are already members” (p. 68). They pointed out that there are “variations in induction, involvement, and commitment, [while] a sliding scale of membership exists” (p. 68). As I was already a ‘member’ of the ENO programme I have categorised the research as ‘opportunistic complete member research’.

Observations of four one-hour ENO lessons (coded L1, L2, L3, L4) were conducted. The purpose of the observations was to obtain evidence on the use of ICT, teachers’ role in ICT, ICT academic rigour, ICT active learning and the relevant environmental educational teaching and learning processes (i.e. multicultural, indigenous knowledge and global education). Each lesson was video taped, either by a student teacher or (when he was not available) by the video camera being statically placed. This observation method was used to allow for the gathering of information in a ‘live’ situation, observing the activities *in situ* rather than second hand and observing the activities in context. The videos were transferred into an electronic format (DVD).

During one of the lessons (Lesson Two) the video camera was not operational for the first half of the lesson. Once the lesson was being video taped the student teacher, who was facilitating with the camera work, paused the camera during what he thought was 'dead' time, resulting in some possibly relevant information not being recorded.

In order to achieve a focused observation process, an 'observation schedule' was created (Appendix 3 – OB Sc). The observation schedule was divided into five sections and where appropriate the sections were divided into clusters. Each lesson was observed (coded L1 OB, L2 OB, L3 OB, L4 OB) using the observation schedule as a guideline (see Appendix 5 – L1 OB and Appendix 6 – L4 OB for examples).

A timeline (Appendix 4 – OB T) was developed as an analytical tool and as a means of 'mapping' the balance within these clusters resulting in a quantitative measurement process. For instance, under Category One – Teacher's Role, I wanted to identify the period of time the teacher spent on the four roles i.e. instructional, information, facilitatory or auxiliary (section 5.4). In order to create a more accurate assessment I felt that a measurement of time would be more appropriate than mere estimations of the predominant role.

The timeline divided the five sections of the observation schedule into two groups, to ensure an accurate and appropriate measurement processes. Thus each lesson was initially observed twice according to the timeline and then a third time to observe any extra appropriate and/or general information.

One practical session, termed 'Zulu Day' (coded ZD) was observed. The 'Zulu Day' was conducted over an entire school day and incorporated other activities not directly connected to the ENO programme, like building examples of traditional dwellings. Photographs of the activities relating to the cooking and meal presentation were taken of the four groups (coded ZD G1, ZD G2, ZD G3, ZD G4). The extra activities (other than cooking) were not photographed except where they directly or indirectly affected or gave greater understanding to the meal-making processes, for example a re-enactment of the collection of water from a river. As direct observation notes were not feasible during the 'Zulu Day' activities, annotated notes of the photographs were created afterwards (see Appendix 11 – ZD G2 AP as an example).

3.3.3. DOCUMENT ANALYSIS

Document analysis was conducted on the learners' submissions onto the ENO website. These submissions were in three forms. The first form was the submission from Lesson One on the 'blog' site (coded LS1 B1). Due to technical inexperience, only one group successfully placed material on the 'blog' (Appendix 7 – LS1 B1). Although, this submission was brief (due to limited time in the lesson as shown in LS1 B1 1.4.1), the information was coded and analysed according to the environmental educational teaching and learning categories identified in the observation process.

The second form was the learners' presentations which were created over the four lessons. The learners collated their work into five groups and submitted these onto the ENO website under the 'material' section during the final lesson. Two of these submissions were analysed according to the categories used during the observation process. These submissions were coded LS2 G1 (Appendix 8) and LS2 G2 (Appendix 9).

The third form was the 'chat' session conducted during the fourth lesson. As this 'chat' was not archived by the programme co-ordinator, the documents could not be analysed. Instead I noted the prominent information which I could remember (coded LS3C N) (Appendix 10 – LS3C N). This was not coded or analysed but was used to support arguments in the discussion chapters.

3.3.4. INTERVIEWS

Fontana and Frey (2005) pointed out that interviews are "one of the most common and powerful ways in which we try to understand our fellow humans" yet the "spoken or written word always has a residue of ambiguity, no matter how carefully we word the questions and how carefully we report or code the answers" (p. 697). They pointed out that interviews cannot be entirely neutral tools or "neutral exchange[s] of asking questions and getting answers" (p. 695). They backed this by stating that it is rather "two (or more) people ... involved in ... [a] process, and their exchanges lead to the creation of a collaborative effort called *the interview*" (p. 696). They pointed out that interviewers must not use techniques to squeeze answers out of the interviewee.

Two interviews were conducted (coded In1 and In2). The first was intended to obtain more comprehensive understandings of the form teacher's perception of the lessons.

The second aimed to obtain insights into the construction, purpose and reasons behind the creation of the theme of the ENO programme from the programme co-ordinator.

Due to the interviewees' breadth and depth of teaching experiences and insights, I wanted to allow for open expressions of opinions. As both of the interviewees are friends and colleagues I adopted a semi-structured, bordering on an unstructured interviewing approach. I wanted to allow for a variation of responses with more open-ended or broad questions with relevance to the research question. This allowed me to probe vague responses or push for elaboration where required, and allowed for interviewees to deviate and expand if required (Welman, Kruger and Mitchell, 2005). I did not want to adopt a completely unstructured approach to prevent a deviation away from the subject at hand. To achieve this objective, interview prompts were created (Appendix 13 – In1 Pr and Appendix 15 – In2 Pr). These prompts served as a reminder to ensure all required points were discussed, but were not a structured set of questions in any particular configuration. The lack of a structured approach allowed for improvisation and independent judgment on my part and open expression on the part of the interviewee. This approach was of particular importance with the second interview which was conducted electronically. The electronic format did not allow for tone of voice or body language which would have shown various aspects, for example enthusiasm for a point or an end of a point. Due to the lack of a specific structure, the interviewee was able to continue on a point until he had expressed himself fully, even with inadvertent interruptions, and could bring in other unsolicited comments.

Obtaining access into the interview process was not a problem due to my working relationship with the participants. Trust and a rapport between the interviewer and interviewees had already been established. I do not believe there were gender or hierarchical implications. One area of possible concern was the difference in mother tongue languages during the interview with the programme co-ordinator, who is Finnish. However, as I have a long-term relationship with the interviewee, I have developed some understanding of his minor English inaccuracies.

I took note of the comments made by Fontana and Frey

The interviewer is not to give his or her own opinions and is to evade direct questions. What seems to be a conversation is really a one-way pseudoconversation.

(2005, p. 710)

Both interviews were conducted after the lessons and 'Zulu Day' activities. The form teacher interview (In1) was video taped, transferred to DVD and transcribed (Appendix 14 – In1 Tr). Unrelated conversation was not transcribed but was retained on the DVD.

As there was not an opportunity for a face-to-face interaction with the Finland based ENO programme co-ordinator during the research period, the interview (In2) was conducted in an ICT forum. The forum utilised was the 'chat' facility within the ENO programme. This 'chat' was 'archived' (Appendix 16 – In2 Tr) and coded according to categories.

The electronic format of this interview is explained by Fontana and Frey (2005) who showed that utilising electronic methods is "another direction currently being taken in interviewing. ... [which] allows researchers to schedule and archive interviews" (p. 721). They refer to using Internet connections for synchronously or asynchronously obtaining information as "virtual interviewing" (p. 721). Synchronous refers to those mediums which allow for the interview to occur simultaneously (for example 'chat' sites) while asynchronous would be those with time delays (for example e-mail). Thus Interview Two was a synchronous virtual interview.

Fontana and Frey pointed out that "the establishment of an interviewer-interviewee 'relationship' ... is difficult" (2005, p. 721) in electronic interviewing. In this situation, though, this was not cause for concern. Fontana and Frey also pointed out that electronic interviews take longer than traditional interviews with the responses being less in-depth. In this situation a face-to-face interview might have allowed for more depth but it was felt that the required information had been obtained. As the 'chat' site was not a totally exclusive site a third party entered but he was not disruptive to the interview and as he was a teacher at an ENO participating school, the limited comments he added gave extra insight into the interview.

3.4. PRESENTATION OF DATA

A systematic process was developed for the filing and retention of the data sources depending on the means of data collection. For example, the lessons were recorded on DVD, the observations of the lessons were made on hard copy and learners' submissions were retained electronically. Table 3.2 below gives an outline of the data sources, the medium in which they were retained and relevant sample appendices. These are presented in chronological order according to the research process.

Table 3.2: Index to data sources

Description of data source		Codes	Medium	Appendix
Focus Group Interview One		FG1	DVD	None
Focus Group One Transcription		FG1 Tr	Hard Copy	Appendix 1
ENO – Environment Online – Theme 4 – “This is our culture” 2006/2007 year		ENO T4	Hard Copy	Appendix 2
Lesson One		L1	DVD	None
Lesson Two		L2	DVD	None
Lesson Three		L3	DVD	None
Lesson Four		L4	DVD	None
Observation Schedule		OB Sc	Hard Copy	Appendix 3
Observation Timeline		OB T	Hard Copy	Appendix 4
Lesson One – Observation		L1 OB	Hard Copy	Appendix 5
Lesson Two – Observation		L2 OB	Hard Copy	None
Lesson Three – Observation		L3 OB	Hard Copy	None
Lesson Four – Observation		L4 OB	Hard Copy	Appendix 6
Learners’ Submissions		LS		
	Learners submission ‘blog’ 1	LS1 B1	Hard Copy	Appendix 7
	LS2 Group 1	LS2 G1	Hard Copy	Appendix 8
	LS2 Group 2	LS2 G2	Hard Copy	Appendix 9
	Learners’ ‘chat’ notes	LS3 CN	Hard Copy	Appendix 10
‘Zulu Day’ Practical Activity - Photographs		ZD		
	ZD Group 2	ZD G2 AP	Hard Copy	Appendix 11
Focus Group Interview Two		FG2		
Focus Group Two Transcription		FG2 Tr	Hard Copy	Appendix 12
Interview One		In1	DVD	None
Interview One – Interview Prompts		In1 Pr	Hard Copy	Appendix 13
Interview One - Transcriptions		In1 Tr	Hard Copy	Appendix 14
Interview Two – Interview Prompts		In2 Pr	Hard Copy	Appendix 15
Interview Two - Transcriptions		In2 Tr	Hard Copy	Appendix 16

3.5. VALIDITY

Terre Blanche and Kelly (1999) pointed out one of the negative effects of interpretive research (but pertaining predominately to the ethnographic form) would be for interviewers to so closely identify with the “culture they are studying that they lose all perspective” with the result that the research report could “read like an advertisement for [that culture] rather than a proper analysis” (p. 138). Advertising the programme was one aspect I had to caution against as I am an advocate for the programme.

As a means of ensuring validity I took cognisance of the statement that “the purpose of interpretive analysis is to provide ‘thick description’, by which is meant a thorough description of the characteristics, processes, transactions and contexts that constitute the phenomenon being studied” (Terre Blanche and Kelly, 1999, p. 139).

I took note of Gold's (1997) requirements which must be met to achieve reliability and validity through "[1] adequate and appropriate sampling procedures, [2] systematic techniques for gathering and analyzing data, [3] validation of data, [4] avoidance of observer bias, and [5] documentation of findings" (p. 399).

'Adequate and appropriate sampling' was addressed by observing all the lessons and activities associated with the theme, analysing all the documents created during the theme and interviewing a cross-section of groups and individuals associated with the research. The cross-section of learners was selected by the form teacher based on various cultural and academic abilities.

In order to meet Gold's second criterion, I established a systematic and methodical processes of gathering and storing of data, as shown in 3.4 above. In order to achieve the systematic analysis of data, the model created by Terre Blanche and Kelly (1999. pp 141-144) was used. They created analytic steps but explain that these are not a fixed recipe but rather a means of 'unpacking' the processes involved in immersing and reflecting on the data.

These steps are:

➤ Familiarisation and immersion (Step 1)

They point out that "data gathering in interpretive research ... involves development of ideas and theories about the phenomenon being studied". More importantly they stress that "by the time you come to data analysis you should already have a preliminary understanding of the meaning of your data" (p. 141). The initial familiarisation process occurred during the teaching of the lessons and the transcribing of the interviews. The first viewing of the video recording of the lessons and Interview One allowed for a preliminary understanding of the data or immersion into the data.

➤ Inducing themes (Step 2)

This is explained as "infer[ing] general rules or classes from specific instances. It is thus a bottom-up approach: you look at your material and try to work out what the organising principles are that 'naturally' underlie the material" (p. 141). This is opposed to the top-down means of fitting instances into ready-made categories. An observation schedule with categories was created after the initial steps of familiarisation with the data (that is after the first two lessons) which allowed themes to emerge from the data. Repeated observation of the video-recorded lessons and interview facilitated re-evaluation of the themes. The categories

were adopted or adapted for the document analysis, the focus group interviews and interview coding processes.

➤ Coding (Step 3)

Terre Blanche and Kelly show that “in coding, we break down a body of data ... into labelled, meaningful pieces” (p. 143). The observation schedule formed the base for the coding of the lessons. The lessons were labelled and measured according to the categories on the schedule.

➤ Elaboration (Step 4)

Terre Blanche and Kelly point out that after the linear sequences of steps 1, 2 and 3, the events which were ‘far away’ are brought close together, giving a fresh view with possible sub-issues and/or other themes. They explain that “exploring the themes more closely in this way is called elaboration”. They explain the purpose for this is to “capture the finer nuances of meaning not captured by your original ... coding system” (p. 144). The drawing together of information occurred with the collation of the data from the different data source (focus group interviews, observations, document analysis and interviews) into the joint thematic categories created during step 2. The ‘finer nuances’, where noted, were recorded, for example insights from the form teacher with regard to one learner possibly being shy about his traditional (rural) home activities (section 6.2.4).

➤ Interpretation and checking (Step 5)

This is the final step of putting together the interpretation, which is the written account of the research. It is significant to note Terre Blanche and Kelly said that this will be “most probably ... using thematic categories from your analysis as sub-headings” (p. 144). In Chapter 4, 5 and 6, I present my findings ‘using thematic categories’.

To address Gold’s third requirement, that of validation of data, a triangulation process was utilised. This involved triangulation between methods through the observation of the lessons, document analysis of the learners’ submissions, the learners’ focus group interviews and the interview with the form teacher. It also involved triangulation within the one method – that is observation. The use of different analytical lenses (for example the “balance of control”, “thinking quadrants”, active learning cycle and instruction, construction and co-construction learning lenses) enhanced triangulation within the observation process.

Avoidance of observation bias is Gold’s fourth means of maintaining standards of reliability and validity. As explained in section 1.2, I have a long-term relationship with the programme under review, thus the potential for bias was high. One means of

addressing this point was the introduction of the 'semi' quantitative system (explained in 3.3.2) as a means of reducing my subjectivity and allowing for more objective measuring of some of the thematic categories. A second means was the form teacher's interview where he was able to express his insights and perceptions of the programme. A third means was the analysis of the learners' submissions which provided more concrete evidence of what learning took place.

3.6. ETHICAL CONSIDERATIONS

The ENO programme is backed by the University of Joensuu in Finland. During a formal visit to Joensuu, Finland, in March 2006 a meeting with the representatives of the ENO programme from the University of Joensuu was held. The representatives from the University of Joensuu were enthusiastic for the research to take place. A copy of the research proposal was sent to the representatives of the University of Joensuu and the ENO programme co-ordinator.

As the research was based at a school, permission had to be obtained from the school. Verbal permission was obtained from the form representative on the school management forum.

3.7. CONCLUSION

The methodology used for this research was a mixed method, interpretative case study. I incorporated an element of quantification (to define and strengthen the qualifications).

The methods used were: two focus group interviews (with a selected group of learners), observations of four one-hour lessons, observations of a full school-day activity, document analysis of the learners' submissions and two semi-structured to unstructured interviews (with the form teacher and the programme co-ordinator).

Thick description and a step-based approach to data analysis were adopted to ensure reliability and validity. Procedures were used to ensure adequate and appropriate sampling procedures, systematic techniques for gathering and analyzing data, validation of data, avoidance of observer bias, and documentation of findings.

Ethical considerations included notifying the programme co-ordinator and backing university of the research intent and obtaining permission from the Treverton form representative.

In the following chapter the ENO programme structure and processes conducted at Treverton are reviewed. Appropriate ICT context of the study is also explored.

4.1. INTRODUCTION

In this chapter the ENO theme being researched is described. Initially the structure of the ENO programme is reviewed. This is followed by the summary and description of the activities, in relation to the theme, conducted at the school where the case study took place. These include four computer lessons, a description of the learners' submissions and a practical activity.

This is followed by a discussion of ICT-related classroom realities as experienced in the study. These discussions are based on information drawn from Chapter 2 (key ideas informing the research) and data collected during observations, interviews and focus group interviews. Topics discussed are the strengths, weaknesses and pernicious influences of ICT, ICT skill requirements from the teachers' and learners' perspectives and ICT use.

4.2. THE ENO THEME AND ITS STRUCTURE*“THIS IS OUR CULTURE” THEME*

In section 1.3.1 the ENO programme was discussed, showing the themes which are conducted during a European academic year. A description of the “This is our culture” theme as it was presented on the ENO programme for the 2006/2007 academic year (Appendix 2) will be discussed here.

The theme was set for the period April – May 2007 and was given the title of “Traditional Food”. The ENO programme (*ENO-Environment Online: This is our culture: Traditional food. 2006/2007*) stated that the contents would be: “local culture in traditional food and traditional food in other countries” (n.p.). The goals were for learners to:

- ❖ appreciate their local cultural food,
- ❖ learn to prepare local traditional food and involve local people in the process,
- ❖ create a recipe of that meal (in English),
- ❖ document the preparation of the meal digitally, and
- ❖ get to know about food cultures globally and prepare a meal from another ENO country.

The theme was to culminate in a so-called “campaign week” (14 – 20 May) with an “ENO Food Show” where learners presented a poster exhibition, a recipe book and prepared and presented a meal from another country.

The theme was divided into eight weeks with recommended lesson plans for each week. These were: “An introduction week”, “Local expert”, “Activity I: A recipe”, “Preparation and Documentation”, “Recipes/ENO chats”, “Prepare for Campaign Week”, “ENO Campaign Week” and “Summaries and Assessment”. The following activities were conducted by the case study group:

- ❖ an introduction to Zulu cultural meals,
- ❖ introduction to the theme,
- ❖ attempt to enter information on the ENO learning diary ‘blog’,
- ❖ documentation of a traditional meal and traditional meals versus fast-food,
- ❖ review of other schools’ submissions,
- ❖ ENO ‘chat’, and
- ❖ preparation of meals.

The ENO suggested lesson plans, timelines and procedures were not precisely followed at Treverton Preparatory due in part to logistical constraints and in part to the incorporation of the theme into other activities conducted at the school. The Treverton programme incorporated a section on fast-food versus traditional meals and merging of the ENO theme with the ‘Zululand Tour’.

4.3. SUMMARY OF THE ACTIVITIES CONDUCTED

The following activities were conducted by the Treverton Preparatory Grade 7 class. Prior to the onset of the lessons the learners were taken on an annual five-day school excursion (‘Zululand Tour’). This excursion incorporated a section where learners were introduced to Zulu cultural traditions, including a section on cultural meals. This tour forms part of the Grade 7 programme and was not specifically identified as part of the ENO programme but due to the nature of the tour some information received here served as background to the ENO lessons. For the ENO “this is our culture” theme, four one-hour lessons were held in the school computer room followed by a practical session. The practical session was incorporated into a ‘Zulu Day’ activity and consisted of cooking a traditional Zulu meal.

4.3.1. DESCRIPTION OF THE FOUR CAI LESSONS

For Lesson One (L1) the learners were briefly introduced to the theme then divided into groups of three or four learners per group, with one representative logging onto the ENO site. The lesson had two objectives: (a) To introduce the learners to the ENO learning diary ‘blog’. The ENO programme suggests that the learners enter information on their individual learning diaries after each lesson, on the ‘blog’ or on a template (discussed in

section 5.3.1). Due to inexperience with the 'blog' sites, only one group of two learners managed to enter their submissions. (b) To initiate the theme of traditional meals within our local context. Each group of learners was given a specific task. Some had to fill in general information on traditional meals in the region. Some had to create graphs after a mini 'survey' where the learners' voted on topics relating to traditional meals (e.g. how many had prepared traditional meals, which meal was their favourite and if they thought traditional meals were better for one than fast-food) . As the learners were unable to transfer the graphs onto the 'blog' sites they were saved for a future lesson.

In Lesson Two (L2) the learners were requested to create a document which described a traditional meal. As the learners had seen (and photographed) some meals created during their "Zululand tour", a Zulu meal/drink was to be focused on. They could obtain the information for the document either from their prior knowledge, drawing on the information received whilst on tour or from the Internet. Photographs could have been used from either those taken whilst on tour or the Internet. Once the documents were created the idea was for the learners to place this information on the ENO 'blog' sites. However, I was not able to assist the learners to get the information onto the 'blog' site. This resulted in an alteration to the lesson plans. As an alternative, the learners created tables on their perceptions of traditional meals versus fast-food. To facilitate the learners, discussions on topic occurred.

Due to the long break between the first two lessons and the third lesson (L3), the learners were initially reminded of the previous lessons. As a continuation of Lesson Two the learners presented five points on the difference between traditional meals and fast-food meals. The five suggested points were: personal opinions, social connotations, economic connotations, health implications and environmental connotations. This work was saved on the school's 'intranet'. Once this had been achieved the learners accessed the ENO site material section to view the work previously submitted from other schools in relation to the current theme.

In Lesson Four (L4) the learners submitted their work created in the previous lessons onto the ENO website material section. To reduce the number of submissions, learners created groups and collated their work into one or two documents. One member of the group logged onto the ENO website, entered the material section and submitted the work. Once this had been achieved the groups entered the ENO website 'chat' room and communicated with other schools present in the room. Prior to the lessons, I had

requested that other schools join us in the 'chat' room at the predetermined time. The theme "cultural meals" was the topic under discussion.

4.3.2. DESCRIPTION OF THE PRACTICAL ACTIVITY/LESSON



The practical meal cooking process dovetailed with an activity conducted by all the Grade 7 learners (including the class which was not part of the ENO programme for 2007), called 'Zulu Day'. During the 'Zulu Day' activity the learners (in groups) created a mini traditional homestead, re-enacted some traditional activities and prepared a full traditional meal cooked in a traditional manner. The nature of the day's activities dictated that the learners had to focus on Zulu cultural meals. The groups were judged on various criteria of which the meal formed an integral part and this required that the judges had to taste the prepared food. The learners then ate the meal for their lunch.



All the groups cooked their meals in cast iron 'three-legged *potjie*' or flat bottom pots. The ingredients for the meals were obtained from home (or the boarding establishment) and although there were minor variances between the groups' meals (e.g. chicken or mutton) they all cooked '*pap*' (maize porridge), '*umngqusho*' (samp and beans) and a '*potjie*' stew. One group prepared non-alcoholic 'Zulu Beer'. The cooking process started at 8:30 and ended when the judging started, at



12:30. As the learners were involved with other processes, e.g. building their 'homesteads' or putting on costumes, not all learners were directly involved in the cooking processes. In most instances the food was considered tasty with some of the 'audience' requesting to be allowed to taste it.

4.4. ICT CONTEXT

Insights obtained from the data, in relation to the use of the ICT software, the skills required for the use of the ICT, the strengths and weaknesses and pernicious influences of the ICT medium, are reported on below. This information provided greater insight into discussions in Chapter 5.

4.4.1. STRENGTHS, WEAKNESSES AND PERNICIOUS INFLUENCES OF ICT USE

In section 2.2.2 the disadvantages of ICT utilisation were highlighted. The disadvantages presented in the data have been categorised into activities which caused time delays, factors which influenced group dynamic complications, evidence of involvement with other computer activities and general disadvantages.

Time delays and timing

A time delay was caused during Lesson One by one group of active boys who needed to restart the computer after bumping it and the teacher having to give them the log-in detail once more (L1 OB 1.3.3.3). The inability to log into the 'blog' sites during Lesson Two (L2 OB) caused delays in the teaching time and altered the direction of the lesson (L2 OB 2.3.3.2). Some learners took time to enter the ENO site as they were not copying the exact information given into their site address (L3 OB 3.3.3.3). During Lesson Four the learners had to receive specific instructions (including receiving their logons and passwords) on how to log onto the 'chat room' site. Groups were not able to continue until the teacher had an opportunity to give them the required one-on-one attention (L4 OB 4.3.3.3). One learner saved her work into an incorrect folder – and this might have been deleted by the system. Thus her work was 'lost' and caused time delays while she attempted to find the work (L4 OB 4.3.3.2).

The only time delay which had any impact on the lessons was in relation to the inability to log into the 'blog' site. The other time delays were insignificant.

Grey (2001) pointed out that arranging a common 'chat' time is a difficult factor (2.2.2). Pre-organising the 'chat' for Lesson Four, by inviting other schools to participate at a specific time, ensured that this was not a concern (L4 OB 4.1).

Group dynamics complications

In Lesson One the learners created 'blog' sites. If all learners had attempted to 'blog' on their own computers the systems might have been overloaded, so the learners worked in groups of three or four with one learner logging onto the 'blog'. This then resulted in other learners being non-active participants in the group (L1 OB 1.3.3.2).

One group of boys found it difficult to contain their energy during the lesson – this could be attributed to normal difficulty within a classroom situation but could also be a result of the inactivity of three members while one member of the group was actively involved with the computer (L1 OB 1.6.6). An hour behind the computer appeared to be too much for this group.

In Lesson Four (L4 OB), it was noted that some learners were not engaging in the group work but were simply stationed at their computers (L4 OB 4.3.3.1). This could be related to the fact that the computers were situated in such a manner that group work was not naturally achieved.

It was observed twice that one learner was sitting on his own and not participating in the group activities (L4 OB 4.6.4). This was possibly due to the difficulties with working as a group around the computers but could also have been due to the group dynamics of that particular group – and could have happened in traditional teaching methods. In the same group – one member was irritated that he was not able to access the specific software sooner. Again this could have occurred during traditional teaching methods but the temptation to enter the ENO website (specific software) formed part of his frustration. This group started working together towards the end of the first quarter. Some general inter-group interactions not related to the task were observed. However, it is possible that this would have occurred in a traditional teaching method too.

Involvement with other computer activities

During Lesson One (L1 OB) a learner was seen to be occupied with other programmes (games) or sites (L1 OB 1.3.3.1). The teacher was required to stop teaching for a short period to instruct the learner to return to the lesson. The research system did not allow for an evaluation of the period the learner was otherwise occupied. The time it took the teacher to sort out the situation was measured to be a total of only 10 seconds.

During Lesson Three (L3 OB) the learners were to complete their generic software requirements prior to entering the ENO site to view the global presentations. There was

a notable desire to enter the ENO site with some learners who had not completed their tasks entering the site (L3 OB 3.3.3.2). This was indicative of how quickly and easily the learners could be distracted from the required task in order to conduct more enjoyable tasks.

General strengths and weaknesses

Taking the adaptation of Grey's (2001) table on the Internet's strengths and weaknesses (Table 2.1) as a base, Table 4.1 has been created in order to discuss the effects within the ENO theme.

Table 4.1: Strengths and weaknesses noted in the ENO theme

	Grey's categorisation	Effects seen in the ENO site
Strengths	An infinite number of resources and quantity of information	Learners were able to obtain information for their material submissions from the Internet (L2 OB, LS G1, G2, G3, and G4)
	A two-way communication at little expense	Learners partook in an international synchronous communication – "chat" (L4 OB, LSC N)
	International information, mainly in English	Learners' obtained international information (in English) via the ENO programme in the form of other learners' material submissions (L3 OB 3.1)
	Constantly updated	The ENO programme is updated by the ENO programme co-ordinator
	In digital format, so can be easily edited	This was evident when learners created their submissions (L2 OB)
	Encourages links to other sources	Links with other schools internationally was not only encouraged but achieved (L4 OB 4.1, LSC N)
	Spontaneous, innovative, knows no national boundaries, ungovernable, untameable and unstoppable	National boundaries were transcended
	Information is free	ENO site is free of charge. Information on Zulu meals, downloaded from the Internet, was free of charge (L2 OB 2.1)

Weaknesses	No framework or format – a jumble – no central catalogue	Not appropriate as the ENO programme had a framework and organised format
	Can be hard to find what you want – and too easy to be distracted to find things you don't want	This was not specifically noted. The learners managed to obtain the required information quickly and did not appear to be distracted (L2 OB, L3 OB)
	Encourages browsing rather than serious searching or reading	As shown – during L3 learners wanted to enter ENO site prior to completion of their generic software work (L3 OB 3.3.3.2)
	Resources of variable quality, no vetting, no editing, no quality control	The ENO programme contains a vetting process but editing and quality control of the learners' submission is not achieved
	Slow to load graphics, movies and sounds	An inability to load the graphs onto the 'blog' was experienced (L2 OB 2.1)
	Difficult to censor unsuitable material	Programme is restricted and specific with inbuilt censor systems (e.g. limited to registered participants only, inappropriate behaviour by learners during a 'chat' would result in the learners passwords being removed)
	Contains bias, prejudice and error	The nature of the programme challenges racial/cultural prejudice
	Spontaneous, innovative, knows no national boundaries, ungovernable, untameable and unstoppable	Was not seen generally as a weakness, although on occasion learners had to be re-directed from game sites (L1 OB 1.3.3.1).

Pernicious influences

No pernicious influences were noted during any of the lessons. The reason for this was discussed by the form teacher during Interview One (In1). He highlighted the fact that the learners were participating in meaningful ICT related communication where the process could be monitored in a disciplined and guided situation (In1-3.2).

Grey (2001) pointed out that one of the ways of reducing pernicious effects was by utilising a secure, password-protection for defined groups (section 2.2.2). The Programme Co-ordinator pointed out that the security of the ENO site was achieved by ensuring that only ENO participants may enter the 'chat' site (In2-3.4).

4.4.2. ICT SKILL REQUIREMENTS

Section 2.2.2 stated that some of the practical disadvantages of ICT are teachers' limited ICT skills and variable ICT skills amongst learners. The teachers' and learners' ICT skills were measured during the observation of the lessons (described in section 3.3.2).

4.4.2.1. Teachers' ICT skill requirements

In each lesson the period when the teachers did not require ICT (this could have been during traditional teaching periods or auxiliary periods when learners did not require ICT assistance) and when teachers required ICT skills, was measured. A percentage of the time allocation for the two categories were calculated and an average over the four lessons shown. The period when teachers' ICT skills were required was also timed according to the categories 'adequate' and 'inadequate' ICT skills. These were calculated into percentages and averaged out. These are indicated in Table 4.2 below.

Table 4.2: Teachers' ICT skills requirements calculations

Teachers' ICT Skills Requirements	Lessons	%		
Teachers did not require ICT skills	Lesson One	35 %		
	Lesson Two	81 %		
	Lesson Three	75 %		
	Lesson Four	47 %		
	Average	60 %		
			ICT skills adequate during the required ICT skills period	ICT skills inadequate during the required ICT skills period
Teachers' required ICT skills	Lesson One	65 %	88%	12 %
	Lesson Two	19 %	42 %	58 %
	Lesson Three	25 %	100%	Nil
	Lesson Four	53 %	100%	Nil
	Average	40 %	82 %	18%

Teaching time was affected in Lesson Two while the teacher obtained information on where to save the submissions, but it was noted that this was for a short period of time (5 minutes) (L2 OB 2.3.2.2).

The teachers' inadequate ICT skills in Lesson One and Two were related to the 'blog' site (explained in 4.3.1). It is of interest the total period of inadequate ICT skills was only 18% even though the original perception (on the part of the teachers) was that it affected a greater portion of the lessons. The major effect of the inadequate ICT skills was the altering of the direction of the lessons (as discussed in 4.3.1). The teachers' ICT skills were adequate for Lessons Three and Four; this meant that the teachers were able to assist the learners with their ICT requirements when necessary.

The teachers' ICT abilities (or inabilities) are significant in the utilisation of ICT in education but it is shown in the ICT skills requirements calculations that for a high percentage of lessons (60% of the time) the teachers did not require any ICT skills. Of particular significance is the high percentage of the lesson the teachers did not require ICT skills during Lesson Two (81%) and Lesson Three (75%). This can be attributed to the learners working predominately on generic software as opposed to specific software (Table 4.4. shows the time spent on generic software in L2 was 81% and L3 50%, while the time where no ICT was used for L2 was 16% and for L3 21%). As the learners at Treverton are well versed in the use of generic software, the teachers' assistance during this period was minimal. Although Grey's (2001) comment (discussed in section 2.2.2) that "the answer to ... low skills is obvious; practice" was referring to the teachers' skills, it was shown that if the learners are well versed or practised in ICT use, the teachers' ICT skills requirements are lower.

4.4.2.2. Learners' ICT skill requirements

In Chapter 2 it was noted that one of the disadvantages of ICT use in education is the variable skills amongst learners (section 2.2.2). As with the teachers' ICT skill requirements, the learners' ICT skills (adequate, inadequate or variable as a group) were measured, and the percentage of the total time and averages over the four lessons were calculated. Variable ICT skills were evident: some group's ICT skills were adequate while others required more assistance from the teacher/s to achieve the ICT requirements. These are indicated in Table 4.3 below.

Table 4.3: Analysis of ICT skills amongst groups of learners

Learners' ICT Skills	Lessons	%	Average
ICT skills adequate in group	Lesson One Lesson Two Lesson Three Lesson Four	58 % 93 % 69 % 57 %	69 %
Learners' skills inadequate in group	Lesson One Lesson Two Lesson Three Lesson Four	7 % 7 % Nil Nil	4 %
Learners' ICT skills of group variable	Lesson One Lesson Two Lesson Three Lesson Four	35 % Not seen 31 % 43 %	27 %
		Total	100 %

The first section of Lesson One (L1 OB) pertained to an instructional ICT period (shown in Chapter 5 - Table 5. 7) where learners were instructed on how to enter the 'blog' sites. The variance in ICT skills within groups was caused by some learners comprehending

the requirements faster than those who required assistance in order to achieve the requirements (L1 OB 1.3.2.1). Two groups took much longer to get into the 'blog' sites. After 23 minutes of the lesson one group had entered the 'blog' site while the other two groups were still attempting to enter at 33 minutes (L1 OB 1.3.2.2). It was observed during the lesson that it appeared as if learners had not previously registered for anything using the computer as they were not au fait with the common ICT registration procedures (L1 OB 1.3.2.3).

Learners at Treverton are well versed with generic material and did not require support during the second part of Lesson One (L1 OB 1.3.2.4). The period when the group ICT skills were not adequate was related to the final loading of material onto the 'blog'.

In Lesson Two 81% (Table 4.4) of the time was spent on generic software, while only 3% was spent on specific software (for 16% of the time there was no ICT usage). Due to this the group ICT skills were adequate for almost the entire ICT use period (93%). The short period when their skills were inadequate related once again to accessing the 'blog' sites.

The predominant software requirements during Lesson Three were generic, resulting in a lower variance in skills (if compared to the Lesson One and Lesson Four when the variance was higher due to the greater specific software requirements).

It was noted in Lesson Four that the predominant variance in the ICT skills was related to the speed at which groups worked (L4 OB 4.3.2.1), as would have occurred during traditional teaching lessons, rather than specifically related to the ability to use the ICT. Where ICT related variance was noted it pertained to the one-on-one assistance required for the groups to achieve the specific software task requirements (L4 OB 4.3.2.2). Some groups were fast at understanding the specific software instructions, e.g. how to enter the material sections, while others required more one-on-one facilitation. It was specifically noted that the variance in ICT skills use increased with the specific material utilisation (L4 OB 4.3.2.3).

The data shows that when learners are well versed in the use of generic software the variance in learners' skills pertained predominantly to the specific software requirements. One of the reasons to which Grey (2001) attributes variable computer skills to is the availability of and use of computers (section 2.2.2). In the situation where the research took place this was not seen as a factor as learners have access to well-equipped networks and receive regular computer teaching.

Although it was observed that there were considerable variations in speed particularly relating to the specific software requirements, there were advantages to this in that the faster groups were not held back while waiting for the slower groups. For example, during Lesson One some groups were able to continue with the project and achieved the aim of submitting material onto the 'blog' and getting 'published' (L1 OB 1.6.4). This caused an obvious sense of achievement and pride in their work. The learners included relevant photos which were obtained from the Internet. This is an indication that they were able to find appropriate sources in the short time allocated. It was also evident that the learners were proud of their work. This backs Imison and Taylor's (2001) comment that ICT gives lessons high status, pride of work and increases the motivation (shown in 2.2.3).

During Lesson Four it was noted that some groups were able to present their work faster than others. This was mainly due to their organisational abilities and that they were faster workers. The advantages of the ICT was noted in that these groups were then able to continue working and were not delayed while waiting for the other groups to catch up. These faster groups were able to enter the chat room prior to the others and partake in the chat (L4 OB 4.6.1). The slower group was able to continue their work and caught up with the faster groups before the end of the lesson (L4 OB 4.6.6). It was noted that the gathering of material from individuals and collating them into a group presentation was quick and easy. This is attributed to the use of ICT. This created extra time in the lesson thus allowing learners to enter into the chat room (L4 OB 4.6.7).

4.4.3. ICT USE

During the observation of the lessons the use of the generic or specific software (see section 2.2.3) was measured. The period when the computers were not used was also noted. These measurements are shown in Table 4.4. The average of the four lessons was calculated. It must be noted that these calculations are for the computer room-based lessons and do not include the practical activity/lesson.

Table 4.4: ICT use during the ENO lessons calculations

ICT use	Lessons	%	Average
No ICT utilisation	Lesson One	17 %	15 %
	Lesson Two	16 %	
	Lesson Three	21 %	
	Lesson Four	6 %	
Generic software used during entire lesson	Lesson One	24 %	45 %
	Lesson Two	81 %	
	Lesson Three	50 %	
	Lesson Four	23 %	
Specific software (ILS) used during entire lesson	Lesson One	59 %	41 %
	Lesson Two	3 %	
	Lesson Three	29 %	
	Lesson Four	71 %	

The periods when there was no ICT use occurred during the teachers' instructional periods or the discussions on the theme. This is particularly evident in Lesson Three when no ICT use occurred for 21% of the time. This occurred when learners were reminded of previous lessons (as shown in 4.3.1), the teachers' instructional period, and the group discussions on traditional meals versus fast-food.

Table 4.4 shows that the predominant ICT use involved specific software in Lesson One (that is while working on the 'blog' site) and Lesson Four (while submitting material on the ENO site and 'chatting'). Generic software was the main focus in Lesson Two and Lesson Three, while the learners created their material (as described in 4.3.1 and 4.3.2).

Lesson Four was structured in such a manner that some of the learners used the generic material while others were tasked with using the specific material, thus both activities occurred simultaneously (L4 OB 4.3.1.1). In one of the groups all the learners wanted to log onto the specific software (ENO website): no one wanted to do the generic work (L4 OB 4.3.1.2). In order to facilitate the group to overcome this impasse, they were not given their password to enter the specific until the generic work was created. Even with this incentive to complete the generic software section, one member would not partake in the group activity and only wanted to enter the ENO site (specific software use). After 20 minutes of the lesson the generic software was only used by the few groups which were slower at the task than the other groups. After 25 minutes all groups were occupied with specific software and were no longer using the generic software (L4 OB 4.3.1.3).

Imison and Taylor (2001) described generic software as being able to free the user from tedious and time-consuming work through the "quick implementation of basic tasks" (p.

56) (section 2.2.3). It was noted during Lesson Two that the use of generic software for the creation of the tables ensured that the work would be conducted much faster than traditional means of table calculations and presentation (L2 OB 2.6.1). This is specifically significant where the learners are well versed in the use of generic software.

In Lesson Three the creation of information on five points relating to traditional versus fast-foods (where generic software was used) had to be completed by all learners before being able to log into the ENO site (specific software). The faster learners entered the site in the thirtieth minute of the lesson (and were able to obtain extra extension) while the slower learners were able to continue with the generic software work (L3 OB 3.3.1.2).

During the initial period of Lesson One, while attempting to get into the 'blog, concentration levels of the learners were high. This was attributed to the anticipation of what a 'blog' would look like, as it was a new concept and skill (L1 OB 1.6.2). It was noted that only three learners had previously learnt or heard about 'blogging' prior to the lesson (L1 OB 1.6.1). As a result of the high concentration levels it was not necessary for instructions to be repeated (during the first part of the lesson) and all groups managed to keep up (L1 OB 1.6.3). This could also be attributed to learners being practised in the initial processes of logging onto the ENO programme at this stage of the year.

In section 2.2.3 it is suggested that the ENO programme is a specific software programme using an integrated learning system (ILS). Yet the data showed that the use of generic software was slightly higher than the specific software. This is an indication that the programme is not relying fully on the ILS but rather incorporating a cross section of applications.

In section 2.2.3 it was shown that Jensen and Simovska (2005) point out that "ICT ... provid[es] means for communication with the world outside the classroom" (p. 317). During the 'chat' session there was obvious excitement, with the entire class enthusiastically interacting and commenting on the other schools' comments (L4 OB 4.6.5). This was highlighted in the second focus group interview (FG2) where the learners were asked about their favourite part and the majority stated: "chat room" (FG2 2.4.8).

As shown in section 2.2.3, Jensen and Simovska (2005) stated that ICT enhances "experimentation with different forms of representation of ideas, opinions and information" (p. 317). The ICT use in the ENO theme allowed for the use of different

forms of representation: that of generic software, specific software, 'chat' sites and 'blogging'.

In section 2.2.3 it is shown that Imison and Taylor (2001) described the real power of ICT as a "tool for providing learning experiences previously impossible, previously impractical and simply previously beyond our imagination" (p. 52). It is beyond the scope of this research to obtain evidence that the activities conducted were previously impossible, impractical and beyond imagination. It is possible to give an indication of (and in some cases confirm) what might not have been achievable in the past.

- ❖ Faster creation of graphs during Lesson One and Two,
- ❖ Obtaining information from international forum (website) for the creation of a document (achieved in Lesson Two),
- ❖ Accessing information from schools internationally for review (obtaining information from the material section of the ENO programme in Lesson Three),
- ❖ Submitting learners' work onto an international forum (ENO material section) for the international community to access, and
- ❖ Simultaneous synchronised communication with learners internationally in an open group forum ('chat' in Lesson Four).

4.5. CONCLUSION

This chapter describes the ENO activities conducted at Treverton Preparatory School. The activities were a visit to a Zulu cultural display, four computer-based lessons and one practical activity. The learners created 'blog' sites, 'material' and 'chat' submissions.

Disadvantages in the ICT use were categorised into: time delays, group dynamic complications and involvement with other computer activities. The strengths and weakness of ICT utilisation (according to Grey) were considered and related to observations noted during the research process. No pernicious effects were noted due to the programme being secure and limited to ENO participants only. This together with the disciplined and guided situation, enabled the learners to participate in meaningful ICT related processes.

The quantitative measurement process showed that the teachers did not require ICT skills during the computer-based lesson for a little over half of the time. As the learners are well versed in the use of generic software, the teachers' ICT skill requirements were reduced during the periods when it was used. Although the teachers' ICT skills were inadequate during the 'blog' periods, it was shown that this was for a short period of time

but it did influence the lesson structure. The learners' variable ICT skills were related predominantly to the specific software use and the normal variances at which learners work.

It was found that although the ENO programme is a specific software programme the use of generic software was slightly higher than the specific software with the generic software being utilised to conduct the required work much faster than traditional means.

In the following chapter data in relation to academic rigour in ICT, the teachers' role within ICT and ICT active learning, is presented and discussed.

5.1. INTRODUCTION

In this chapter the data which was collected in relation to ICT educational processes is detailed, followed by a discussion on this data.

Academic rigour in ICT applications is presented and incorporates the computer/user “balance of control”, the “thinking quadrant” and academic rigour in general. This is followed by a discussion on active learning in ICT and the teachers’ role in the ICT processes.

5.2. ACADEMIC RIGOUR IN ICT/CAI

In section 2.2.3 it was shown that the ICT application should extend beyond the mere technical skills component and dissemination of knowledge to “higher-order activities” (Imison and Taylor, 2001, p. 55) or “academic rigour” (Oppenheimer, 2003, p. 56). Section 2.3.4 shows Claassen’s (2000) concepts of global education. This incorporates skills formation which is “creative thinking and problem-solving skills instead of mere rote learning” (p. 37).

The programme co-ordinator pointed out (In2) that the development of the ENO programme was directly related to Finnish educationalists wanting to develop academic rigour within their ICT programmes and appropriate means of utilising their computers (In2-3.1). His opinion was that the dedicated tasks allowed for building knowledge together, rather than simply ‘browsing’ the Internet (In2-3.2). He noted specifically that computers are a tool for incorporating other offline activities too (In2-3.3).

The two lenses for qualifying academic rigour in the use of ICT/CAI applications which were identified in section 2.2.3 are used to access the ENO theme under review. These are Imison and Taylor’s (2001) “balance of control” lens and Buchanan’s “thinking quadrants”.

5.2.1. “BALANCE OF CONTROL” CONTINUUM DIAGRAM FOR ICT CAPABILITIES

The four CAI lessons were assessed for the predominant positions on the “balance of control” continuum table for ICT capabilities. These positions are shown in figures 5.1 – 5.4 below with an explanation for the location of those positions discussed.

	Computer Controlled			User Controlled
User	Passive/ Receptive a	Responsive/ Selective	Decisive/ Investigative t	Creative/ Instructive
Computer	Instructive/ demonstrative	Informative/ responsive	Co-operative/ Receptive	Constructive/ Adaptive

Figure 5.1: Lesson One - “Balance of control” continuum diagram (L1 OB 1.4.2)

- a) The initial process of the lesson involved logging onto the ‘blog’ site. During this process the computer was the medium of ‘control’, that is fully instructional and the learners (users) were the passive recipients.
- b) The learners conducted a ‘mini-survey’ amongst their class members and used the results to create graphs on the computer. In this process the learners were deciding how to use the software to create the graphs (decisive). The computer was ‘co-operating’ with the learners and ‘receptive’ to their information. Thus this role was positioned in the decisive/investigative and co-operative/receptive section.

	Computer Controlled			User Controlled
User	Passive/ Receptive e	Responsive/ Selective c	Decisive/ Investigative	Creative/ Instructive d
Computer	Instructive/ demonstrative	Informative/ responsive	Co-operative/ Receptive	Constructive/ Adaptive

Figure 5.2: Lesson Two - “Balance of control” continuum diagram (L2 OB 1.4.2)

- c) During the lesson the learners described a traditional meal from their prior knowledge, drawing on the information received whilst on tour or via the Internet and started a report on their own thinking relating to traditional meals versus fast-food. During the process of obtaining information from the World Wide Web the learners were selective and the computer ‘informative’.
- d) During the development of the documents on a traditional meal, the learners were creative in deciding on the document layout and which pictures to be incorporated. The creative processes are evident in the variations of the contents and layout of the documents. During the process the computer was ‘adaptive’ to the learners’ directives.
- e) For a brief period the learners used the computer prompts (instructions) to save their documentation. Thus the learners were receptive in this process.

	Computer Controlled			User Controlled
User	Passive/ Receptive	Responsive/ Selective g	Decisive/ Investigative f	Creative/ Instructive
Computer	Instructive/ demonstrative	Informative/ responsive	Co-operative/ Receptive	Constructive/ Adaptive

Figure 5.3: Lesson Three - “Balance of control” continuum diagram (L3 OB 3.4.2)

- f) Learners reported on their personal opinions on traditional meals versus fast-foods. During the process the learners were investigating their own personal interpretations and were being decisive on how to utilise the computer software to create their document.
- g) While assessing information on the other countries’ traditional meals the learners were selective regarding the information they accessed. The computer was supplying the information and was ‘responsive’ to the learners’ processes.

	Computer Controlled			User Controlled
User	Passive/ Receptive i	Responsive/ Selective j h	Decisive/ Investigative	Creative/ Instructive
Computer	Instructive/ demonstrative	Informative/ Responsive	Co-operative/ Receptive	Constructive/ Adaptive

Figure 5.4: Lesson Four - “Balance of control” continuum diagram (L4 OB 4.4.2)

- h) The learners (in groups) selected the material created in previous lessons to be collated so the computer was ‘responsive’ to the learners’ processes.
- i) The learners submitted the material onto the ENO site, by following the computer instructions; thus the learners were receptive.
- j) For the second part of the lesson the learners entered the ‘chat’ site. During the ‘chat’ process the learners had to respond to other participants in the ‘chat’ site. The computer was supplying the information for the ‘chat’.

The positions identified for the four lessons are collated and shown in figure 5.5 below.

		Computer Controlled			User Controlled
User		Passive/ Receptive	Responsive/ Selective	Decisive/ Investigative	Creative/ Instructive
Computer		Instructive/ demonstrative	Informative/ Responsive	Co-operative/ Receptive	Constructive/ Adaptive
Lesson One		a		b	
Lesson Two		e	c		d
Lesson Three			g	f	
Lesson Four		i	j h		

Figure 5.5: “Balance of control” continuum diagram - collation of the four lessons

Imison and Taylor (2001) indicated that most applications lie somewhere between the right and left of the continuum. Figure 5.5 indicates: (i) All positions on the continuum were occupied during the theme. (ii) Each lesson occupied more than one position of the continuum. This is substantiated by Imison and Taylor when they stated “some applications are designed to promote several different activities and could therefore occupy more than one position on the continuum” (p. 70).

The “balance of control” continuum table shows that the computer-based section offered opportunities for the receptive technical skills component (when the computer was in ‘control’ or instructional), investigative learning processes and creative learning. Imison and Taylor (2001) (section 2.2.3) stated that tasks which were slow to accomplish when manually conducted could be done quickly in the ICT forum thus allowing for more complex tasks to be tackled. Their “balance of control” continuum indicates that “more complex tasks” were conducted during the CAI lessons (that is, the activities which were placed towards the right of the continuum).

It must be noted that the user/computer “balance of control” continuum had a distinct limitation for reviewing academic rigour. It could only be utilised for the interpretation of the computer-based lessons (as it measured when the computer versus the learner was in ‘control’). It does not accommodate the associated and extended activities that develop out of or accompany the ICT use. In the ENO theme’s case this extended activity was the practical lesson.

Imison and Taylor (2001) noted that “the further to the right along the continuum an activity is placed, the ... more generic [the] software” (p. 71). Using the figures taken from Table 4.4 (section 4.4.3) the following information is related to the above “balance of control” continuums.

- ❖ In Lesson One the specific software utilisation (59%) occurred while entering the ‘blog’ site or position (a). The generic software (24%) related to the creation of the graphs, position (b).
- ❖ In Lesson Two (e) it was noted that this position was only occupied for a brief period. This is backed by the specific software being utilised for 3% of the lesson while generic software was utilised for 81%.
- ❖ In Lesson Three the specific software utilisation (29%) occurred during the period when the learners were viewing material from other counties (or position (g)).
- ❖ In Lesson Four the specific software utilisation was 71% and related to the placing of the positions on the left of “balance of control” continuum. The generic software use (23 %) occurred while the learners were collating the material submissions as shown in position (h), the position furthest on the right.

This evaluation shows that the specific software utilisation periods resulted in positions being on the left of the continuum and the further to the right of the continuum the more the generic software was used. These points give an indication that the use of generic software by the ENO programme facilitated a more constructive learning environment, where the learner is in the ‘driving seat’ (right of table), than the specific software.

5.2.2. “THINKING QUADRANTS”

For each lesson the appropriate positions on the “thinking quadrant” were plotted and shown in figures 5.6 – 5.10. An explanation for the positioning within these thinking quadrants is discussed thereafter.

Lesson One

The initial process of the lesson was to log onto the ‘blog’ site. As this was not dealing with information this has not been included in the “Thinking quadrant”.

- a) The learners collected information from the ‘mini-survey’ for the creation of the graphs. The learners were involved with

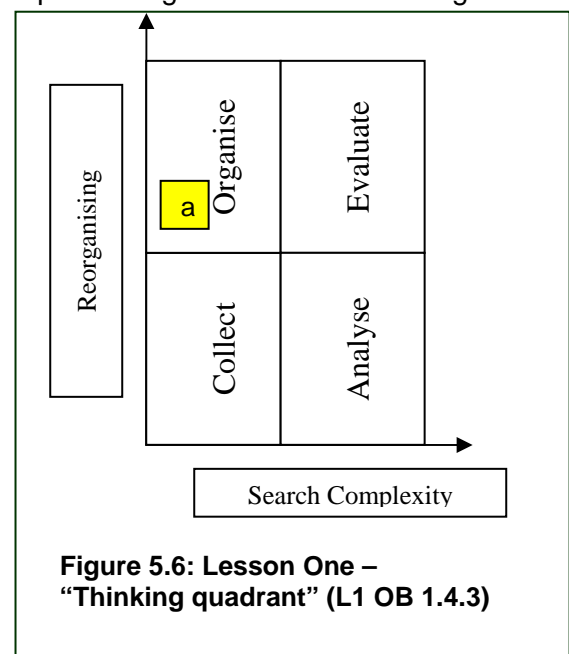


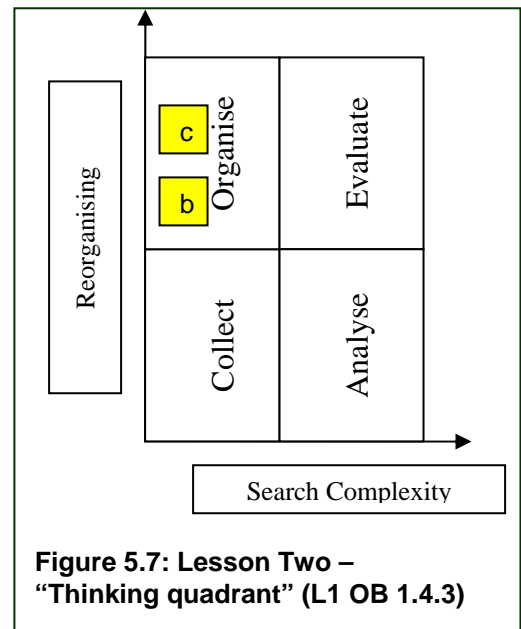
Figure 5.6: Lesson One – “Thinking quadrant” (L1 OB 1.4.3)

reorganising the information – but the search complexities were low. The process was thus towards the upper end of the reorganising axis but lower end of the search complexity axis which resulted in the position being in the organising quadrant.

Lesson Two

- b) During the first part of the lesson the learners described a traditional meal from their prior knowledge, drawing on the information received whilst on tour or collected from the Internet. The search complexity requirements were not particularly high as the learners were not required to evaluate the information, but to ensure the information matched the task, a higher reorganising requirement. Thus the position is in the 'organise' quadrant.

- c) While the learners were creating the report on their perceptions of traditional meals versus fast-food, as the information was easily available (their own interpretations), their search requirements were low. They were required to reorganise the information into a structure, thus the position is also placed in the organising quadrant.



In section 2.2.3 it is explained that Aivazidis, Lazaridou and Hellden (2006) pointed out that learners require “skills for locating, evaluating and selecting relevant and appropriate information” (p. 45). During the analysing of the groups’ documentations created during this lesson (LS2 G1 and LS2 G2) it was shown that although the learners relied on their prior learning to create some of the information in the document the use of appropriate photographs and obtaining of some of the required information was evidence that the learners were able to locate and select relevant and appropriate information (LS2 G1 1.4.2).

Lesson Three

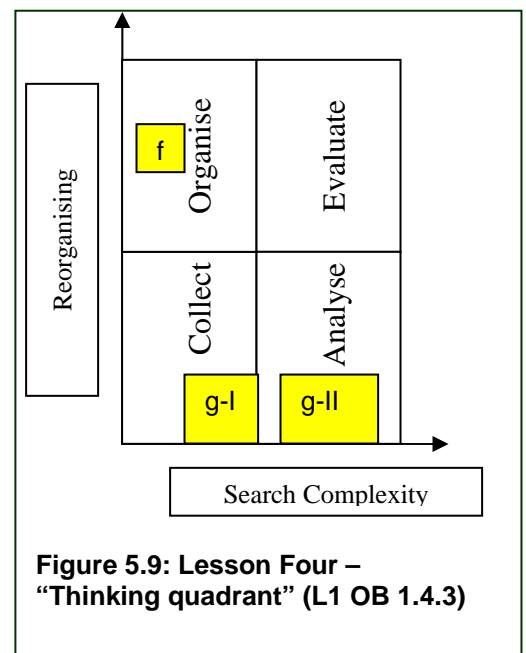
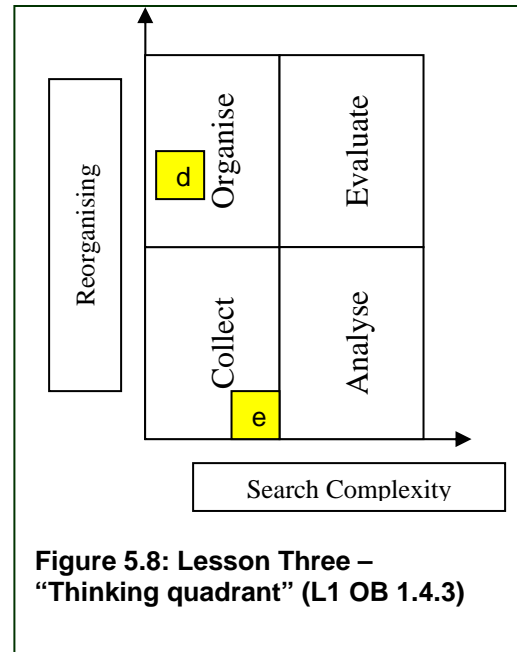
- d) The initial process of the lesson was a continuation of Lesson Two, where the learners created documentation on their perceptions on traditional meals versus fast-food. The position in the “thinking quadrant” is thus a repeat of Lesson Two point (c).

- e) Once the learners had completed the task described in (d) they viewed material submitted by other countries. Although the learners were required to do some searching (as in deciding which schools information to access) the search complexities were low. The learners were not required to reorganise the information. The position is placed in the collect quadrant.

Lesson Four

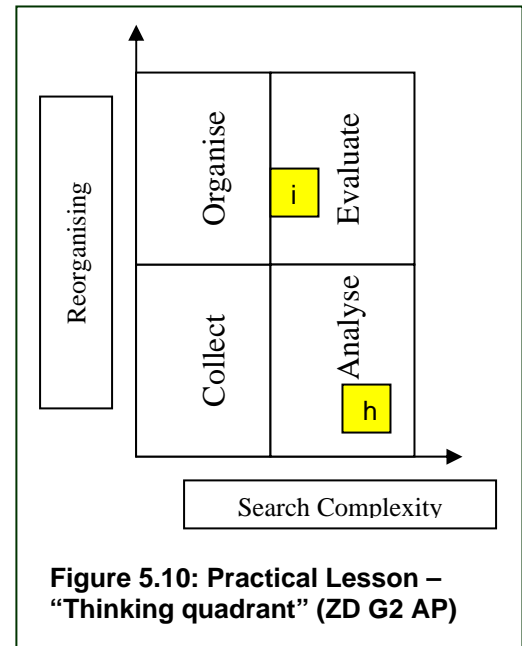
- f) Initially the learners collated and submitted their work created in the previous lessons onto the ENO website. The collation process required a high reorganising process but the search complexity was minimal. Thus the position is located in the organising quadrant.
- g) Once this was accomplished the learners entered the 'chat' room. During the 'chat' the learners were not required to reorganise the information. The activity belongs in two quadrants:
- I. Low on the search complexity axis where the learners were conducting basic 'conversation' which did not require any analysing.
 - II. The learners were also involved in analysing of information received processes during the 'chat'.

As pointed out in section 3.3.3 the 'chat' conducted in Lesson Four was, unfortunately, not archived and thus it was not possible to do an analysis thereof, and not possible to assess the level of open general 'chat' as opposed to discussions relating to the topic. Indications of the content were given in focus group two. Firstly a learner said: "I said we eat biltong, and here is a picture of biltong and he said that's disgusting" and "I sort of understand it because they had never seen ... or tasted it" (FG2 2.2.7). Secondly it was stated "they [the other learners] wanted to kind of go off the subject all the time, so it was ..." (sentence was not finished) (FG2 2.5.1). These are the only indications that there were incidences of co-construction and meaningful communication during the chat.



Practical Lesson

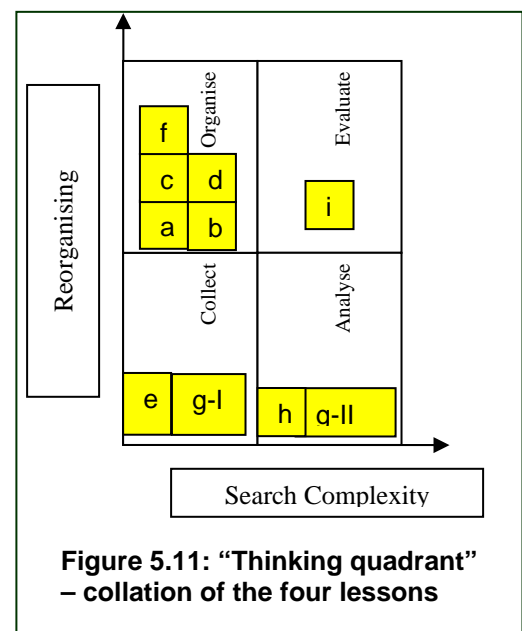
- h) Prior to the lesson, information on the appropriate recipe, ingredients, methods and cooking processes had to be obtained. The search complexities were high but reorganising of the information low, so the position is in the analyse quadrant.
- i) During the cooking process, the learners were assessing the information on the taste, vision and temperature of the food based on the prior information received during (h). The information had to be re-evaluated and reorganised according to the situation observed thus the position is in the evaluation quadrant.



The positions in the “Thinking quadrants” identified for the four CAI lessons and the practical lesson are collated in figure 5.11 and indicate: (i) The collect quadrant was occupied for two out of a possible ten occasions (20%). (ii) The analyse quadrant was occupied for 20% of the occasions. (iii) High reorganising processes with low search complexity (organising quadrant) was occupied on five occasions (50%). (iv) The evaluate quadrant was occupied for 10% of the occasions.

Buchanan (2006) used the “thinking quadrant” to measure academic rigour in the use of ICT to ensure that the computer is not reduced to a word processor and/or an Internet search engine. The use of these quadrants as a ‘tool’ to interpret the data indicates that both lower-order (cut-and-paste type activity) processes and higher-order (information evaluated and matched to the task) processes were achieved with a range of applications between the two extremes. It shows that the ENO theme was able to address Buchanan’s statement that “carefully crafted program[m]es” (p. 18) allow learners to interpret information and make up their own minds.

Fridman, Dasoo and Basson (2003) (section 2.2.3) stated that ICT allowed learners to evaluate their own performance more accurately. The form teacher (In1) stated that in his view the ENO programme encourages learners to evaluate their lifestyles



(“evaluation of current lifestyles ... from just a case of: ‘This is what other people do’ to ‘What I’m doing’, ‘Why I am doing it’ ... to ‘How they [learners] live and assess themselves’”) (In1-2.1). This statement is backed by evidence of evaluation as reported above.

Aivazidis, Lazaridou and Hellden (2006) suggested that the use of ICT in schools should be based on: (a) educating the skills of communication, which was achieved during the chat session, (b) critical thinking, which is evident from the thinking quadrant analysis which indicates that learners were involved in analysis and evaluation processes, (c) independence which learners developed whilst obtaining information for their material submissions and preparation and creation of the meal in the practical lesson, and (d) responsibility to ensure “effective learning”, which is indicated in the “balance of control” (in creative, decisive and investigative processes) and “thinking quadrant” (in increased reorganising and search complexity components). Aivazidis et al. (2006) point out that: learners require “skills for locating, evaluating and selecting relevant and appropriate information” (p. 45). The “thinking quadrants” measured the location (higher search complexities) and selection (higher reorganising processes) of information to give an indication of the analysing, organising and evaluation skills.

5.3. ICT ACTIVE LEARNING

5.3.1. ICT ACTIVE LEARNING CYCLE

Imison and Taylor (2001) developed an ICT active learning cycle (described in section 2.2.5.1). The categories from their cycle were used as a lens to observe and measure the computer-based lessons. The categories created were: “not applicable” (periods when learners were not occupied with the CAI lesson e.g. when the teachers were explaining the activities to be conducted), “do” (independent or collaborative activities for new skills and/or concepts), “review” (reflect, ideas compared, shared, results formulated, analysed and interpreted), “learn” (extract and internalise meaning, information absorbed, meaning making), and “apply” (applying what was learnt). The figures are shown in Table 5.1 followed by examples and the descriptions.

It must be noted that this active learning cycle ‘tool’ was not utilised for the practical lesson as the data source of annotated notes on the photographs did not supply sufficient information. Each section of the cycle would have been addressed during the lesson but a means of measuring the periods was not possible with the limited information.

Table 5.1: Learning cycle calculations

	Lessons	%	Average	Excluding the “not applicable” periods	
Not applicable	Lesson One	14 %	12.5 %		
	Lesson Two	13 %*			
	Lesson Three	16 %			
	Lesson Four	7 %		Per lesson	Average
Active/do	Lesson One	50 %	40.25 %	58 %	45.5 %
	Lesson Two	30 %*		35 %	
	Lesson Three	10 %		12 %	
	Lesson Four	71 %**		77 %	
Reflect/review	Lesson One	19 %	41.5 %	21 %	47.5 %
	Lesson Two	57 %*		65 %	
	Lesson Three	68 %		81 %	
	Lesson Four	22 %**		23 %	
Learn/extract	Lesson One	9 %	3.75 %	11 %	4.5 %
	Lesson Two	Not seen		Not seen	
	Lesson Three	6 %		7 %	
	Lesson Four	Not seen		Not seen	
Apply	Lesson One	8 %	2 %	10 %	2.5 %
	Lesson Two	Not seen		Not seen	
	Lesson Three	Not seen		Not seen	
	Lesson Four	Not seen		Not seen	
		Total	100 %		100 %

* During Lesson Two, when the video camera was not working, the learners were creating their presentation on a traditional meal. There would have been periods which would have been categorised into ‘not applicable’, ‘active/do’ and ‘reflect/review’ categories. An estimation of time allocation to these sections is not possible, thus the percentages of time here only refers to the period which was video taped.

** As shown in 5.2.2 it was not possible to assess when the learners were fully occupied with reviewing of information during the ‘chat’ in Lesson Four, or when they were passively involved in informal communication. For the purpose of the active learning cycle, the ‘chat’ period was divided equally between the ‘review’ and ‘do’ applications.

In Lesson One (L1 OB) the ‘do’ measurements incorporated the initial process of creating the ‘blog’ (section 4.3.1) as the learners were carrying out activities as an introduction to a new skill (L1 OB 1.5.4.2) and the submission (or attempting to submit) of information onto the ‘blog’. The reviewing of the information from the ‘mini-survey’ amongst the class and the reorganising into a format which could be viewed easily and interpreted, was measured as ‘review’ (L1 OB 1.5.4.3). The ‘learn’ (making sense or meaning) occurred when the groups were drawing on the results of the mini-survey to start their documentations (L1 OB 1.5.4.4). ‘Apply’ occurred when the learners utilised the information from the ‘mini-survey’ to create their graphs (L1 OB 1.5.4.5).

During Lesson Two (L2 OB) the “do” periods occurred while the learners were utilising the computers to save their work (active independent work) (L2 OB 2.5.4.2) and while attempting to submit their material onto the ‘blog’ (L2 OB 2.5.4.4). The review periods were when the learners were creating their documentation on the traditional meals and the traditional meals versus fast-food (L2 OB 2.5.4.3).

In Lesson Three (L3 OB) the “do” periods were measured while the learners were saving their information on the computer (L3 OB 3.5.4.1). The review periods related to the completion of the traditional meals versus fast-food documentation and when viewing the submissions created by other schools (L3 OB 3.5.4.2). The ‘learn’ stage was allocated to the periods when the learners showed obvious internalisation or interpretation of their discussion, for example a learner expressed his views on the quantity (“everything is so tiny”) and quality (“I think they don’t use actual meat and they add the colourants and flavourings”) of fast-food.

In Lesson Four (L4 OB), the “do” activities occurred while the learners were collating their material and submitting these onto the ENO site (L4 OB 4.5.4.1). Reflection occurred during the ‘chat’ period but as shown in table 5.1 (and 5.2.2.1) the exact period of review during the ‘chat’ is not measurable (L4 OB 4.5.4.2).

The ‘review’ category was the predominant activity in the ENO programme (47.5 %). The sections where the learners carried out activities as an introduction to new skills or concepts and active independent work occupied 45.5% of the time while the ‘learn’ and ‘apply’ sections received very low representation. Thus the use of the cycle as an interpretation lens indicated that the ENO theme allowed for reviewing/reflection and active independent processes with limited movement around the cycle. The ENO programme 2006/2007 stated that “the emphasis [is] on local action and/or research” (section 1.3.1). The predominance of the review section during the CAI lessons shows that learning by researching occurred.

By utilising the measurement of time as a method to obtain information on the active learning cycle stages, it was shown that it was possible to measure the periods when the learners were: (i) involved in independent activities, (ii) reviewing, comparing or sharing of ideas, formulating results, analysing and interpreting, and (iii) applying what was learnt. I, firstly, noted that the method of observing the video did not allow for an accurate assessment of when the internalisation periods occurred (L4 OB 4.5.4.3 and L3 OB 3.5.4.3). Imison and Taylor (2001) indicated that “the learning cycle is perhaps the

most difficult to describe” (p. 56). This was the case in this research especially as a true reflection of the ‘learn’ period was not obtainable with the data collection method used. Other more qualitative methods of assessing the lessons could have given more in-depth information on the internalisation of meaning. Secondly, the differentiation between the ‘learn’, ‘review’ and ‘do’ categories implies that learning does not happen during the reviewing and doing stages but this cannot be the case, so an accurate measurement of the entire learning periods was not obtained.

During the first interview the form teacher stated that the “real test” would be if ENO is able to encourage “internalisation” within the learners and “transform” the “way [they] do things” and the way they “think about things” (described in section 2.2.5.1). The form teacher was referring to the long-term impact the programme had on the learners while the active learning cycle measurements of internalisation and application were restricted to the specific lessons.

During the theme, two activity sheets should have been completed by the learners - a two-page recipe template and a twelve-page ENO learning diary template (Appendix 2 - ENO T4). On a weekly basis the learners were to fill in the diary template with details of the learning of the week, points they did not understand and concepts they would remember. At the end of the theme the learners were to indicate what they remembered, goals achieved, any concepts or skills they had learnt and to identify any further learning on the theme they would like. The ENO diary was to be filled in on the template or on the ‘blogs’. Due, predominantly, to time constraints these activities were not achieved during the lessons at Treverton. During the research process it was identified that if these activities had occurred the active learning cycle ‘learn’ (or “internalisation of meanings” (Imison and Taylor, 2001, p. 56)) section would have been strengthened.

5.3.2. INSTRUCTION, CONSTRUCTION AND CO-CONSTRUCTION LEARNING

The three types of learning as described by Imison and Taylor (2001) (section 2.2.5.2) were measured during the CAI lessons. The measurements were: instructional (learning by being shown or told), construction (active experiences, information and ideas collected, developed and processed) and co-construction (socio-cultural theories of communication and interaction with others and engaging in discussions and/or reflection). The calculated percentages of the times per category and the averages thereof are shown in table 5.2 below. Descriptions of the observations relating to these categories are discussed thereafter.

Table 5.2: Instruction, construction and co-construction types of learning calculations

Involvement in CAI activities	Lessons	%	Average
Instructional	Lesson One	48 %	30.25 %
	Lesson Two	13 %	
	Lesson Three	Nil	
	Lesson Four	60 %	
Construction	Lesson One	35 %	46.5 %
	Lesson Two	87 %	
	Lesson Three	64 %	
	Lesson Four	Nil	
Co-construction	Lesson One	17 %	23.25 %
	Lesson 2	Nil	
	Lesson Three	36 %	
	Lesson Four	40%*	
		Total	100 %

*As explained in 5.2.2 an accurate measurement of co-construction as opposed to general communication during the 'chat' activity was not possible. As with the active learning cycle, the 'chat' co-construction period is halved. The general communication section of the 'chat' is not included in either instructional or construction (L4 OB 4.4.1.3).

In Lesson One (L1 OB), the instructional section occurred when the learners had to follow the computer's instructions in order to enter the 'blog' site (L1 OB 1.4.1.2). Although the learners were grouped during this stage (discussed in section 4.3.1) the activities did not require co-construction as one learner operated the computer while others watched the processes (L1 OB 1.4.1.1). The construction section occurred during the creation of the graphs (L1 OB 1.4.1.3). Co-construction occurred while the learners were obtaining the information from the class on the traditional meals (L1 OB 1.4.1.4).

The predominant categorisation during Lesson Two (L2) was construction (including the period when the camera was not operational). This is when the learners were creating their information on traditional meals and traditional meals versus fast-food (L2 OB 2.4.1.1). The CAI instructional period was during the saving of the material onto the intranet section (L2 OB 2.4.1.3).

In Lesson Three (L3) the construction phase occurred during the documentation of their information on traditional meals versus fast-food. Co-construction occurred whilst the learners were viewing submissions from other schools. They reported and generally interacted with each other on their thoughts on the information presented by the other schools (L3 OB 3.4.1.1).

While the learners were presenting their work on the ENO material webpage (in Lesson Four (L4)) the learners were following the computer's instructions (L4 OB 4.4.1.1). The 'chat' period was divided between co-construction and general communications.

To back the concept of co-construction within the ICT use, the ENO programme co-ordinator suggested that we should not refer to "information society" (as in Information and Communication Technology) but rather to "interaction society". He was suggesting we refer to ICT as Interaction and Communication Technology (In2-3.6).

The calculations above show that the ENO programme allowed for all three types of learning, with construction occurring for almost half of the time (46.5%).

When comparing the information from this lens and that of the active learning cycle, the high percentage of time allocated to construction and co-constructive learning (69%) is contradictory to the low "learning" (4.5%) shown in the active learning cycle (section 5.3.1). To explain this contradiction it must be noted that the active learning cycle (1) did not allow for an accurate measurement of when internalisation occurred, and (2) by distinguishing between learning, reviewing and doing stages, the learning which occurred during the reviewing and doing processes was not taken into consideration (pointed out in section 5.3.1). Thus a comparison between the two measurement processes is not achievable. Fortunately, due to the triangulation of methods (rather than relying on one of the processes), greater insights into the ENO theme were achieved.

Imison and Taylor (2001) stated that the types of programmes which predominantly utilise instructional learning are the drill and practice type programmes. They state that integrated learning systems (ILS) predominately rely on this form of learning but not necessarily entirely (section 2.2.5.2). In section 2.2.3 it is shown that what they classify as ILS would incorporate the ENO programme. The figures above show that although ENO is classed as an ILS programme it does not predominantly use instructional learning processes. Imison and Taylor also stated that "co-construction has less to do with the software itself than the context the teacher creates for its use" (p. 66). In the ENO situation (as shown in the calculations above) it could be stated that the programme facilitated the teachers' ability to create the context for co-constructive learning.

It must be noted that the instructional category here relates to the learners' being instructed by the computer and cannot be related to the teachers' instructional category

(shown below). The teachers' instructional category includes periods when the teachers were instructing the learners on what was to be done or achieved.

5.4. TEACHERS' ROLE WITHIN ICT PEDAGOGY

The roles the teacher/s played in the teaching and learning processes of the lessons were observed. I was the teacher directly involved in the lessons, but on occasions the form teacher and/or IT teacher joined in the teaching processes either for additional assistance or when they wanted to add information on the theme. The amount of time (from all teachers) which was spent on instruction, information "giving", facilitation of the group, facilitation of individuals and the auxiliary periods, was measured. Any additional information on the teachers' role was noted. During Lesson Four due to the placement of the video camera, there was a period (4.45 minutes) where the teachers' role was not visible or could not be heard.

The instructional process refers to the periods when the teacher/s were instructing the learners what had to be done. For instance the teacher in Lesson One instructed the learners what the expected outcomes of the lesson would be (to enter information on the 'blog'), instructed the learners to get into groups, for one learner in the group to log onto the Internet, supplied the Internet address and showed the path to be followed in order to enter the 'blog'. Once this was achieved the teacher instructed the learners on the next process in the lesson, the gathering of the specific information from the class and how to report this information onto the 'blog'. The final instructional role was to instruct the learners where to save their work.

The information section refers to the sharing of information which pertained to the theme. For instance in Lesson Two during the discussions on traditional meals versus fast-food I informed the learners about the two types and the manner in which the two could be compared; and the form teacher gave some insight into the principles behind the two.

The facilitatory process (group, individual traditional teaching or individual ICT related) took place when the teachers assisted the learners to achieve the objectives. For instance I facilitated the group to vote during the 'mini-survey' in Lesson One. Individual facilitation was in the form of either relating to traditional teaching or specifically relating to ICT assistance. For instance when the teachers helped a learner with creating his/her points on the traditional food versus fast-food, this was classed as traditional teaching facilitation. Whereas, when the teachers assisted a learner to save his/her work on the intranet this was recorded as ICT assistance.

The auxiliary periods were when the teachers were not actively engaged in the lesson. This would have occurred while the learners were creating their work and did not require assistance.

The time spent on each of the teacher roles was converted to a percentage of the total lesson and an average for all four lessons calculated. The roles are divided into the teacher-centred, facilitatory and learner-centred with the total percentage of time for each calculated. The calculations of the teachers' roles are summarised in Table 5.3 below.

Table 5.3: Calculations of the teachers' role during the ENO lesson

Teachers' Role			Average	Roles
Instructional	Lesson One Lesson Two Lesson Three Lesson Four	37 % 7 % * 6 % 23 %	18.25 %	Teacher-centred 32,5%
Information	Lesson One Lesson Two Lesson Three Lesson Four	5 % 25 % 17 % 10 %	14.25 %	
Facilitatory - group	Lesson One Lesson Two Lesson Three Lesson Four	25 % 3 % 22 % 2 %	13 %	Facilitatory 42%
Facilitation of individuals – traditional teaching facilitation	Lesson One Lesson Two Lesson Three Lesson Four	Nil 25 % * 15 % Nil	10 %	
Facilitation of individuals – ICT one-to-one assistance	Lesson One Lesson Two Lesson Three Lesson Four	20 % 2 % 15 % 39 %	19 %	
Auxiliary	Lesson One Lesson Two Lesson Three Lesson Four	12 % 34 % 25 % 16 %	21.75 %	Learner-centred 21.75%
Unable to see teachers' role	Lesson One Lesson Two Lesson Three Lesson Four	Nil Nil Nil 8 %	2 %	2%
		Total	98.25% %	98.25%

* During the period in Lesson Two when the video camera was not working, the perceived predominant teachers' role categorisations were initially instructional, followed by a predominantly auxiliary role with some facilitation of individuals but in the traditional teaching system – rather than ICT - as the learners were using the generic software and they are practised in this form of ICT utilisation (L2 OB 2.2.1).

In Lesson One the teachers' role was predominantly instructional followed by group facilitation and ICT one-to-one assistance. It was shown in section 4.4.3 that the ICT use (Table 4.4) during Lesson One predominantly pertained to specific software use. It was observed during the lesson, that when the ICT requirements were orientated towards the use of the specific software, the teacher's instructional, group facilitation and ICT related one-to-one assistance was high (L1 OB 1.2.2).

In Lesson Two the teacher's auxiliary role was significant. The auxiliary role is attributed to the learners' ICT skills being adequate while working on their material submissions. In section 4.4.2.2, Table 4.3 shows that the learners' ICT skills were adequate for 93% of the time, as the predominant focus related to generic software use (81% of the time, Table 4.4). The teachers' role (when not auxiliary) focused on information giving and individual facilitation, and pertained predominantly to traditional teaching facilitation rather than ICT related facilitation (L2 OB 2.2.2 and 2.2.3).

During Lesson Three none of the teachers' roles dominated. The teachers' facilitation role related to the discussion periods and thus traditional teaching methods were used (L3 OB 3.2.1 and 3.2.2). The form teacher joined in the traditional teacher facilitation – initially to facilitate individuals and later for group facilitations (L3 OB 3.2.3). The period spent on ICT related teaching was limited to the end of the lesson when learners required one-to-one facilitation to save their work on the intranet (L3 OB 3.2.5).

In Lesson Four (L4 OB) the initial facilitation of individuals predominantly related to assisting with the specific software requirements such as supplying passwords to enter the ENO material or 'chat' room (L4 OB 4.2.1). It was noted during the lesson that as the specific material use increased, so did the required teacher ICT instruction or ICT related one-to-one facilitation (L4 OB 4.2.2). The class received instruction on 'chat' etiquette (L4 OB 4.2.3). The teachers' ICT facilitation was decreased once the groups were engaged in the 'chat', the learners required little assistance, even though it was specific software use (L4 OB 4.2.4).

Imison and Taylor (2001) (section 2.2.4) pointed out that the use of ICT did not reduce the role of the teacher. Table 5.11 shows that for 74% of the time the teachers were involved in instructional, informational (teacher-centred) and facilitatory roles. The learner-centred period when the teachers were not directly involved in teaching occurred for 21% of the lessons. This shows that the teachers' role was not reduced. Buchanan (2006) advocated that the use of ICT freed the teacher from mundane tasks enabling the

teachers to increase their facilitatory roles (section 2.2.4). Table 5.1 shows that 42% of the time, the teachers were fulfilling a facilitatory role.

It was observed that software use affected the role the teacher played in the lesson. When the ICT requirements were orientated towards the use of the specific software, the teacher's instructional, group facilitation and ICT related one-to-one assistance was high. When generic software was utilised the teachers' role pertained predominantly towards traditional teaching facilitation. Imison and Taylor (2001) implied that this scenario could occur when they pointed out that the one-to-one requirements decrease as the learners become more ICT skilled (section 2.2.4).

Imison and Taylor (2001) stated that one of the major challenges facing a teacher when using ICT is to help everyone when one-to-one assistance is required. Table 5.11 shows that the percentage of time that learners required this kind of assistance was only 19%. It was, however, pointed out in section 4.4.1 (Time delays) that during Lesson Four learners were delayed from entering the 'chat' site before they had received the ICT related one-to-one attention.

According to Jensen and Simovska (2005) teachers must have the competence to improvise if technology fails. In section 4.3.1 it is shown that I had to alter the lesson plans due to the inability to enter the 'blog' site.

5.5. General discussion on teaching and learning through ICT

Jain (2006) (section 2.2.3) stated that the key to ICT is to facilitate a culture of: (i) information sharing, (ii) relationship building, and (iii) trust. The ENO theme achieved: (i) sharing of information with the learners' submissions on traditional meals from different countries which could be viewed by all participants and a sharing of information on cultural and indigenous knowledge amongst the Treverton learners, (ii) an indication of the building of relationships was noted in the international communications created, that is the 'chat' and by exposure to other people's points of view and reducing international and intra-national isolation, (iii) trust can be seen as the opposite to Van Niekerk's prejudice and suspicion among ethnic groups (described in 2.3.1). The ENO theme facilitated cultural understanding by exposure to other people's points of view and reducing international level and intra-national isolation. This was backed by the form teacher who stated the learners were "confined" in a limited sphere of influence and experienced, a "narrow world". He says ENO opens them up globally (In1 Tr 4.4).

5.6. CONCLUSION

Two lenses for measuring academic rigour were used, the computer/user “balance of control” and “thinking quadrants”. The “balance of control” continuum table gave evidence that during the CAI lessons, the ENO theme offered opportunities for technical skills and middle-level thinking skills but did not require the learners to fully ‘instruct’ the computer. The “thinking quadrants” showed that the ENO theme allowed for a full range of information collection, analysing and organising, with evaluation occurring during the practical lesson.

It was shown that the ENO theme was able to address the concern that utilisation of ICT in schools should be based on teaching the skills of communication, critical thinking, independence and responsibility to ensure “effective learning”. Information sharing occurred amongst the Treverton learners and via the submissions and viewing of material on the ENO site.

Evidence of all elements of the active learning cycle was presented with an emphasis on reviewing or reflection, although it was shown that ability to assess when the learners were internalising information was limited. The ENO theme allowed for a spread of the instructional, constructional and co-constructive learning processes. The programme is structured so that co-construction is not entirely reliant on the teacher creating the context to achieve this learning process.

It was shown that the teachers’ role was not reduced due to ICT use but that the different software used affected the role the teacher played in the lesson. When generic software was used the teachers’ role was predominantly traditional teaching facilitation while, when specific software was used, the teachers’ instructional, group facilitation and ICT related one-to-one assistance was higher. Despite the concerns around the requirements for one-to-one assistance when using ICT, this element occurred for a short period with the traditional teaching and group facilitation requiring more attention.

In this chapter the data relating to the teaching and learning through ICT was presented. In Chapter 7 these teaching and learning processes will be reviewed in relation to the SADC REEP Education for Sustainable Development dimensions on conceptualising and strengthening teaching and learning processes. In the following chapter (Chapter 6) the data relating to multicultural, indigenous knowledge and global education learning is presented and discussed.

6.1. INTRODUCTION

In this chapter data representing the teaching and learning processes specific to the ENO theme of “this is my culture” is presented and discussed. The discussion is structured under the themes of multicultural education, indigenous knowledge and global education – educational processes which are pertinent to the practice of Education for Sustainable Development.

6.2. MULTICULTURAL EDUCATION and INDIGENOUS KNOWLEDGE (IK)**6.2.1. CULTURAL PRACTICES**

In Chapter 2.3.3 it is highlighted by Sefa Dei, Hall and Goldin Rosenberg (2000) that indigenous knowledge includes social practices in our societies. This section presents cultural social practices which were highlighted during the ENO programme and considers the way the learners engaged with these practices. This means a consideration of whether these practices were integrated as content knowledge or whether learners were engaged in processes of cultural knowledge construction as described by Ramsey, Williams and Vold (2003) (see Chapter 2.3.2).

The sharing of social cultural practices and indigenous knowledge was evident when the learners related the making of beer from mealies. In the first focus group interview a learner described his observation of the making of traditional beer from mealies. The learner said “they take a big stick and they start crushing [the mealies]. Then they mix it up and they leave it to set for two days” (FG1 1.3.4). He stated that “there are ways it should be done, for instance, men should not go into the kitchen. They [the men] should work in the garden and be with the cattle and not in the kitchen” (FG1 1.3.5). In the learners’ submissions (LS2) the learners referred to the brewery being distinctive amongst the huts as it would be the only semi-thatched hut. They showed that they understood the reason for this by saying this “allow[s] the smoke from the fire to escape ensur[ing] a good supply of oxygen to the mash” (LS2 G1 1.3.1.2.1). They showed their own personal perception when they said “Zulu beer tastes really gross, it is quite bitter” (LS2 G1 1.3.1.2.2). The Learners’ Submissions Two (Groups 1 and 2) gave descriptions of the traditional means of preparing the beer and ‘amas’ (LS2 G1 1.3.2.1 and LS2 G2 2.2.2.1). In Learners’ Submissions Two - Group One (LS2 G1) the learners indicated that making of beer is the role of women (LS2 G1 1.3.2.3). Learners’ Submission Two – Group Two highlighted that (a) after consumption, the vessel is immediately refilled and

is never cleaned, (b) making the beer is the duty of the women, (c) when the beer is served the king will taste it first to make sure it is fine and then the king will pass it on, and (d) beer is drunk out of a calabash (LS2 G2 2.2.2.3). During the practical lesson judging process the groups all gave renditions and/or re-enacted traditional social practices (for example Group Two and Four re-enacted fetching water in calabashes and singing of related songs during the processes). Some of the groups included these renditions in their meal presentation (for instance Group Two presented Zulu Beer and explained the traditional customs associated with the drinking thereof (ZD G2 AP)).

Other instances of content integration of social cultural practices are discussed below. During the first focus group interview a learner expressed an opinion that “some Zulus believe when you are slaughtering a cow and you stab it more than once, and it does not die instantly, you are not a man” (FG1 1.2.10). In the Learners Submissions Two - Group One (LS2 G1) the learners (a) supplied a description of the roles played by women during traditional meal making for a wedding (for example, “at a Zulu wedding, the ladies prepare a lot of meat in the pots”), (b) highlighted the collection of water by documenting “Zulu maidens walk for about two kilometres to fetch water from the closest rivers”, (c) introduced concepts of traditional courtship rituals by explaining “Zulu warriors are only allowed to propose to a woman at the river”, and (d) highlighted the use of wooden cutlery (LS2 G1 1.3.2.3). The documents from Learners’ Submission Two – Group Two indicated that “eating is hygienic, [as] each member us[es] his own plate and utensils. Hands are washed before eating and mouths are washed after[wards]” (LS2 G2 2.2.2.3). During the focus group interview an isiZulu speaking representative related hearsay stories on social cultural practices within the Afrikaans culture when he said “because the Afrikaans shoot pigs for weddings” (FG1 1.2.8). The way of working with indigenous knowledge in the above two paragraphs has been described as content integration as there was no critical element to the sharing of information as is central to the process of knowledge construction.

The practical lesson (“Zulu Day”) can be considered to be a process of cultural knowledge construction. As the second focus group discussion was conducted at the end of this practical lesson (just prior to the final activity of the day, that of judging and the learners eating the meal) the learners highlighted some of the processes relating to the cooking of the traditional meals during the discussion (FG2-2.2.6). For example, one learner said “but ours isn’t cooking well”. When asked why this was happening he responded “ours is grey instead of yellow”. A second learner stated “our food is cooking quite well” backed by another learner who said “theirs is nice. They’ve got nice

mzambane". The learners showed (predominantly by their expressions with emphasis and appreciation in their tone rather than the actual words as they spoke) appreciation for the knowledge which has to go into the preparation of a traditional meal. This can be attributed to the practical session and the experiences they had to go through to achieve their goal of cooking a full traditional meal (FG2-2.3.4). The learners were expressing their different perspectives on the cooking processes thus opening up the concept that different perspectives can occur in relation to cultural knowledge.

The data above shows that knowledge of social cultural practices and indigenous knowledge were evident when the learners related cooking practices, cultural rituals, courtship rituals and hygiene practices. This is evidence of the integration of cultural content in the programme.

6.2.2. *KNOWLEDGE OF CULTURAL DIVERSITY*

Mda (2000) pointed out that multicultural education should include "the ability to identify with and relate to other groups and develop multicultural knowledge, attitudes and skills" (p. 234). Ramsey, Williams and Vold's (2003) concept of multicultural education called for respect for the diversity of our society and world. As in the above section data is discussed in relation to content integration and cultural knowledge construction.

Due to the focus of Zulu customs and culture during the "Zululand Tour" (Chapter 4.3.1), the learners' documentation focused on Zulu traditional meals (LS2 G1 and G2). During the practical session the learners were actively engaging in a process of creating a traditional meal (but only a Zulu traditional meal) (ZD G2 AP). This emphasis which was placed on the social practices around, and indigenous knowledge of, the Zulu culture could have created a sense of "Them and Us" – as the focus was on one culture (Zulu). Although other cultures had been identified during the lessons they did not receive as much focus. This could have (inadvertently) led to the isolation of one culture as the predominant traditional culture. This is partially confirmed by the comment by the form teacher when he expressed his impressions on how well the Zulu and Xhosa members of the grade appreciated the cultural theme (In1 7.2). The highlighting of one group as the predominant culture might have created a feeling of segregation and ethnic studies highlighted in the concerns by Ramsey, Williams and Vold (2003) (Chapter 2.3.2).

When the class discussed and voted on the cultural meals in Lesson One cultural content integration occurred (L1 OB 1.5.1.1). Learners' Submission One (LS1 B1) gave examples of the differentiation between meals traditionally eaten by the different

cultures, thus supplying information from a variety of cultures (LS1 B1 1.3.11). Evidence of cultural content integration was seen during Lesson Two when the learners sourced content on Zulu cultural meals from the “Zululand tour”, prior knowledge and/or from the Internet to create a document (L2 OB 2.5.1.1). The documents formed part of the Learners’ Submission Two (LS2 G1 1.3.1.1.2). Content integration was also evident in the description of the methods of making Zulu beer (LS2 G1 1.3.1.1.1), ‘amas’ (LS2 G2 2.2.1.1.1), “grinding maize on rocks” (LS2 G2 2.2.1.1.2) and discussion on the staple diet of Zulus (LS2 G1 1.3.1.2.3). The learners’ ‘blog’ submission (LS1 B1) comment, “these [cultural meals] are what people eat almost everyday”, is also indicative of content integration (LS1 B1 1.3.1.2).

Content integration occurred during the cultural discussions during the ‘chat’ in Lesson Four. As explained in Chapter 3.3.3 the ‘chat’ was not archived so exact information on the content integration was not possible but discussions amongst the learners were noted. During the ‘chat’ a learner mentioned “bunny chow” (a curry meal in half a loaf of bread). This led to a brief discussion amongst the Treverton learners and teachers on what “bunny chow” was (a traditional South African Indian meal of curry in half a loaf of bread), its origins and other South African traditional meals (LS3 CN 3.2 and L4 OB 4.5.11).

A learner stated that ‘three-legged *potjie*’ pots originated from the Zulu culture. However, this perception is incorrect as the pots originated from the Afrikaans traditions during ‘*trekking*’ (the pots would hang on the side of the wagon and were placed on the fire during out-spanning periods). This is an indication of misperception of cultural knowledge (FG2-2.3.3).

Although the learners initially required prompting in order to draw on their cultural diversity insights the ENO theme allowed for information sharing and investigation of examples of content from a variety of cultures. Thus evidence of content integration as envisaged by Ramsey, Williams and Vold (2003) was presented.

6.2.3. EXPRESSIONS AND/OR INDICATIONS OF CULTURAL ‘OWNERSHIP’, CULTURAL IDENTITY AND MULTIPLE CULTURAL IDENTITY

Chapter 2.3.2 shows that Claassen (2000) indicated the importance of cultural identity. He stated that as people become more international and lose their national attachments they are “becoming more attached to their primary cultural group”, the reason “is perhaps ... a desire for tangible identities within a group” (p. 30). Yet, in both the first

focus group interview and the first lesson the learners found it difficult to equate the language groups other than Zulu with a culture. Indications were that the Zulu culture was seen as the most prominent culture. The learners initially referred to a very limited range of traditional meals, showing a limited perception of firstly traditional or cultural meals, and secondly, relating traditional meals to anything other than Zulu meals. The comment “my maid cooks me *pap*” (FG1-1.2.6) is evidence of this. In Lesson One, during the discussion on traditional meals, an English speaking learner initially defined traditional meals as meals eaten by Zulus, and was only able to expand on this concept when it was queried. He replied “well any culture” (L1 OB 1.6.8). Only with some prompting both during the focus group interview and the lessons did the discussion move from Zulu or Xhosa to recalling some Afrikaans traditional meals (FG1 1.2.5). In Lesson One the first culture identified after the Zulu culture was “*Boer*” (Afrikaans), identified by one of the isiXhosa speaking representatives of the class. While in the focus group interview an isiZulu speaking representative asked a South African English representative of the group: “what do English people eat?” (FG1-1.2.11). This statement could either be an indication that the English learner had not yet seen himself as representing a culture or that the Zulu learner spoke faster (my perception is that it was the first option). It is indicative that the English and Afrikaans speaking representatives had not perceived that they were representatives of a culture. When asked to identify local traditional meals one learner identified pizza (both in the focus group conversation and during the first lesson). This indicates that the learner had a narrow concept of the local traditional meals and which cultures were represented in the region. He also appears to have had difficulty with identifying and describing implicit elements of his own culture (South African English) (FG1 1.2.14).

Indian traditional meals were only mentioned three quarters of the way through the focus group interview but only after some prompting, and were brought in after some general discussion in the first lesson (L1 OB 1.6.10). Once the culture was introduced the Indian traditional meals were enthusiastically discussed.

During the second focus group interview the learners showed development of cultural identity when they indicated that previously they had eaten ‘*Boboti*’ at the school hostel and now (due to the ENO lessons) understood it to be a traditional Afrikaans meal (FG2-2.2.5). Identification of the various cultures during the lessons and the focus group discussions are indications that cultural knowledge construction occurred.

The traditional food versus fast-food discussions and documentation allowed for a broader perspective of culture which incorporated youth culture and consumerism culture and examples of a variety of cultures – thus showing evidence of cultural knowledge construction.

Linked to the concept of cultural identity is the acknowledgment that one person can be part of more than one culture. That is an individual can have two (or more) cultures with which he/she can identify or multiple cultural identity. In Focus Group One (FG1) one learner explained the making of traditional beer (discussed in 6.2.1). When asked “have you done this [crushing mealies] at home?” by the interviewer, the learner’s response was “at our *elalini*” (FG1 1.3.3). *eLalini* refers to a rural village/home/area, that is as opposed to his ‘urban home’.

A second complexity in cultural identity was noted in the focus group interview. Two learners had a discussion on the naming of a traditional meal. The learners were isiZulu and isiXhosa speaking representatives. The Xhosa learner named ‘*umboloho*’ as one of the traditional meals. When asked what that was, he replied “it’s a Xhosa traditional dish” “... like *mqushu* but it is white and it has got vegetables cooked in a big pot”. Immediately the isiZulu speaking learner said (with domination in his voice) “*isjabane*”, but then reduced his domination attempt and stated “it’s also called *isjabane*” (FG 1 1.2.13). This is indicative that traditional practices can be ‘owned’ by more than one culture.

In Chapter 2.3.2 Claassen’s description of citizen formation is discussed. This is the development of a common culture giving citizens a shared national identity. The predominant focus in the first focus group discussion and first lesson pertained to citizen formation with the discussions of the various local traditional meals and obtaining information for the ‘mini-survey’ on traditional local meals. Although the focus was not one specific “common culture”, the process could be seen as identifying a “shared national identity”. The information on the traditional meals was documented in the learners’ ‘blog’ submission (LS1 B1 1.3.3.2). The comment by a isiZulu-speaking learner, in the second focus group interview, that “I said we eat biltong”, shows a concept of a common culture as “we” referred to South Africans in general rather than Zulus in particular.

The data reported above indicates that the learners changed perceptions from a prior perspective of culture as only belonging to indigenous groups to a perspective that they

all could identify with one culture or another. This enabled them to take ownership of their own cultures and illustrated the development of cultural identity. Both multiple cultures within one individual and cultural practices across cultures were highlighted. In this way the ENO programme helped the learners to identify cultures, investigate cultural assumptions and biases, and understand local cultures, so addressing Ramsey, Williams and Vold's (2003) requirements for cultural knowledge construction. Finally the data indicates that citizen formation was taking place within the group.

6.2.4. APPRECIATION AND UNDERSTANDING OF OWN AND OTHER CULTURES

Van Niekerk (2000) pointed out the significance of being exposed to other cultures and points of view (Chapter 2.3.2).

During the 'chat' session in Lesson Four one of the learners attempted to make a joke when he referred to chicken as a vegetable (implying that chicken cannot be seen as real meat). I pointed out to him that it is possible that those participating in the 'chat' might not understand this sense of humour (LS3 CN 3.1) which would have led to inter-cultural misunderstanding. In Focus Group Two learners noted that during the 'chat' it was said "we eat biltong and here is a picture of biltong and he said that's disgusting I sort of understood it because they have never seen biltong and ...tasted it before" (FG2-2.2.7). The learner's indication that they could appreciate that other people might not enjoy the food which they perceived to be tasty, showed an understanding of different cultures.

In Focus Group Interview Two (FG2) the learners showed a particular understanding and insight into other cultures. A learner discussed his perception on the other countries' food seen while accessing the ENO submissions (explained in Lesson Four - Chapter 4.3.1). He pointed out that as there was "the stuff [food] that we wouldn't dare to eat", he then expanded on this by saying "therefore they would probably not dare to eat our food" (FG2-2.2.3).

When asked, during the second focus group interview (FG2), which part of the ENO programme they enjoyed the most of the learners indicated they enjoyed learning about the different cultures ("learning about other people that we don't know about") and their cultural ways ("I enjoyed learning [about] all the different types of food from the different countries") (FG2-2.2.4).

In the first focus group interview, one learner (Learner 1) appeared to be a bit reticent to relate his stories of meals from his “*elalini*” (rural home) (FG1-1.2.9). At the time of the interview my perception was that either there had been dominance from other members of the group or he was shy about the practices. During Interview One the form teacher expressed his interpretation of this as not being shy about the activities but rather pertaining to his general demeanour at the time (In1-7.3). During the discussions with Learner 1 on the meals from his “*elalini*”, Learner 5 attempted to draw attention to himself, as he was excited about relating his own traditional story. Once Learner 5 was given an opportunity to speak, he enthusiastically related some of his cultural practices (FG1-1.2.10). This is indicative of Learner 5’s cultural pride.

During Focus Group Interview One, one of the Zulu representatives stated with pride that “that’s why [King] Shaka Zulu and those guys were strong, because they ate mealies” (FG1 1.2.17).

During the ‘Zulu Day’ activities the isiZulu speaking learners showed particular pride in being able to enact social practices both relating to the meal-making processes and to the general social practices. An example was two learners re-enacting the collection of water for the meal-making. They placed the containers on their heads, walked to the ‘river’, filled their containers and returned to the ‘homestead’, all the time singing Zulu songs (with gusto) (ZD G3 AP).

The form teacher (In1) expressed his impressions on how well the Zulu and Xhosa members of the grade appreciated the cultural theme within the grade in general. He said “Oh! They [isiZulu and isiXhosa speaking learners] love it ... they don’t see it as a degrading thing ... I think with time culture has become part of your pride. You are [proud] of your culture. The Zulu kids ... have enjoyed it” (In1 7.2).

It is significant to note that at no particular time did any of the English or Afrikaans speaking learners show any particular pride in their culture. This can be linked to the statements in 6.2.2 that the English and Afrikaans speaking representative had not initially perceived that they were representatives of a culture. It can also be related to the emphasis placed on the Zulu culture with the cooking of the Zulu traditional meal (6.3.2).

To summarise the above section, the Xhosa and Zulu learners had a greater understanding and appreciation of cultural identity and cultural pride while evidence of cultural pride was not noted in the English and Afrikaans learners. Exposure to, and

understanding and appreciation of, other cultures and points of view is evident in the data reported above and there is notable evidence of knowledge construction in the insights and understanding expressed regarding international differences in food tastes. The learners expressed enjoyment in learning about other cultures through the programme.

6.3. GLOBAL EDUCATION

In section 2.3.4 I discussed Claassen's (2000) belief that globalisation has led to a need for education which includes global context. In section 2.2.6 Nomura's (2004) point that online networks facilitate inter-relatedness between people in physically distant areas is discussed. Global context and inter-relatedness are reported on below.

6.3.1. GLOBAL CONTEXT

Globalisation has made changes to traditional patterns of education provision which include the incorporation of a global context that is not confined to localised facts (see section 2.3.4). Examples of global perspectives in the ENO activities are presented below.

A global context was incorporated into Lesson Three when the learners viewed material from other countries. The Treverton learners discussed these presentations, focusing on the visual impact of food (L3 OB 3.5.3.1). For instance they enthusiastically showed their classmates a meal which was green in appearance. One learner expressed a dislike for a meal that appeared to have meat wrapped around a metal stake. During the 'chat' in Lesson Four the discussions on the variations between meals allowed for insights into the global context (L4 OB 4.5.3.1). For example, the discussion on the different types of traditional meals resulted in the learners (from both schools) admitting that they would not like to eat traditional meals from the other countries (discussed in 6.2.4 above). The learners stated that they "enjoyed learning all the different types of food from the different countries" (FG2-2.4.2).

In the focus group discussions an understanding of global context was shown during the conversation on traditional meals globally (enthusiastically articulated by the learners) (FG1-1.4.1). Some learners expressed their own personal perspectives and opinions on meals from other countries. For example, one learner expressed her opinion that food in other countries was not good quality food ("they don't have proper food") while local food is a lot more healthy ("in South Africa you get the proper stuff") (FG1-1.4.4). A learner

stated his perception that “it’s different because Zulu people have *mqushu* and *pap* and all that stuff but sometimes Italian people just have pizza” (FG1-1.4.3). This statement resulted in enthusiastic conversation and the comments: “like pasta and lasagne and richer foods. It is rich food” and “its richer food but then it’s made out of vegetables”. The learners showed certain popular perceptions of cultures around the world when they referred to different meals from different countries. For example, pizza was described as Italian traditional food (FG2-2.4.1), ‘fish and chips’ were referred to as the number one dish in England (FG1-1.4.2) and it was mentioned that Chinese people ate dogs (FG1-1.4.6).

In summary, one of the goals of the theme “this is our culture” was to get to know about food cultures globally (Chapter 4.2). The global context was created directly by the ENO theme and learning within this context took place during Lessons Three and Four (as described above). Understandings of global context which took place during the focus group discussions were an indirect result of the ENO theme. It is significant that the learners expressed their enjoyment of the global content during Focus Group Interview Two.

6.3.2. GLOBAL INTER-RELATEDNESS SHOWN

International inter-relatedness between people in geographically distant areas was shown during Lesson Three’s discussion on the use of bread around the world and how each culture has a requirement for bread, but uses different types of bread (L3 OB 3.5.3.3). Cakes from different parts of the world were discussed during the ‘chat’ (L4 OB 4.5.3.3). Global inter-relatedness was shown through the importation of food from other countries when a learner expressed his opinion that mealies originally came from America (FG1-1.4.11 and 12). These common frames of references would have laid the foundation for greater cultural understandings and contribute to cultural knowledge construction.

6.4. CONCLUSION

A strong thread that runs through this chapter is the evidence of both content integration and cultural knowledge construction.

The types of content integrated into the programme were the Zulu cultural practices of the making of food and beer, gender specific practices and rituals. Knowledge of Afrikaans, English and Indian culture was also elicited through prompting and

understanding of the concept of culture grew. Knowledge about food at an international level was introduced during the 'chat' activity.

Cultural knowledge construction was shown in the development of an understanding of culture not being limited to indigenous groups only. Understanding of culture was also furthered in the development of the understanding of 'fast-food' as a type of culture and the presence of multiple cultures within individuals. Other evidence of cultural knowledge construction could be found in the development of a sense of cultural identity, and a shared national identity; while, at the same time, a sense of cultural diversity. Learners also furthered their understandings around cultural ownership and developed a pride in their culture (the latter being particular to isiZulu and isiXhosa speaking learners). On an international level cultural knowledge construction was evidenced by the identification of common frames of reference and the discussion around popular perspectives on meals globally. A challenge evident in the data was the problem of potentially creating a sense of 'Them and Us' through overemphasis on one culture. Challenges to content integration were evidenced in the lack of knowledge about the origin of indigenous technologies (in this case the three-legged pot).

In this chapter the data relating to multicultural, indigenous knowledge and global education learning was presented and discussed. In the following chapter these teaching and learning processes (along with the ICT related processes evaluated in Chapter 5) will be reviewed in relation to the SADC REEP Education for Sustainable Development dimensions of teaching and learning pertinent to Education for Sustainable Development in a southern African context.

CHAPTER 7 RELEVANCE OF THE ENO PROGRAMME TO ESD TEACHING AND LEARNING PROCESSES

7.1. INTRODUCTION

In this chapter the data presentations and discussions from Chapters 4, 5 and 6 are related to the eight dimensions on strengthening ESD practices as suggested by the Southern African Development Community (SADC) Regional Environmental Education Programme's (REEP) *ESD practice in southern Africa: Supporting participation in the UN Decade of Education for Sustainable Development* (Lotz-Sisitka et al., 2006) (as described in section 2.3.1). Recommendations for the ENO programme, schools and educators are suggested.

7.2. DIMENSION 1 - INVOLVING PEOPLE IN SUSTAINABLE DEVELOPMENT ACTIONS

This dimension refers to the development of viable development strategies, meaningful poverty alleviation and improved quality of life, driven by practical actions. This can be related to the comment by the form teacher that the “real test” for ENO would be whether it encourages “internalisation” within the learners and “transforms” the “way [they] do things [and] think about things” (explained in section 5.3.1).

The practical activity (described in section 4.3.2) did not lead to the development of visible improvement of quality of life or a viable development strategy, but together with the discussion and submissions on traditional meals versus fast-food (described in section 4.3.1) the learners received an indication of, and were exposed to, the concepts of quality of life. For instance, during the discussion on the nutritional value of traditional food over fast-food the learners were exposed to the concept that their choices could affect their quality of life. It is significant to note that Treverton deviated from the ENO programme (shown in section 4.2 and 4.3) by including the fast-food versus traditional meals component. A recommendation then would be for ENO to incorporate a component of this nature as a means of highlighting quality of life.

In section 1.3.1 it was noted that the ENO programme's overview included “an emphasis on local action and/or research with the intention to report the findings or actions into the global forum” (ENO-Environment Online, n.d.). Subsequently ENO has removed its reference to the specific “local action and/or research” and replaced it with a statement that ENO will “lay emphasis on the local environment and to see it in a global aspect. ...Learning is student-centred with both online and offline activities” (ENO-Environment Online/basics, n.d.). Thus the terminology has changed from ‘action’ to ‘activities’. For

the “This is our culture” theme the learners were involved in a practical and ICT activities and not with action, as per Jensen and Schnack's differentiation between these two terminologies (discussed in section 2.2.5.1). From an environmental education point of view, an emphasis on ‘local action’ would address this dimension, that of involving people in sustainable development action. A recommendation to ENO would then be to differentiate between environmental education ‘actions’ (something to improve the surroundings) and ‘activities’ (involving the learners in something practical) and to incorporate ‘actions’ in their programme.

7.3. DIMENSION 2 - ACTIVE AND LEARNER-CENTRED METHODOLOGIES

Section 5.3 reported on active e-learning pertaining to the CAI-based lessons. Here it was shown that ENO facilitated the movement through all the stages of the ICT active learning cycle and incorporated instructional, constructional and co-constructional learning. The active learning cycle included independent activities, reviewing and applying what was learnt. The practical lesson, the cooking of a traditional meal (described in section 4.3.2 and which was not incorporated in the e-learning active evaluation) was, by the nature of the activity, an active learning component of the theme. Thus the ENO theme's combination of CAI-based lessons and the practical lessons allowed for active learning processes.

A variety of ICT applications were used. These were: ‘blogging’, ‘mini-survey’, creation of graphs, creation of documentation, group collation of documentation, viewing of other schools’ presentations and ‘chatting’. These enabled the learners to take responsibility for their own learning which is a central tenet of learner-centred education.

Learner-centred processes were ascertained during the measuring of the teachers’ role in the CAI application of the ENO theme (section 5.4). Here it was shown that during the CAI lessons, the learner-centred period (where the learners did not require direct involvement from the teachers) occurred for a little under a quarter of the time.

Thus it would seem that for the ENO Programme it is worth reinforcing such opportunities for investigations, dialogue, discussion, group work, creative representation, and allowing learners to put their knowledge into practice; thus strengthening active learning and providing a foundation for ESD practices in the region.

Challenges identified by Lotz-Sisitka et al. (2006) for ESD practice included the availability of suitable learning and teaching materials, and accessing relevant information. The ENO programme supplies the teaching materials and some of the

information supplied via the submissions can be used. As this is a significant challenge within the southern African region and if ENO wants to address this challenge, a recommendation would be to incorporate a section in the programme which supplies pertinent information or links to other ICT-based sites with the information.

7.4. DIMENSION 3 - WORKING WITH DIFFERENT LEARNER GROUPS IN DIFFERENT LEARNING ENVIRONMENTS OR DIFFERENT CONTEXTS

This ESD dimension referred to practitioners in southern Africa working with a diverse range of groups in diverse learning environments. The context in which this study was conducted is: (1) A well-resourced school with full access to computers and Internet facilities where learners have extensive exposure and training in the use and application of computers. (2) The maximum numbers of learners per class is 25. (3) The ratio of teachers to learners is relatively high (around 1:12). (4) Teachers are comfortable with including, and are encouraged to incorporate, CAI in their teaching programmes and can draw on the assistance of an IT department if necessary. (5) Learners come from diverse cultural backgrounds. The effects that this context had on the application of the programme are: (1) As the learners are familiar with the use of generic software they were able to complete the required presentations in a short period of time (discussed in section 4.4.2.2). This reduced the teachers' ICT facilitation role (discussed in section 5.4). (2) The teachers' role was influenced by the number of learners, for instance with the increase in the number of learners the teachers' time could be more orientated towards one-to-one assistance. (3) In section 5.4 it is shown that although I was the predominant teacher in the ENO programme, I was joined on occasions by the form teacher and/or the IT teacher. Thus I was able to draw on their support and they were able to give alternative or additional input where they felt it was required. This allowed for additional insights to be imparted and highlighted. (4) In section 2.2.2 it is indicated that a disadvantage of ICT use could be the teachers' limited ICT skills. In section 4.4.2.1 it was shown that the teachers' skills were predominantly adequate or not required. This would have enabled the teacher to facilitate the learners where required and allowed for more non-ICT traditional teaching processes. (5) The diversity of cultural backgrounds would have influenced Dimensions 5 and 7 discussed in sections 7.6 and 7.8 below.

Even though the Treverton context naturally supports the implementation of an ICT-based programme, it was shown in section 4.4.2 that although the teachers' and learners' ICT skills are predominantly adequate, a situation arose where their skills were inadequate. It was shown, firstly, that the perception of the impact of the inadequate ICT

skills periods was higher than the actual effect (section 4.4.2.1) and, secondly, that despite these short-term inadequate periods they did not impact significantly on the teaching and learning opportunities within the programme. In fact the inadequate ICT skills period allowed for exposure to that specific skill and an ICT technical learning opportunity (for both teachers and learners). Thus a recommendation would be for schools to embrace the ENO programme even if the teacher and learner ICT skills are not extensive. The ENO programme is a means of obtaining exposure to and learning those skills, especially the globally orientated skills (for example, 'blogging' and 'chatting').

7.5. DIMENSION 4 - DEALING WITH COMPLEX ISSUES

A feature of this dimension is the complexity of environmental and sustainability issues and the conflict, tensions and contradictions that are highlighted during teaching and learning processes.

It was noted in section 6.2.4 that during the 'chat' contradictory cultural values emerged around different foods consumed. As I did not notice and was not aware of the conflict during the 'chat' session I was not able to respond appropriately by deliberating the conflict. Thus the learners were only exposed to the conflict and were not encouraged to debate the point. As the 'chat' is in a synchronous format and the teacher is often facilitating the learners (dependent on how confident the learners are with 'chat' processes), he/she will not always be able to directly participate in the 'chat' and thus is unable to view all the material directly. A recommendation is for the 'chats' to be archived and for teachers to obtain/be sent copies thereof in order to review these chats for possible conflicts, tensions and contradictions. The teacher would then be able to deliberate and debate conflict, tensions or contradictions in subsequent lessons.

During the sharing of indigenous knowledge and social cultural practices (described in 6.2.1), cultural gender practices were discussed. These practices could have been discussed in more detail with the view to considering how these relate to modern views on gender roles and South African constitutional principles. Another possible conflict which could have been discussed related to the 'ownership' of traditional items (such as the three-legged *potjie*). However, these conflicts were not addressed during the lessons and/or focus group interviews. The predominant reasons were: (1) time constraints which restricted the opportunities for the debating, (2) the focus which I adopted in the teaching processes was to allow the indigenous knowledge (thus content integration) to emerge and did not focus on the conflicts within, and (3) although the misrepresentation

of 'ownership' was noted during the focus group interview, at the time it was decided that correction thereof might dampen the general enthusiasm for the topic (the learners might then have been nervous that their information would be incorrect too). On reflection and review of the lessons it was noted that teaching and learning opportunities would have been improved if: (1) more time had been allocated for the ENO lessons, thus allowing for opportunities for debating, (2) I, as the teacher, had encouraged deliberation and debating on the conflicts. These are seen as missed opportunities.

It was noted that the learners showed certain popular perceptions of cultures around the world (described in section 6.3.1). These popular perceptions were not challenged or debated and thus a critical response to the perception was not encouraged. A recommendation could be for: (1) the ENO programme to incorporate a dimension which could challenge these perceptions, especially due to the global nature of the programme, and (2) for educators to be aware of the possibilities that these perceptions might be expressed by the learners and thus be prepared to open up dialogue and debate on the perceptions.

Lotz-Sisitka et al. (2006) called for educators to deliberate, debate and evaluate cultural vantage points while challenging ESD practitioners' development of the skills and abilities to deal with these complex issues like gender-related concerns, in context. A recommendation is for educators to be alerted to: (1) the possibility that conflict and contradictions could materialise in ENO lessons, and (2) the potential teaching and learning opportunities which could emerge if these conflicts are deliberated, debated and evaluated appropriately. A second recommendation here could be for the ENO programme to include a strategy within the themes which specifically highlights contradictory issues, for instance incorporating a section within the ENO Learning Diary on contradictory issues discussed or debated.

7.6. DIMENSION 5 - WORKING WITH VALUES, ETHICS AND CULTURAL DIVERSITY

Lotz-Sisitka et al. (2006) recommended strategies for dealing with values, ethics and cultural diversity. One of the strategies called for involving learners in useful community projects, the modelling of behaviours and actions, and for appropriate role models. The learners were not involved during this research period in a community project but it was noted in section 6.2.3 that the learners developed cultural identity and showed shared national identity (or citizen formation). The modelling of behaviours and actions occurred during the practical session where the learners enacted cultural practices (discussed in

section 6.2.1). The ENO structure (section 4.2) suggested requesting a local expert demonstrate the cooking of a traditional meal. This would have allowed for the appropriate role model process. Treverton did not have a local expert demonstrate the cooking, instead (as shown in section 4.3) the learners received instruction on cultural activities whilst on tour.

A second strategy involved creating platforms for dialogue and debate. A platform for debate was developed during the discussion on fast-food versus traditional meals (section 4.3.1). Dialogue opportunities were created in the ICT forum, that of, 'chatting' internationally with another school (section 4.3.1). The 'chat' and 'blog' forums provided opportunities for developing communication skills. One of the keys to ICT is to facilitate the sharing of information and improve communication skills (section 2.2.3). Information sharing was achieved with the international submission and viewing of material (section 5.5).

A third strategy recommended engaging people in reflections on existing values, actions and alternatives. The discussions and submissions on traditional meals versus fast-food (conducted by Treverton) ensured reflection on values (discussed in Dimension 1 above). A recommendation here would be for ENO to incorporate subject matter (like the fast-food versus traditional meals) which would encourage reflections on existing values, actions or alternatives.

A fourth strategy suggested building relationships, forming groups and attending to group dynamics. Relationship building in the form of international communication was noted (reported on in section 5.5). The learners worked in groups in the CAI lessons which would have resulted in learners having to attend to group dynamics. In the Treverton situation, a cross section of cultural groups was represented in each group during the practical lesson. This situation was created by Treverton and not the ENO programme. A recommendation would then be for educators to create (where viable) cultural diversity within the group activities.

A fifth strategy dealt with managing, accommodating and embracing diversity, with particular reference to cultural diversity. Due to the theme "This is my culture", cultural diversity was particularly noted (discussed in section 6.2.2). Examples of cultural content integration were shown. A broader perspective of cultural diversity in relation to consumerism and youth culture occurred. Learners were exposed, internationally, inter-regionally and locally, to the concepts of multiple cultural identities and cultural ownership (shown in section 6.2.3). It was noted in section 6.2.4 that a greater

understanding and appreciation of cultural identity and cultural pride occurred. In section 6.2.3 it is shown that some learners were unable initially to identify with a culture but achieved this with prompting. Evidence of embracing diversity was shown in section 6.2.4.

Lotz-Sisitka et al. (2006) noted that “all these issues bring *mediation* in the learning environment to the fore” thus drawing attention to the educators’ mediation role. The teachers’ role was reported on in section 5.4 but this pertained to the teachers’ role in ICT pedagogy and not to the mediation of complexities arising from focusing on values, ethics and diversity. A recommendation would be for educators to be aware that a mediation role will be required when addressing values, ethics and diversity and to be prepared for this.

7.7. DIMENSION 6 - CREATIVITY AND CRITICAL THINKING

Lotz-Sisitka et al. (2006) highlighted creative and critical thinking as another important dimension of ESD. In section 5.2 academic rigour in the ICT application was reported on where it was shown that both lower-order and higher-order thinking processes were stimulated in learners. Evidence of evaluation, analysing, investigation, and independent and effective learning were seen. Skills of communication and information sharing were developed. Cultural knowledge construction occurred (discussed in section 7.8). Thus it is evident that the ENO programme was able to provide opportunities for developing creative and critical thinking.

In section 2.2.5.2 instructional, construction and co-construction learning processes are introduced. Here it is shown that construction learning is ‘building meaning’ from active experiences and co-construction incorporates reflection amongst people in groups. Both ‘building meaning’ and reflection are linked to critical thinking processes. In section 5.3.2 it was shown that these occurred during the CAI-based lessons. The ICT-based active learning cycle (described in section 2.2.5.1) incorporated a *review* stage (where ideas are compared with other ideas) and a *learn* stage (making sense and internalisation of the previous stages). The comparing of ideas and ‘making sense of’ can be correlated to critical thinking processes. It was revealed in section 5.3.1 that reflection or review did take place. It was also revealed that if Treverton had incorporated ENO’s activity sheets and completed the ENO Learning Diary, internalisation of meanings (or making sense) would have been strengthened. Thus the recommendation here is for educators to incorporate the ENO activity sheet and the ENO Learning Diary into their lessons.

7.8. DIMENSION 7 - WORKING WITH DIFFERENT WAYS OF KNOWING (PARTICULARLY INDIGENOUS KNOWLEDGE AND LOCAL KNOWLEDGE)

Lotz-Sisitka et al. (2006) indicated that indigenous, traditional and local knowledge need to be fore-grounded and mobilised. A key challenge identified was the lack of capacity for mobilising IK in education. In section 2.3.3 O'Donoghue and Neluvhalani's (2002) methods and materials for mobilising of indigenous knowledge are discussed. The means in which the ENO programme responded to these were: (1) Mobilising prior knowledge. Cultural knowledge construction educational processes were highlighted. In section 6.2.1 it is shown that the cultural knowledge construction occurred while relating cooking practices, cultural rituals, courtship rituals and hygiene practices, and through expressions of different perspectives, development of broader perspectives and alteration of perspectives on culture. In section 6.2.3 it was shown that the learners identified cultures, investigated cultural assumptions and biases, and developed understandings of local cultures. Global cultural understandings were indicated in section 6.3.2. (2) Using indigenous technologies. The cooking of a traditional meal involved the use of indigenous technologies. Thus it was indicated that the ENO theme was able to facilitate this dimension of working with different ways of knowing and incorporated methods for mobilising indigenous knowledge and that indigenous knowledge was foregrounded.

In section 6.2.2 it is shown that within the Treverton case an emphasis was placed on the Zulu culture. This might have encouraged a situation of "Them and Us" and inadvertently led to the isolation of this culture as the predominant culture. A recommendation to schools with multiple cultures is to ensure adequate representations of appropriate cultures and opportunities to engage across cultures represented in the school.

7.9. DIMENSION 8 - ENSURING INCLUSIVITY IN ESD PRACTICE

This dimension pertains to the inclusion of learners with disabilities as well as the inclusion of cultural, linguistic and marginalised groups.

As ENO is an ICT-based programme it is automatically exclusive in that it is limited to schools with access to computers linked to the Internet. It is shown in section 2.2.1 that access to ICT facilities is being addressed in a variety of ways. Section 2.2.2 indicates that one of the disadvantages of ICT use is limited and variable ICT skills. By engaging in the ENO programme, learners and teachers will be exposed to and thus become more skilled in a variety of ICT-based applications (examples given in 7.3 above). In section

5.2 the academic rigour within the ENO theme was evaluated. Here it was indicated that schools participating in the ENO programme will have the opportunity for their CAI to extend beyond the mere technical skills applications (discussed in section 2.2.3). A challenge to the ENO programme would be to facilitate schools which are new to ICT skills, and thus might require entry-level applications (for example, entering submissions in the material section), while still offering extension to those schools which require higher-level applications (for example, entering information on 'blogs'). A recommendation could be for the current "twinning" project (where well-resourced schools from the North link with poorly resourced schools in the South to share information and results of the activities) to incorporate an ICT mentoring or 'trouble-shooting' facility (thus those schools which are au fait with the use of ICT facilitate their "twin" school which might be new to ICT processes).

7.10. CONCLUSION

In the assessment of how the ENO programme responded to the eight dimensions of the ESD practices in a southern African context it was found that the programme facilitated the teacher to attend to these dimensions at various levels. For dimension 1 the learners were exposed to the concepts of quality of life. With regard to dimension 2 it is shown that active ICT processes occurred while the practical lesson was the active learning component of the theme. Learner-centred processes were noted. The context in which this study was conducted, and the effects that this context had on the application of the programme, are discussed under dimension 3. Although Treverton's context supported the implementation of an ICT-based programme, a situation arose where their ICT skills were inadequate but this did not significantly impact on the teaching and learning opportunities within the programme. Missed opportunities were noted, where teaching and learning opportunities could have been improved if the complex issues (dimension 4) relating to contradictory cultural values and cultural gender practices had been discussed. To address the suggestions in dimension 5 it was noted that the theme facilitated learners to develop cultural identity, a greater understanding and appreciation for cultural diversity, modelling of cultural behaviours and actions, and cultural content integration. The theme also supplied a platform for debate, dialogue opportunities, information sharing, reflection on values and relationship building. Multiple cultural identities and cultural ownership were distinguished and developed. With regard to dimension 6 (creative and critical thinking), it was shown that the programme allowed for lower-order and higher-order thinking processes, evaluation, analysing, investigation, communication and information sharing, construction and co-construction learning, while

reflection, independent and effective learning were seen. A key challenge identified in dimension 7 was mobilising of indigenous knowledge. The theme addressed this challenge with mobilising of prior knowledge through cultural knowledge construction, identifying cultures, investigating cultural assumptions and biases, developing understandings of local and global cultures and use of indigenous technologies. Treverton might have inadvertently encouraged cultural isolation. Dimension 8 calls for inclusivity in ESD practices. ENO is an exclusive programme due to its ICT requirements. As access to ICT facilities becomes less restrictive, the ENO programme could facilitate exposure to a variety of ICT-based applications.

Based on the information on how the programme responded to the eight dimensions recommendations were formulated for the ENO programme, schools and teachers. These are discussed in Chapter 8. Chapter 8 also incorporates a summary of the research and a critique of the research processes.

CHAPTER 8 CONCLUSION

8.1. INTRODUCTION

In this chapter the research processes are summarised, followed by considerations on how the research and logistical processes could have been improved. Recommendations on the ENO programme (based on the researched theme) are supplied. A brief indication of what the research revealed is provided as a conclusion.

8.2. SUMMARY OF THE RESEARCH

8.2.1. RESEARCH CONTEXT

The research was conducted at Treverton Preparatory, South Africa. Treverton is a well-resourced school with full access to computers, Internet facilities and ICT support.

8.2.2. METHODOLOGY

The methodology used was a mixed method, interpretive case study (section 3.2). The predominantly qualitative mixed method was based on the use of different kinds of data gathering and analysis techniques, implemented concurrently (section 3.2.1). An interpretive approach was adopted where the primary emphasis was on the process of understanding, from which I was able to identify patterns of meaning (section 3.2.2). A case study process was used as the research was conducted within a specific time frame and space, focusing on a specific educational programme and its aim was to inform judgments of the policy makers and practitioners involved in the programme (section 3.2.3).

8.2.3. METHODS

Two focus group interviews were conducted with the learners (section 3.3.1). Four one-hour computer-based lessons and a practical 'Zulu Day' session were observed (section 3.3.2). Document analysis was conducted on the learners' three submissions. These were the submission on the 'blog' site, the learners' presentations created over the four lessons and the 'chat' session (section 3.3.3). Two semi-structured interviews were conducted with the form teacher and the programme co-ordinator (section 3.3.4).

Triangulation was achieved by using different interpretation lenses ("balance of control", "thinking quadrants", "active learning cycle" and "instruction, construction and co-construction") for the interpretation of the data. The triangulation highlighted the

inappropriateness of the “active learning cycle” lens and/or the means of gathering the information for the lens (discussed in section 5.3.1 and 5.3.2 and 8.3.2 below).

8.2.4. DATA COLLECTION

The focus groups were video taped, transcribed and analysed to “establish patterns of meaning” and coded according to categories identified (section 3.3.1).

For the observation of the lessons an observation schedule was created as a means of focusing on the data. A timeline was developed as an analytical tool and as a means of ‘mapping’ the balance within these clusters, resulting in a quantitative measurement process (section 3.3.2). Photographs were taken of the activities relating to the cooking and meal presentations conducted during the ‘Zulu Day’ lesson and annotated notes were made (section 3.3.2).

The material on the ‘blog’ and a selection of two material submissions were coded and analysed according to the categories identified in the observation process. As the ‘chat’ was not archived the documents could not be analysed. Instead the prominent information which could be remembered was noted (section 3.3.3). The transcription of both interviews were coded and analysed according to the categories identified in the observation process. Other codes were incorporated according to the trends noted in the data.

8.2.5. DISCUSSIONS

The data and the discussions on the data are presented in chapters four, five and six. Chapter 4 pertains to the ICT context based on information drawn from Chapter 2 (key ideas informing the research) and data collected during observations, interviews and focus group interviews. Topics discussed are the disadvantages and pernicious influences of ICT, ICT skill requirements from the teachers’ and learners’ perspectives and ICT use. Teaching and learning through ICT is presented and discussed in Chapter 5. This includes academic rigour in ICT applications, active learning in ICT and the teachers’ role in the ICT processes. Chapter 6 pertains to specific environmental educational teaching and learning processes including multicultural education and indigenous knowledge followed by global education.

8.2.6. RELEVANCE TO ESD TEACHING AND LEARNING PROCESSES

The data presentation is related to dimensions on teaching and learning processes to strengthen ESD practices as suggested in the SADC REEP *ESD practice in southern*

Africa: Supporting participation in the UN Decade of Education for Sustainable Development (Lotz-Sisitka et al., 2006).

8.3. CRITIQUE OF THE RESEARCH PROCESS

Here I will explain the processes in my research which, in hindsight, I would have conducted differently. I have divided these into research orientated and logistical considerations.

8.3.1. RESEARCH ORIENTATED CONSIDERATIONS

1. The ESD teaching and learning guidelines were incorporated towards the end of the research process. If the ESD guidelines had been incorporated into the initial literature review process more information relating to these guidelines (for example, learner-centred methodologies) would have been obtained and used.
2. The use of a variety of lenses to interpret the data allowed for a triangulation process which highlighted shortcomings relating to the active learning cycle in that: (1) the use of measurement of time to interpret the active learning cycle processes did not allow for a true reflection of when internalisation (or learning) occurred, (2) the active learning cycle did not take into consideration that learning can occur during reviewing and doing processes, and (3) accurate assessment of “learning” or internalisation was not achieved (although an appropriate means of viewing this process could have been devised).
3. Due to logistical limitations the collection of data from the practical lesson was limited, resulting in insufficient information. It would have been more appropriate to obtain more information with analytical notes created during the lesson.
4. It was shown that use of the user/computer “balance of control” had limitations. A means of evaluation which incorporated the practical lesson and was not limited to the CAI component, would have been more appropriate.
5. The original objective (section 3.3.1) of Focus Group One was to obtain an understanding of the learners’ level of prior knowledge on the theme. In Focus Group Two the objective was to assess the learners’ personal opinions and experiences of the lessons on the theme and the programme as a whole. Although these focus group discussions supplied some background and data for the educational processes, the original purposes were not fully incorporated into the research process. The original purposes of the focus groups could have been altered to allow for greater insight into the learners’ knowledge for instance:

- a) In the first focus group interview more information on the learners' insights into cultural or indigenous knowledge could have been obtained.
- b) In focus group two the Interviewer could have drawn more cultural understandings and insights from some of the learners by encouraging more discussion around meals prepared at their homes.

8.3.2. LOGISTICAL CONSIDERATIONS

- 1. The 'chat' archiving should have been pre-planned. This would have allowed for an analysis of the content and judgment on the quality of the interactions.
- 2. A standby recorder should have been available at all times, in case of technical failure (as in the case of Lesson Two).
- 3. If the video-recording assistant had been fully briefed on the required procedures he would not have 'paused' the recorder during Lesson Two.

8.4. RECOMMENDATIONS FOR ENO

In Chapter 7 recommendations based on the dimensions in *ESD Practice in southern Africa: Supporting participation in the UN Decade of Education for Sustainable Development* (Lotz-Sisitka et al. 2006) were suggested. Recommendations to the ENO programme were: (1) to incorporate a component which highlights quality of life, (2) to differentiate between environmental education 'actions' and 'activities' and to incorporate 'actions' in the ENO programme, (3) to incorporate a section in the programme which supplies pertinent information or links to other ICT-based sites with the information, (4) for the 'chats' to be archived, (5) to include a dimension which would challenge popular perceptions of cultures around the world, (6) to include a strategy within the themes which highlights contradictory issues, a suggestion was to incorporate a section in the ENO Learning Diary on contradictory issues discussed or debated, (7) to incorporate subject matter which will encourage reflections on existing values, actions and alternatives, and (8) for the current "twinning" programme to incorporate a mentoring facility. A challenge identified for the ENO programme was to facilitate entry level ICT skilled schools while offering extension opportunities to experienced ICT skilled schools.

Recommendations to the schools were: (1) to embrace the ENO programme irrespective of the level of ICT skills of either the educators or learners, and (2) for those schools with multiple culture representation to ensure adequate opportunities for engaging across all cultures.

Recommendations to the educators were: (1) to obtain and review copies of the 'chats' their learners partook in and then to deliberate and debate conflicts, tensions or contradictions seen therein, (2) to allocate enough time to the ENO lessons to allow for opportunities for debating, (3) to be aware of possible popular perceptions of cultures around the world and to be prepared to open up dialogue and debate on these perceptions, (4) to be alerted to the possibilities of conflict and contradictions which might occur and the potential teaching and learning opportunities which could emerge if these conflicts are deliberated, debated and evaluated appropriately, (5) to be aware of and prepared for possible mediation roles which might arise, (6) for educators to create cultural diversity within the group activities, and (7) to incorporate the ENO activity sheets and the ENO Learning Diary in the lessons.

For logistical reasons Treverton was not able to follow the structured weekly plans laid out by the ENO programme. A less structured, more flexible layout might encourage greater active participation from schools which experience similar constraints.

8.5. CONCLUSION

To assess the teaching and learning opportunities offered by the ENO programme, the data on the ICT and environmental education viewpoints were compared to the SADC REEP guidelines on how to strengthen ESD practices.

It was noted that the ENO theme supported active learning and a variety of learning contexts, a sense of community, modelling of behaviours and actions, debate, sharing of information and improved communication skills. The learners worked in groups and were exposed to language and cultural diversity, contradictory cultural values, cultural inclusion and global inclusivity. Knowledge of social cultural practices and indigenous knowledge were shared. Instances of academic rigour were noted with reflection being the predominant activity while creative learning and evaluation also occurred but to a lesser extent. Both advantages and disadvantages of the use of ICT as a medium were noted.

The case study on the ENO-Environment Online programme at Treverton Preparatory indicated that ICT driven teaching and learning opportunities are able to support environmental education processes within a southern African context. This support could be strengthened through an emphasis on exploring possibilities for increasing focus on sustainable development actions, access to relevant information, encouragement of critical debate, and critical engagement with cultural diversity.

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