

**ENVIRONMENTAL EDUCATION FOR
SUSTAINABLE COMMUNITIES BY ADULT
PRACTITIONERS IN A BLACK URBAN
COMMUNITY**

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**ENVIRONMENTAL EDUCATION FOR SUSTAINABLE
COMMUNITIES BY ADULT PRACTITIONERS IN A BLACK
URBAN COMMUNITY**

DISSERTATION

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Promoter: Professor D.R. Schreuder

by

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DECLARATION

I, the undersigned, hereby declare that the work contained in this dissertation is my own original work and has not previously in its entirety or in part been submitted at any other university for a degree.

Signature:

Date:

ABSTRACT

Within the broad theoretical context provided by debates and policies on curriculum development and current approaches in adult and environmental education, this study attempted to improve my own practice by making a meaningful contribution towards the professional development and conceptual understanding of student teachers who have registered for a three-year National Diploma in Adult Basic Education and Training (ABET) at the Peninsula Technikon in Cape Town. Although these students have no teaching qualifications, they are involved in community literacy education for disadvantaged people in various communities and in non-governmental education centres. The professional development and conceptual understanding of the students with regard to sustainability as a key environmental concept was effected by focusing on the concepts, and applying the processes of environmental education for sustainability (EEFS) in the teaching and learning process.

In an attempt to integrate theory and practice the student teachers took action in community-based environmental projects organised by the Tsoga Environmental Resource Centre in Langa, Cape Town. The idea was that they should apply their acquired skills and understanding of sustained environments and teach adult learners to transform their local environments through their literacy classes. This means integration of adult literacy with environmental or ecological literacy

The interviews and observations of the students at work in the community were not only aimed at providing feedback for the purposes of future programme design but also at monitoring what the students did with their learning experiences regarding EEFS as a theme, in a different teaching situation (adult literacy classes).

In the final analysis, the present study attempted to clear up conceptual misunderstandings and to show that education processes are as important as its content and outcomes. It has attempted to operationalise curriculum approaches, recommended for environmental sustainability, in a practical way. The study as a whole is set within the general literature of both adult and environmental education, and particularly that of curriculum and student development for social transformation.

SAMEVATTING

Binne die breë teoretiese raamwerk van diskoers en nasionale beleidsdokumente ten opsigte van kurrikulumontwikkeling, en huidige benaderings tot volwasse en omgewingsopvoeding poog hierdie studie om my eie praktyk te verbeter deur 'n betekenisvolle bydrae te lewer tot die professionele ontwikkeling, en konseptuele begrip van studentonderwysers wat ingeskryf is vir 'n drie-jaar Nasionale Diploma in Volwasse Basiese Onderwys aan die Skiereilandse Tegnikon in Kaapstad. Alhoewel hierdie studente oor geen formele onderwyskwalifikasies beskik nie is hulle betrokke in geletterdheidsopvoeding onder benadeelde gemeenskappe en in nie-regeringsentra. Die professionele ontwikkeling en konseptuele begrip van die studente ten opsigte van volhoubaarheid as 'n sentrale omgewingskonsep is ondersoek deur te fokus op die kernbegrippe, en die aanwending van prosesse eie aan omgewingsopvoeding vir volhoubaarheid (OOVV) in leer en onderrigprosesse.

In 'n poging om teorie en praktyk te integreer is studente aangemoedig om betrokke te raak in verskeie gemeenskapsgebaseerde projekte wat deur die Tsoga Omgewingsentrum in Langa, Kaapstad georganiseer word. Die idee hiermee was dat hulle ontwikkelende vaardighede en begrip ten opsigte van volhoubare gemeenskappe sal aanwend deurdát terwyl hulle volwasse leerders leer lees en skryf, hulle terselfdertyd sal bydra tot die transformasie van hulle gemeenskappe. Dit beteken integrasie van volwasse geletterdheid met omgewings of ekologiese geletterdheid.

Onderhoude met, en waarnemings van die studente tydens hulle werk in die onderskeie gemeenskappe is gedoen nie alleen met die oog op programontwikkeling nie, maar ook met die oog op monitering van die verskillende wyses waarop studente hulle eie leerervarings in (OOVV) hulle praktyk in 'n ander konteks (volwasse geletterdsheidsklasse) beïnvloed en

verryk.

By wyse van samevatting kan gesê word dat hierdie studie ondersoek ingestel het na wanpersepsies ten opsigte van omgewingskonsepte en hoe dit aangespreek kan word, en aangetoon het dat ook in hierdie konteks, onderwys *prosesse* net so belangrik soos inhoud en uitkomstes is. Verder is kurrikulumbenaderings wat vir OOVV ontwikkel is ondersoek en in konteks van Volwasse Basiese Onderwys geoperasionaliseer. Die studie as geheel is gesetel binne die algemene literatuur van beide volwasse en omgewings opvoedkunde, en in besonder die van kurrikulum en studente ontwikkeling vir sosial transformasie.

This work is dedicated to

My late father

Elliot Mmidi Msengana

for having taught me how to persevere in life
and to trust in God

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CHAPTER ONE

INTRODUCTION

1.1 THE CONTEXT OF THE RESEARCH

Much has been written about the lack of clear focus on adult basic education and about possible causes of the high percentage of adult illiteracy in South Africa (Allman and Wallis 1995; Mayo and Thompson 1995; Thompson 1980). In an attempt to eradicate high adult illiteracy levels current education reforms have placed emphasis on lifelong learning which is central to the National Qualifications Framework (NQF), a new structure that aims to improve the quality of education in South Africa (Department of Education 1997:5).

Lifelong learning means that adults who have been constructed as "other" (Stuart and Thomson 1995:3) by the education system of the old South Africa, and out-of-school youths with very little formal education, can now benefit from the new education system. It has been noted that adults with low levels of literacy have a sense of personal disempowerment and that they need special understanding, support and an immediate sense of achievement which boosts morale and provides practical tools for self-improvement (Freire 1998; Jarvis 1987). This situation presents a challenge for adult educators to make learning interesting, accessible and useful so that adult learners will be able to make up for the lost years of opportunity.

Much has also been written about the lack of clear focus on environmental issues in the South African education system. Ecological literacy was given little or no attention in both adult and environmental education. There have been increasing calls for environmental education in general and ecological literacy in particular (Orr 1992:85). Environmental education has been regarded as an essential strategy not only for addressing environmental problems, but also for creating

opportunities for good teaching and learning experiences. It has been illustrated how a community-based environmental project can provide a framework for the development of a wide range of teaching and learning skills (Department of Education 1997:16).

Ecological literacy has been identified as one of the cornerstones of sustainability. Orr (1992:85) defines literacy as the ability to read, numeracy as the ability to count and ecological literacy as the ability to ask, "What then?". He states that much attention has been given to our shortcomings in teaching the young to read, count and compute, but not nearly enough to ecological literacy. He further argues that "What then?" is an appropriate question to ask before the last rain forests disappear, before the growth economy consumes itself into oblivion and before we have warmed the planet intolerably (Orr 1992:85). He regards the failure to develop ecological literacy as a sin of omission and of commission and emphasises the fact that by failing to include ecological perspectives in any number of subjects, students are taught that ecology is unimportant for history, politics, economics and society.

According to Emmelin (1989:133) environmental issues have a two-fold place in adult education. First, they can present problems that need solutions by adult learners. This means that adult learners can play a major role in effecting meaningful positive changes in their environments. They are well placed in the sense that they are experienced members of the community who can initiate environmental projects if they are well educated and equipped to take action. They can participate actively in the social and economic development of their country. Second, environmental issues can be used as relevant and immediate examples in the teaching of adult basic education such as literacy, health and welfare, and in civic, political and community competence. The present study is an attempt to highlight the importance of not only adult literacy, but also environmental literacy.

Previous trends in both adult and environmental education were influenced by a technocratic approach to the curriculum. The agenda of adult education was not for transformation, but for meeting vocational needs (Mayo and Thompson 1995). In literacy education adult learners were subjected to the learning of reading and writing which resulted in the reading of texts without any critical comprehension of the social context to which they referred. The transmission of knowledge was dominant and the banking concept of education minimised the learners' creative power (Freire 1972). In other words, adult learners were subjected to an education process that ignored what they already knew (Freire 1978).

Past approaches to environmental education have been many and varied. The following section examines four approaches to environmental education.

The first approach is education **about** the environment. In this informative approach the environment becomes a topic or theme of study in the science and geography curricula. Education **about** the environment is only concerned with developing awareness, knowledge and understanding about human-environment interactions and is also referred to as environmental science or studies. It used to be a popular approach in schools (Fien 1992), although it does not encourage active learner participation in addressing local environmental problems. In Orr's words, it does not enable the learners to ask the question "What then?" (1992:85) about their environmental problems. In other words the focus of education **about** the environment is not environmental sustainability.

The second approach is education **in** the environment. This approach usually takes the form of outdoor education and favours learner-centred and activity-based learning. This approach is developed through fieldwork and has a strong experiential orientation. It develops environmental awareness and concern by encouraging personal growth through contact with the local environment (Fien 1993). Although education in the environment uses students' fieldwork experiences as a medium for education, its aim is only to provide students with

an appreciation of the environment through direct contact with it. Such experiences may, however, develop skills for data gathering as well as social skills, such as co-operation and group responsibility (Greenall, Gough and Robottom 1993).

The third approach is education **for** the environment. Education **for** the environment aims to engage students in the exploration and resolution of environmental issues; to promote lifestyles that are compatible with the sustainable and equitable use of natural resources; to help develop an informed concern for the environment, a sensitive environmental ethic, and the skills for participating in environmental protection and improvement (Fien 1993; Orr 1992; Harber 1990).

The fourth approach is education with a strong focus on sustainability. This approach integrates education **about**, **in** and **for** the environment and incorporates a futures perspective. Probable futures are examined in relation to the existing environmental relationships (Tilbury 1995).

Increased pressure on education authorities to accept responsibility for assimilating the principles of environmental education into formal education, have resulted in the recognition of environmental education in Curriculum 2005. The **environment** is one of the six phase organisers and the outcomes-based approach creates space for a focus on sustainable communities and sustainable use of resources. This highlights the rich potential of sustainability as an educational focus as it involves value system judgements with regard to both ecological sustainability and social justice (Fien 1993).

Current education reforms in South Africa are based on an outcomes-based approach to the curriculum. These reforms reject a rigid division between academic and applied knowledge, theory and practice, and knowledge and skills (Department of Education 1997:1). Outcomes-based education has been

regarded as a “unanimous rejection of the apartheid education principles of Christian National Education” by the Council of Education Ministers and the Cabinet in July 2000 (*Sunday Times*, 20 August, 2000). An outcomes-based approach aims not only to increase the general knowledge of the learners, but also to develop their skills, critical thinking, attitudes and understanding. The learners are expected to demonstrate that they are able to think; to solve problems; to collect, organise and analyse information; to work in a group, as well as independently; to communicate effectively and to make responsible decisions.

The new national curriculum encourages strategies of teaching and learning based on the constructivist theory. It will pay “particular attention to the teaching of environmental education and history” (*Sunday Times*, 20 August, 2000) and is an explanation to why both environmental and adult education are better placed at present. The learners and facilitators are given an opportunity to generate and reconstruct knowledge. The responsibility of developing educational programmes that create opportunities for the learners to practise, to try things out, to learn by doing and thinking, lies with the learners, facilitators and teacher educators. The following section examines how features of the new education dispensation open doors for effective adult learning, portability and environmental focus.

The following are the implications of Curriculum 2005 for adult and environmental education. Since Curriculum 2005 integrates education and training and promotes conceptual understanding and lifelong learning, adult learners:

- Will be provided an opportunity to learn on an on-going basis, both from life experiences and formal learning situations, regardless of their age, circumstances and the level of education and training they may have.
- Will be able to move from one place of learning to another and between the education and working environments, to build on what they learn and to transfer their credits and qualifications as they move from one learning

situation to another.

- Will be regarded as active, creative critical thinkers living productive and fulfilling lives.
- Will be empowered with the knowledge, competencies and orientations needed for assuming their roles as citizens after they have left school or have completed their training.
- Will be able to use environmental issues as relevant and immediate examples in the learning of literacy, health, welfare, and in civic, political and community competence. In addition, they will be able to solve problems, including their local environmental problems.

The new curriculum recognises that environmental problems call for an environmentally literate citizenry with the capacity and the will “to work individually and collectively to sustain the quality of the total environment on behalf of present and future generations of all living things” (Eastern Cape EEPI Document 1995:1). It also recognises the fact that environmental issues are complex and cannot be understood through a single discipline or department and that all education is environmental education.

The introduction of a new national curriculum in South Africa has created an opportunity for educators to develop learning programmes that are relevant to the challenge of building a sustainable society, thus enhancing the learners’ competence with natural systems (Orr 1992). It has created the need for the use of teaching methods that encourage the learners to think critically, to participate actively in the learning process and to be creative. The emphasis placed on local community-based environmental work demands and stimulates changes to traditional classroom approaches and practices in formal education. The need for change in teaching and learning processes highlights the importance of the role of educators in promoting outcomes-based education and learning for sustainability.

Several authors have regarded the role of teachers as vital if environmental education is to be one of the social agencies through which the transformation to an ecologically sustainable society is to be achieved (Huckle 1994; Stevenson 1987; Robottom 1984). Teacher education has also been recognised by successive UNESCO-UNEP conferences and reports as a major priority for research and action in promoting environmental education (UNESCO-UNEP 1988; Wilke, Peyton and Hungerford 1987; UNESCO 1980). The need for equipping teachers with the necessary facilitation skills and the skills needed to act responsibly towards the environment has been realised. The influence teachers can have on the learners' perspectives on environmental issues is, in turn, partly dependent upon the teachers' own knowledge and skills. Teacher education is regarded as the "priority of priorities" for action to improve the effectiveness of environmental education (UNESCO-UNEP 1988:3).

The "Tbilisi Plus 10" International Congress on Environmental Education and Training in Moscow in 1987 resolved that:

Teacher training is a key factor in the development of EE. The application of new environmental education programmes and proper use of teaching materials depends on suitably trained personnel, as regards both the content and the methods specific to this form of education. Teachers well trained in the contents, methods and process of EE development can also play a crucial role in spreading the impact of EE at the national level, thus increasing the cost-effectiveness of the efforts made by member states to develop EE ... There is a need to identify the national objectives of the training of teachers and to develop plans for the training of teachers which can be implemented by the training authorities (UNESCO-UNEP 1988:12).

A similar statement by the Council of Education Ministers and Cabinet in South Africa has been documented recently:

Teacher orientation, training and support are essential ingredients of curriculum change, and it is accepted that these have been inadequate to date. It has been agreed that the Teacher In-service Project, a Western Cape-based Non-Governmental Organization (NGO), together with the

Department of Education, will be responsible for developing a national strategy for teacher development. Consideration will be given to content of training, modes of delivery and identification of institutions to deliver. The incorporation of colleges into universities and technikons will strengthen the role of higher education institutions in PRESET and INSET. All higher education institutions will be encouraged to ensure that their programmes are in line with the Norms and Standards for Educators (*Sunday Times*, 20 August 2000).

In other words, to make our dreams come true requires good quality facilitators who can provide an education that can contribute to the development of citizens who are aware of their historical responsibilities, as well as avenues of creative effective participation in the process of social transformation. It is against this background that an attempt is made to help develop good quality adult educators at the Peninsula Technikon in the Western Cape.

1.2 PROBLEM STATEMENT AND JUSTIFICATION

While much attention has been given to both the pre-service and in-service areas in official documents, the current status of environmental education in teacher education remains at an unsatisfactory level. According to Wilke, Peyton and Hungerford (1987:1), "Few, if any, teacher training programmes adequately prepare teachers to effectively achieve the goals of environmental education in their classrooms". In a study that involved an extensive and rigorously sampled survey of the teaching of environmental education by 300 primary school teachers in the Australian city of Brisbane, it was found that there was a serious lack of teacher education and professional development with regard to environmental education. When asked about their pre-service teacher education experiences, only 4,9 per cent of the respondents said that they had undertaken any studies in environmental education, whilst over 85 per cent claimed that they had received no training at all in environmental education (Fien 1993).

The local education scene is different from the above situation in the sense that there are a few South African universities, such as Rhodes and Stellenbosch,

that offer environmental education programmes which adopt a critical practice-based orientation (Robottom 1987). However, there has been a historical inattention to environmental education in black pre-service programmes in South Africa. My experience as a lecturer at a college of education, technikon and university for blacks has convinced me that pre-service programmes in South Africa still give little or no attention to environmental education. Consequently, few teachers understand the socially transformative nature, scope and objectives of environmental education. Most teachers believe environmental education to be more appropriate to the science curriculum than to their areas of curriculum concern.

This problem is a serious cause for concern in South Africa, because in June 2000 the Minister of Education has initiated the National Environmental Education Project (NEEP) which recognises environmental education as a basis for all education. The NEEP has created the need for teachers who are qualified to teach environmental education in an effective and acceptable way.

Although most learning areas provide perspectives which are essential to holistic understanding of the environment and the framework within which environmental issues arise (Kelly 1984), educators have often been over-concerned with inculcating knowledge **about** the environment only, and too little involved in providing learners with direct experience **in** the environment (Walford 1981), and with using the environment as a medium for learning skills which are related to sustainable living (Fien 1993).

This problem has also been experienced at the Peninsula Technikon. The course content for Development Studies is based on a workbook which covers the following topics: **What is development?, Water, Desertification, Sustainable Land Development, and Recycling**. Although the course content has an environmental focus, the student teachers have been studying this course in the inappropriate academic context of a formal curriculum and timetable, large



student groups and lectures in lecture halls. This means that emphasis has been placed on education **about** the environment only. Since I became the lecturer for this course in 1997, I realised the need to equip the student teachers with the necessary skills needed to teach issues of sustainable living. This involves a number of aspects of education: information, a deeper understanding of the underlying concepts, skills acquisition, and the ability to apply the skills in environmental action.

There are few studies that portray the intervention of adult educators in environmental problems where different actors, through a relation of co-operation, have come to new concepts and solutions for filling in ecological responsibility. Such intervention is necessary, especially in the black communities of Cape Town where environmental problems such as overcrowding, land pollution, poverty, unemployment, malnutrition and lack of primary health care are manifested in a variety of diseases. The black communities in Cape Town need to be supported, educated, motivated and encouraged to take action in improving their own environments.

The present study provides an example of interventions that stimulate learning in relation to social and environmental problems. It is an attempt toward socially critical education. It also demonstrates that adult educators can take up the role of facilitator to stimulate people to question the different existing scenarios of sustainable development in the light of how to contribute to the quality of life and how to stimulate people to experiment with their own proposals. This study further demonstrates that adult educators can also be environmental educators and that it is possible for all educators to break through the walls of institutions and encourage collaborative learning for sustainability as this is the responsibility of every individual. It is against this background that I have decided to use the focus and methods of EEFS in the learning programme of my students at the Peninsula Technikon.

1.3 GOALS OF THE RESEARCH

The goals of the present study are to:

- Integrate theory and practice by promoting the use of the process of EEFS in the human and social sciences, thereby encouraging teaching and learning for sustainability.
- Enhance conceptual development of the student teachers with regard to sustainability as an environmental issue so that they will be able to involve their learners in education processes relevant to the challenge of building a sustainable society.
- Integrate adult literacy with ecological literacy so that the student teachers will be able to do the same with their adult learners.
- Use observations of students' practice to inform and improve my own practice.

In achieving these goals the study would hopefully contribute to the personal growth or development of adult educators in the teaching and learning processes as well as to the improvement of the environment.

1.4 RESEARCH LOCATION

Since environmental education has been perceived to be processes of social change that develop a range of skills in learners and enable communities to address environmental problems, I have decided to make an attempt, as a lecturer, to initiate processes of environmental education in the programme for my students. My students are adult educators who have registered for the three-year National Diploma in Adult Basic Education and Training (ABET) at the Peninsula Technikon in Cape Town. Although these students have no teaching qualifications, they are involved in community education for the disadvantaged

people in the various communities and in NGO education centres.

The National Diploma in ABET has been restructured in October 1997 to meet the demands of Curriculum 2005. Social Science Teaching, which was formerly known as Development Studies, is one of the modules for the programme. The content which places emphasis on development studies and environmental education, is integrated with the method of teaching. The method of teaching places emphasis on environmental education for sustainability and outcomes-based approaches. It also encourages local community-based environmental projects.

In an attempt to integrate theory and practice, the student teachers took action in community-based environmental projects organised by the Tsoga Environmental Resource Centre in Langa, Cape Town. The idea was that they should apply their acquired skills and understanding to teach their adult learners to transform their local environments through their literacy classes.

1.5 THE STRUCTURE OF THE STUDY

The present study has been set out in seven chapters. The first chapter is the introduction, which portrays the lack of clear focus in adult basic education and on environmental issues in the old South African education system. The place of environmental issues in adult basic education is outlined and the importance of integrating adult literacy with ecological literacy is highlighted. The implications of the new curriculum for adult as well as environmental education are portrayed and an explanation as to why adult and environmental education are better placed at present, is given. This chapter also highlights the importance of the educator's role in providing learning with a focus on environmental issues and methods of EEFS, and the need created by the NEEP for educators who are qualified to teach environmental education effectively.

Following the introduction is a theoretical analysis of the relationship between the curriculum and approaches in adult and environmental education. Different approaches to the curriculum and its development are explored and technocratic approaches are related to the old South African curriculum, to the previous trends or conventional approaches in adult and environmental education and to black education in the old South Africa. The critical conception of curriculum as a contextualised social process is examined and related to the new curriculum and to the accepted current approaches to adult and environmental education. The importance and appropriateness of social critical education and learning for sustainability are emphasised and the extent to which environmental education for sustainability has the potential to meet the needs of Curriculum 2005 has been portrayed. The challenge for teacher education has also been documented.

The participatory action research model employed in this study was designed so that both the student participants and I could benefit from our involvement. An analysis of this methodology and the procedures followed in the research form the subject of Chapter 3. This chapter also examines the debate about research in education with regard to positivist, interpretivist and critical approaches. My research position is documented and my research story narrated.

To make sure that the student teachers had the necessary emancipatory knowledge to take environmental action toward land resource management, I decided to determine the extent to which they understood the concepts related to land resource management. The manner in which the diagnostic test was conducted and the results thereof are set out in Chapter 4. From the results it was evident that the student teachers had a serious lack of conceptual understanding, which was related to the language problem, as they were Xhosa speakers.

The diagnosed misconceptions highlighted in Chapter 4 resulted in the development of the teaching unit that used the recommended approach to EEFS

with regard to land resource management. The teaching unit aimed at clearing misconceptions and developing the student teachers' conceptual understanding so that they could understand environmental issues related to land resource management and be able to take action toward their solution. The details of the teaching unit, which included field research, are presented in Chapter 5.

Chapter 6 focuses attention on the student teachers' stories from their teaching practice and reflects on their teaching practice. The interviews and observations of students at work in the community aimed at monitoring what students did with their learning experiences regarding environmental education for sustainability as a theme in a different teaching situation (adult literacy classes). The interviews and observations also aimed at providing feedback for the purposes of future programme design. The student teachers were asked to describe how they teach their learners.

A summary of the research findings and conclusions is set out in the final chapter and some recommendations which deal with how an appropriate approach to environmental education may best be stimulated and encouraged in the education system of South Africa, are put forward.

CHAPTER TWO

THEORETICAL ANALYSIS OF THE RELATIONSHIP BETWEEN THE CURRICULUM AND APPROACHES IN ADULT AND ENVIRONMENTAL EDUCATION

2.1 INTRODUCTION

Current reform initiatives in the South African education system have resulted in the introduction of a new national curriculum - Curriculum 2005 - in 1997. In order to understand the necessity and value of this new curriculum we need to understand the past and make sense of the future. It is important to know where we come from and where we are going.

The new curriculum aims to redress imbalances in education that were created during the era of Apartheid. These imbalances include the exclusion of adult or lifelong learning from the education system and the use of teaching methods that did not encourage critical thinking, creativity and active participation on the part of the learners. These inadequacies have been addressed in the new proposed education framework and in Curriculum 2005. This chapter examines the development of the theory supporting the new proposed curriculum, and explains why both environmental and adult education are better placed at present.

2.2 APPROACHES TO THE CURRICULUM AND ITS DEVELOPMENT

Our conceptions and ways of reasoning about the curriculum reflect and shape how we see, think, talk about, study and act on the education made available to the learners. These conceptions are influenced by different approaches. Cornbleth (1990) distinguishes between technocratic and critical approaches to the curriculum and its development. These approaches reveal important differences in conceptions and associated practices with different social, political

as well as pedagogical implications. Among the differing and interrelated implications of the two approaches are those concerning:

- (a) teacher and curriculum specialist roles
- (b) the nature of knowledge made available to the learners, and
- (c) social control, conflict and change (Cornbleth 1990).

The following section examines the differences between technocratic and critical approaches and how these approaches affect the selection, organisation, treatment and distribution of knowledge to which the learners are exposed.

2.2.1 TECHNOCRATIC CONCEPTION: THE CURRICULUM AS A DOCUMENT

Most of the efforts to characterise, distinguish or categorise curriculum conceptions have accepted the dominant technocratic conception of the curriculum as a document, and noted variations on this theme. They have not identified alternative conceptions (Vallance 1986; Eisner and Vallance 1973). A technocratic conception views the curriculum as a tangible product, usually a document or plan for instruction in a particular subject. This document contains a brief outline of the topics to be taught and learned (syllabus or course of study), an elaborate outline accompanied by teacher and learner materials (e.g. readings, worksheets, transparencies) and a teacher guide including directions for teaching and testing (Cornbleth 1990). Curriculum change is viewed as constructing and implementing a different document or package. Change is seen as a function of the curriculum product and curriculum change efforts tend to focus on document revision and perhaps teacher in-service "training".

The educators and learners are assumed incapable of curriculum planning or enactment in the absence of direction or assistance from curriculum specialists. The educator is regarded as a manager or passive implementor of expert

designs. Technocratic approaches to the curriculum and its construction contribute to what has been characterised as teacher de-skilling (Apple 1982), since they foster reliance on experts and expert knowledge.

A technocratic approach tends to foster transmission of expert knowledge, often in fragments amenable to behavioural objectives, sequencing and standardised testing. Knowledge in the form of correct answers is predetermined and often trivialised and academic-intellectual integrity is lost. There is little room for personal knowledge of the educator or the learner as well as creativity or critique that might lead to comprehension, knowledge generation or reconstruction. Memorisation of correct answers and mastery of discrete skills take precedence over open-ended inquiry or reflective thinking.

Technocratic approaches enable the state to manipulate the curriculum directly and indirectly and to shape curriculum practice and change. The state not only mediates external demands and pursues its own interest, but also influences “the meanings and methods of politics for all groups and classes in society” (Evans, Rueschemeyer and Skocpol 1985:253). By direct and indirect means the state contributes to the formulation of the socially shared understandings that serve to standardise and control education such as the “schooling rule” that defines school, teacher and student (Meyer and Rowan 1983:84), thereby minimising conflict.

South Africa is one of the countries that adopted the technocratic approach to the curriculum and its construction. A satisfactory grasp of this approach as it was put to use in black education in South Africa demands a full consideration of black education's historical background.

2.2.1.1 A historical background to black education in South Africa

The following section focuses on the evolution of an educational policy for black

South Africans, not because I believe that white education is not besieged by problems, but simply because the crisis is most acute in black education and the focus of the study is on improving the quality of education for black student teachers.

Formal schools made their appearance in South Africa as part of the new social relations introduced with colonialism. Within the colonial context schools became key institutions of control, whereby a new indigenous elite was created to replace the traditional groupings who represented a different cultural and political outlook that was often hostile to the culture and social practices of the conqueror (Kallaway 1984). Schooling was designed for a specifically colonial context. There was a need for schooling to produce

a sufficiently docile, 'colonised' population to prevent the emergence of an outright political challenge to the status quo, yet at the same time there (was) a demand for appropriate 'manpower' for ever increasing mechanisation and technological sophistication, with demands for versatile and competent black employees capable of holding their own in the 'open' racial labour market (Kallaway 1984:8).

Educational policies had to meet the general political demand for educational equality and for the provision of an appropriately skilled labour force, while at the same time attempting to meet the needs of control in the apartheid state. Schools and schooling were "sites of struggle" and the implementation of schooling systems represented a history of losses and gains for the mass of the people rather than promoting the betterment of society as a whole. Schooling was used to weaken the indigenous people's resistance to colonisation and established them, once conquered, in their new place of subordination (Molteno 1984).

Stuart and Thomson use the concepts of "other" and "othering" to describe the ways in which individuals and communities construct the identities of people who are different.

Explorers, missionaries, imperialists and colonists responded to the peoples (and to the environments) of unfamiliar worlds by understanding and constructing them as different from and inferior to the prevailing norms of European culture and society, as 'other' ... Anthropologists entrenched these attitudes by studying 'other' cultures from Euro-centric perspectives (Stuart and Thomson 1995: 3).

Certain individuals and groups were thus constructed as "other" to the educational norm and many people internalised this definition, articulating their negative learning experiences and identities through phrases such as "education is for other people". The process of "othering" in education (Stuart and Thomson 1995: 4) also took place in South Africa. When the Union of South Africa was formed in 1910, a system of education known as Native Education was evolved for blacks as part of the policy of segregation. The Report of the Departmental Committee on Native Education (1935-6) sums up this policy as follows:

The education of the white child prepares him for life in a dominant society and the education of the black child for a subordinate society... The limits (of Native Education) form part of the social and economic structure of the country.

Thus the rulers utilised education to maintain their dominant position. In practice this meant inferior education for non-Europeans. At this stage, however, the few who could afford secondary and university education did receive the same syllabuses as the Whites and managed to hold the same qualifications. This was against the Minister of Native Affairs' idea of South African society. Dr Verwoerd labelled educated blacks as

the class which has learnt to believe that it is above its own people and feels that its spiritual, economic and political home is among the civilised community of South Africa, i.e. the Europeans (Verwoerd 1954:17).

At the time, it was believed that an education system based on a divided system to provide different curricula for different ethnic groups was the only solution for

South Africa. This led to the introduction and development of Bantu, Coloured and Indian education by the National Party in 1948. Bantu education was calculated to serve as

an instrument for creating and ensuring the continuance of a voteless, rightless and ignorant community ... (It was) intended to rob the African of education, cut him off from the main stream of modern culture and shut him into a spiritual and intellectual ghetto (Tabata 1980:11).

This point is further made clear by Dr Verwoerd's speech:

My Department's policy is that (Bantu) education should stand with both feet in the Reserves and have its roots in the spirit and being of Bantu society ... There is no place for him in the European community above the levels of certain forms of labour ... For this reason it is of no avail for him to receive a training which has as its aim absorption in the European community. Until now he has been subjected to a school system which drew him away from his community and misled him by showing him the green pastures of European society in which he was not allowed to graze (Verwoerd 1954:23).

With this purpose in mind, the control of education for blacks was transferred to the Native Affairs Department, often with a white top structure. This department dealt with the supply of cheap black labour to the mines, the farms and industry, agriculture, the collection of poll tax and enforcement of pass laws.

The local management of the schools was handed over to tribal school committees and school boards that worked under the tribal authorities, with a chief at the head. The inability of the chief or headman to read or write his name did not disqualify him. When he had to append his signature to an official document, he put down a cross, which had to be witnessed by one of the teachers he employed (Tabata 1980:13). It was these people who not only directed and supervised the schools, but also employed and dismissed the teachers.

2.2.1.2 The Old South African Curriculum

The curriculum likewise was fundamentally adapted. A decontextualised technocratic approach to the curriculum was adopted and the curriculum came to be seen as a product or plan of teaching. It was developed according to procedures of task analysis by outside experts and then made available to classroom teachers in various school settings.

According to Young (1971:24) there is a strong link between the curriculum and power. Those people who have power are able to decide what knowledge schools should teach, what the goal of education would be and, by implication, what methods should be used. The school curriculum itself reflects what these people think is important. In this way it indirectly reflects the power structures and hierarchies of society. Young defines the curriculum as

a result of choices that are made ... These choices reflect the *values* and *beliefs of dominant groups* in the society at a particular time (Young, 1971: 24 adapted).

The links between knowledge and power in the South African curriculum are explored by Christie (1985). She gives examples, and raises many questions about the hidden curriculum.

There are certainly a number of questions which we could ask about the South African curriculum:

- It is compulsory for black children to learn through the medium of English or Afrikaans at school. Why is it not compulsory for white children to learn through the medium of an African language?
- Why do we spend so much time at school learning about European history? Why don't we learn about Third World history or African history?

- Why do black children learn gardening, when white children don't?
- Why do girls and boys learn different subjects, e.g. girls learn sewing and boys learn woodwork? Shouldn't both genders learn to mend their clothes and fix their furniture?

These questions - and the answers we give - certainly tell us something about power arrangements in the South African society (Christie 1985:146).

The old curriculum was influenced by the scientific approach to education. It was believed that human behaviour could be described according to the same scientific principles as those used in science. The real purpose of education was seen as bringing about desired changes in behaviour (Jarvis 1987).

The following section reflects on how a technocratic approach to the curriculum manifested itself in South Africa.

When the National Party came to power in 1948, the curriculum for blacks was content-based and there was a rigid division between education and training, academic knowledge and applied knowledge, theory and practice, and knowledge and skills (Department of Education 1997:1). The learner was regarded as an object and was expected to memorise facts without actually understanding their meaning. This resulted in an education system that did not provide opportunities for questioning knowledge, the syllabus or the method of assessment. The result was a passive learner who did not get the opportunities to develop, or to understand how to apply critical thinking. The learner was denied the right to both conceptual and skills development. In other words, the learners and educators were denied the right to a meaningful education. This type of education is referred to as "domesticating and banking" education in which "knowledge is a gift bestowed by those who consider themselves knowledgeable upon those whom they consider to know nothing" (Freire 1972:46). In South Africa it was done in an attempt to turn some learners into workers who would be satisfied with the little they have, rather than people who

feel that they have the right to a better life, and the ability to change their situation.

With regard to pre-service teacher education and training there were as many inadequacies. When Grade 11-12 learners in the 1976-80 period talked of their educators being “badly qualified”, they were usually referring to the inability of their teachers to explain and clarify difficult concepts and problems or to answer their questions and engage in discussion with them. Because of inadequacies in their ability to use English, pupils found the textbooks difficult to understand, but many teachers were unable to help them because of their own limited understanding of the textbook. Resort was taken to rote learning of what was contained in the textbook (Hartshorne 1992). A new generation of socially and politically aware senior students became frustrated and could not accept this situation. Their frustration was directed not only against “the system”, but also against their educators, whose limited “qualifications” were regarded as the cause of their inability to cope with the pupils’ learning needs (Kane-Berman 1978: 22-25).

Since the focus of this study is to investigate strategies aimed at empowering adult educators for more morally and theoretically defensible, transformative teaching and learning, it seems appropriate to examine the extent to which the technocratic approach to the curriculum influenced both adult and environmental education.

2.2.1.3 Previous Trends in Environmental Education

It has been noted that the survey of articles in the Southern African Journal of Environmental Education (1984-1990) and the Environmental Education Bulletin (1989-1991) reveals that, before the Environmental Education Association of South Africa (EEASA) conference of 1990, most environmental education initiatives attempted to raise environmental awareness in order to conserve

nature (Irwin 1991; Robottom, 1991). Environmental education was seen as a strategy or mechanism by which values and attitudes could be inculcated and behaviour changed to reduce environmental damage. This reflects the instrumentalist approaches of curriculum development approaches of the time.

Another feature that distinguishes these earlier approaches is their reductionist perspective, in the sense that these approaches address only the biophysical dimensions of the environmental crisis. This, in turn, reflects the strongly discipline-based curricula of the day. The outcome of this orientation is environmental education which draws exclusively on the natural sciences, particularly ecology (Paxton 1994).

The third distinguishing feature reflects the epistemology of technocratic curricula, and is manifested in the adoption of a transmission approach to education, learning and social change. This approach is characterised by the communication of appropriate conservation messages from experts (most often scientists) to specific target groups, such as educators, learners and the public, with the intention of promoting awareness and behaviour change (O'Donoghue 1993; Robottom 1991).

The fourth feature identified in the early approaches, likewise strongly reminiscent of education philosophy and curriculum theory of the time, is its individualist and behaviourist underpinnings, manifested in an emphasis on individual responsibility for environmental problems and on behaviour change (through the adoption of a prescribed set of environmental values) as a solution to environmental problems. Emphasis is placed on individual values, attitudes and behaviour as determinants of behaviour.

2.2.1.4 Previous Trends in Adult Education

For many years adult education has been subject to restructuring around the

promotion of market forces, moving away from the agenda of education for transformation toward a narrow agenda of meeting vocational needs (Mayo and Thompson 1995). Most learning theories in adult education have taken a predominantly psychological perspective. This is not surprising, since adult education has been concerned with both adult development and traditional approaches to learning (Jarvis 1987) and since education generally has emphasised the cognitive psychological approach to learning. In addition, Piaget's studies of cognitive development have also played a significant role (Moessinger and Poulin-Dubois 1981; Piaget 1976).

There was a belief that language acquisition is manifested in quantifiable change in behaviour, and behavioural definitions specify that learning is the product of a particular process, namely behaviour modification. An example is the following claim, "Our judgement of whether any learning has taken place must ultimately rest on making some sort of observation" (Borger and Seaborne 1966: 16). This claim is problematic since the learners' assessment of their own learning may be far more accurate than observations.

Initial studies (Hilgard and Atkinson 1967; Borger and Seaborne 1966; Skinner 1953) placed emphasis on the concept of knowledge rather than on the process whereby that knowledge had been acquired. In other words they were concerned about discovering the technology whereby a correct response can be learned rather than understanding the learning process.

The most important factor in the literacy education of adults was the learning of reading and writing, which resulted in the reading of texts without any critical comprehension of the social context to which they referred.

The learners are never called to think critically about the conditioning of their own thought process; to reflect on the reason for their own present situation; to make a new 'reading' of the reality that is presented to them simply as something to which they should adapt themselves ... They learn that knowledge is something to

be 'consumed' and not made and remade ... Illiteracy is thought of as a harmful weed which should be eradicated (Freire 1978: 23).

What was also important in adult education, was the transmission to the people of a knowledge previously elaborated, a process that ignored what the adult learners already knew. The banking concept of education was dominant and the learners' creative power was minimised or annulled. Freire (1972) refers to this type of education as "domesticating" education.

2.2.2 CRITICAL CONCEPTION OF THE CURRICULUM AS A CONTEXTUALISED SOCIAL PROCESS

A contextualised social process view of the curriculum and its construction reflects a critical rather than a technical rationality. Key features of a critical perspective are its normative stance against all forms of domination and autocracy and its context sensitivity. Cornbleth (1990) explores what a critical perspective might mean for curriculum construction and change efforts and for curriculum studies as an area of inquiry and advocacy. According to this author, the purposes of a critical perspective are enlightenment and empowerment that can foster personal and social emancipation from various forms of domination. It recognises and values human intention and action in relation to both the limiting and the enabling aspects of people's historical, material and cultural circumstances.

Cornbleth (1990) maintains that the curriculum must be seen and treated as value-laden and contextualised. The relevant context is both structural and socio-cultural. The structural context can be considered at several layers or levels, from the individual classroom to the school organisation to the national education system. The socio-cultural context includes demographic, social, political and economic conditions, traditions and ideologies, and events that actually or potentially influence the curriculum.

A similar approach to the curriculum is Grundy's account of "curriculum as praxis" (Grundy 1987). According to Grundy, curriculum as praxis is a social process that

develops through the dynamic interaction of action and reflection. That is, the curriculum is not simply a set of plans to be implemented, but rather is constituted through an active process in which planning, acting and evaluating are all reciprocally related and integrated into the process (Grundy 1987:115).

This implies that the curriculum is constructed within actual learning situations and within certain contexts with students, that learning is a social process, and that curriculum knowledge is socially constructed and subject to critique and reconstruction. Since interpretation and critique involve differing and conflicting meanings or constructions of knowledge, the curriculum process is inescapably political (Grundy 1987).

Although Grundy's account of curriculum as praxis (1987) is compatible with Cornbleth's view of the curriculum as a contextualised social process (1990), it only acknowledges contextual influences but does not pursue them. Grundy (1987) does not examine more specific questions of what contextual understanding and improvement might involve or how such understanding and improvement might be pursued. Whereas Grundy's approach to curriculum praxis might be characterised as personalised and reflective, individually and collectively, Cornbleth's proposed approach is contextualised.

Cornbleth (1990) argues that the curriculum emerges from the dynamic interaction of action, reflection and setting (context), not action and reflection alone. This author pursues a conception of the curriculum as a contextualised social process and shows how education systems mediate state and socio-cultural pressures.

Curriculum construction is defined as

an on-going social activity that is shaped by various contextual influences within and beyond the classroom and accomplished interactively, primarily by teachers and students. The curriculum is not a tangible product but the actual, day-to-day interactions of students, teachers, knowledge and milieu. The curriculum encompasses what others have called curriculum practice or the curriculum-in-use. Curriculum as product or object, the conventional view, is seen as one aspect of the context that shapes curriculum practice (Cornbleth 1990:24).

The critical conception of the curriculum and its construction is therefore an integrated and ongoing process. It does not separate curriculum policy-making, construction and implementation as a linear sequence of events. The curriculum is constructed and reconstructed in situated practice. Attention is shifted from intention to realisation, and from plan to practice. The focus is on which knowledge and learning opportunities are actually made available to the learners, how they are created and what values they reflect and sustain. Responsibility is shared and not evaded.

With regard to teacher and curriculum specialist roles, the nature of knowledge made available to the learners, together with social control, conflict and change, a critical approach highlights situated teacher-student interaction, and also assumes and fosters active, reflective and responsible teacher roles.

A critical approach views curriculum knowledge as opportunities to construct, reconstruct or critique knowledge. It holds the potential for alternative knowledge forms and processes including knowledge generation or reconstruction by students and teachers. The extent to which this potential is realised depends on both teachers' capacities and contextual supports.

Understanding a curriculum and how our views might be changed, requires understanding the culture of the education system, which may involve several subcultures associated with occupational groups (e.g. teachers and

administrators), subsystems (e.g. elementary education, teacher education), and regions (e.g. urban, rural), as well as racial-ethnic, religious, socio-economic and gender groups (Cornbleth 1990). Conflict is acknowledged and seen as an impetus for change.

2.2.2.1 Moving towards a critical conception of the curriculum as a contextualised social process in the South African Education system

Bantu education, like any other educational system, required certain prerequisites for its success. Firstly, it had to be acceptable to those for whom it was designed. Secondly, it not only had to be beneficial to them, but had to be seen as such by the people. Thirdly, it had to be in keeping with the general cultural and economic trends of the time (Tabata 1980). All these three requirements were absent in Bantu Education. It was rejected by the majority of the black population. Since June 1976, many students showed their dissatisfaction with the education system and demanded changes.

In response to demands for changes in education, the government appointed the Human Sciences Research Council (HSRC) in 1980 to conduct an investigation into education in South Africa and to make recommendations for an education policy (Christie 1985). These recommendations should "provide for the manpower requirements of the RSA and make available education of the same quality for all population groups" (HSRC 1981: 1). The De Lange Commission of inquiry was also appointed because business people were complaining that the education system did not meet the demands of the growing economy (Christie 1985).

The De Lange Report put forward proposals for educational change in South Africa. It proposed a more comprehensive system of mass schooling, a single education system and the principle of "equal quality" in education for all groups. It

proposed a move away from traditional, formal schooling patterns towards a new schooling structure. Instead of twelve grades of formal school, there would be a formal (academic) education structure running parallel to a non-formal (vocational) education structure (Buckland 1984).

There were different responses to the De Lange Report. The government rejected the proposal of a single education department for all and issued a White Paper accepting some, but not all De Lange proposals. According to Chisholm and Christie (1983), some people, however, welcomed and supported the De Lange proposals and urged the government to implement them. They hailed the De Lange Report as a “revolutionary breakthrough in education” and they saw the White Paper as a setback for reform, because it did not completely support the De Lange Report (Chisholm and Christie 1983: 256). Some strongly criticised the De Lange Report and saw it as a revitalised support for Apartheid. They argued that class, race and gender differences would remain and working class children (mainly black) would be channelled into technical and vocational education while middle class children (whose parents could afford to pay) would be more likely to have an academic education. Radicals stated that the De Lange system would not bring fundamental change to the educational and social inequalities in South Africa (Christie 1985). The current education reform initiatives in South Africa have resulted from the processes of struggle and historical change. With the first full, democratic elections in 1994, it was possible for the new government to propose the new national curriculum - Curriculum 2005.

2.2.2.1.1 The Implications of Curriculum 2005 for Adult Education

Curriculum 2005 integrates education and training and promotes conceptual understanding, skills development and lifelong learning. Lifelong learning is central to the National Qualifications Framework (NQF) which is a new structure that aims to improve the quality of education in South Africa (Department of

Education, 1997). The objectives of the NQF are to create an integrated national framework for learning achievements and to enhance access to, and mobility and quality within, education and training (SAQA Act, 1995: clause 2). The NQF provides opportunities for people to learn regardless of their age, circumstances and the level of education and training they may have. It allows them to learn, on an on-going basis, both from life experiences and formal learning situations. This new system provides access to nationally accepted qualifications through recognition of prior learning (RPL). Different forms of learning and work or life experiences will be recognised and credits allocated and registered on the NQF.

The NQF aims to close the gap that exists between education and training. In the past education was seen as an area where knowledge is gained, and training as an area where skills are obtained. The integration of these two areas of learning will enable adult learners to move from one place of learning to another and between the education and working environments. Since the areas of learning are connected to each other, adult learners will be able to build on what they learn, and transfer their credits and qualifications as they move from one learning situation to another.

For the first time high quality education will be available for everyone, irrespective of age, gender, race, colour, religion or language (Department of Education 1997). Lifelong learning means that adults who have been constructed as “other” by the education system of the old South Africa, and out-of-school youths, with very little formal education, can now benefit from the new system. All South Africans can become active, creative, critical thinkers living productive and fulfilling lives. The new curriculum aims at empowering all learners with the knowledge, competencies and orientations needed for assuming their roles as citizens after leaving school or completing their training. Its guiding vision is that of a thinking, competent future citizen (Department of Education 1997). This vision is important because South Africa needs competent and responsible citizens who are able to operate in a culturally diverse and democratic society.

The word “outcome” is a key word in the education and training system. Outcomes are the results expected at the end of each learning process. The learner’s progress is measured against these outcomes. The learner is not only assisted to achieve the outcomes, but is also helped to develop as a whole person. Outcomes-based education is a flexible, empowerment-oriented approach to learning. It stresses the social construction of knowledge, active participation, integration of knowledge, reasoning, reflection and action. It also develops attitudes and understanding (Department of Education 1997).

The new curriculum stresses that education and training should be seen as a community development resource and should meet the needs of the community. Comment and input from the wider community in the curriculum development process is encouraged and people are also encouraged to learn how to interact with each other and with their environment (Department of Education 1997). One of the aspects that have become important in the learning process is active empowerment through community-based environmental projects. The involvement of the wider community in the curriculum development process corresponds well with Cornbleth's ideas of a critical curriculum. Active democratic participation in the writing of unit standards and in their regular revision reflects this author’s idea of the curriculum as a contextualised social process.

The following are some of the critical or essential outcomes of the new national curriculum.

Learners should be able to demonstrate their ability to:

- identify and solve problems by using creative and critical thinking;
- organise and manage themselves and their activities responsibly and effectively;
- work effectively with others in a team, group, organisation and community;
- collect, analyse, organise and critically evaluate information;

- communicate effectively using visual, mathematical and/or language skills in the modes of oral and/or written presentation;
- use science and technology effectively and critically, showing responsibility towards the environment and the health of others;
- understand that the world is a set of related systems by recognising that problem-solving contexts do not exist in isolation;
- show awareness of the importance of effective learning strategies, responsible citizenship, cultural sensitivity, education and career opportunities, and entrepreneurial abilities (Department of Education 1997: 16).

These critical outcomes apply to all learning areas. From the critical or essential outcomes of the new national curriculum it is evident that an outcomes-based approach to education encourages teaching and learning based on constructivist orientations. The new curriculum has therefore placed both adult and environmental education in a better position.

2.2.2.1.2 The Importance of Adult Basic Education and Training in South Africa

The introduction of lifelong learning by the new education and training system in South Africa reflects the realisation that sustainable economic growth is dependant on successful human resource development and that active democratic participation is important in all spheres of the Reconstruction and Development Programme. The new curriculum stresses the importance of community involvement in education :

Education and Training should be a joint responsibility of the State, the community and the private sector. In the case of schools, parents and guardians share the primary responsibility for the education of their children. A healthy partnership between state authorities and parents is absolutely essential for the establishment of a culture of Lifelong Learning Development (Department of Education 1997:13).

Community involvement in education and developmental or environmental projects is hardly possible if the majority of the population have low levels of literacy. This highlights the value and importance of effective Adult Basic Education and Training (ABET). Adults with low levels of literacy have a sense of personal disempowerment. They need special understanding, support and an immediate sense of achievement which boost morale and provides practical tools for self-improvement.

Adult educators in South Africa are challenged to make learning interesting, accessible, useful and memorable. The hard slog of making up for lost years of opportunity, which is the essence of the RDP, is made easier for the adult learner if learning is practical and relevant to their day-to-day reality.

The following section focuses on improvements in adult and environmental education which have been made possible by the introduction of Curriculum 2005.

2.2.2.1.3 The Current Approach to Adult Education

Perspectives on adult learning have changed dramatically over the decades. Cranton (1994) outlines the following dimensions of adult learning:

(a) Adult learning as a political movement

Historically, particularly in Britain and Europe, adult education has been seen as a political movement – a movement toward freedom and liberation that is both personal and social. In other words, it was viewed as a process of being freed from the oppression of being illiterate.

(b) Adult learning as a way to satisfy learner needs

This view is based on the North American adult education system which adopted the model of meeting the needs of the learners. Several authors argue that adult learning should be **practical** as adults have immediate problems to solve (Wilcox 1990; Wlodkowski 1990; Jarvis 1983; Knowles 1975,1980). They assume that the adults want to apply their learning directly to their work or personal lives. Recent theorists, such as Mezirow (1991), have continued to include action as a vital component of adult learning. Knowles's work was viewed in a black-and-white manner and criticised by some writers (Candy 1991; Brookfield 1986).

According to Brookfield (1986) an effective training programme in business and industry is often described as one that helps trainees become "more productive employees, not one in which employees become critically reflective and develop insights concerning their own lives ..." (Brookfield 1986: 191). This view corresponds with what Dr Verwoerd said and believed of a black, illiterate community in South Africa (Verwoerd 1954). Cranton (1994) describes this view as "consumer oriented" and states that in the light of theorising about individual psychological types and learning styles, it can be argued that not everyone prefers, or is even interested in practical learning.

Knowles' conception of self-directed learning (1980) led practitioners to work from the assumptions that adults are **self-directed** and that they have immediate goals and problems to solve, in other words that they know what they want to learn. Knowles (1980) argues that, as a person matures, his or her self-concept moves from that of a dependent personality toward one of a self-directing human being. This conception corresponds with Cranton's (1994) view of consumer-oriented adult learning.

The consumer-oriented perspective on learning has been severely criticised in recent adult education literature (Griffin 1987; Collins 1991; Cranton 1992). It is

argued that although adults may prefer self-directed learning, and although they may be self-directed in every other aspect of their lives it does not necessarily follow that adult learners have the skills or maturity as learners to be self-directed (Cranton 1994). The notion that individuals must develop the capacity for self-direction is supported by Kirschenbaum and Perri (1982). Candy (1991) suggests that there are several components to this capacity, including the possession of “deep-level learning”, and the ability to ask questions. Also included is the ability to read well, to monitor comprehension, and to think critically. In practice, consumer-oriented learning programmes have often been implemented without considering learners’ ability to be self-directed (Ash 1985; Thorne and Marshall 1984; Ferrier, Marrin and Seidman 1981). Working within a consumer-oriented model does not guarantee learners who are informed consumers, and learning can become a frustrating experience that leads to anxiety and even to withdrawal from the learning experience (Cranton 1994).

On the other hand, Cranton (1994) suggests that we should realise how valuable this type of learning could be. We should also recognise that the process of becoming a self-directed learner often involves critical self-reflection and changes in our assumptions about ourselves as learners, as well as about education generally. Brookfield (1993) reminds us of the political dimensions of self-direction: learner control over educational decisions, a concept that is central to emancipatory education.

(c) Adult learning as a process of critical self-reflection that can lead to transformation

Mezirow (1990, 1991) suggested that the goal of adult education is transformative learning. Transformative learning is defined as the “development of revised assumptions, premises, ways of interpreting experience, or perspectives on the world by means of critical self-reflection” (Cranton 1994: xii). Recent literature places emphasis on the description of the transformative

learning process as educators observe it, within familiar contexts, as well as guidelines and strategies for working toward transformative learning (Mayo and Thompson 1995; Cranton 1994; Mezirow 1991). They also stress the importance of the educator's role in promoting transformative learning and fostering learner empowerment. There have been increasing calls for a change in the direction of adult learning toward this type of learning which is also referred to as constructivist and emancipatory learning (Cranton 1994).

The phenomenon of adult learning is complex and difficult to capture in any one definition. According to Cranton (1994) adult learning could be any or all of these processes as well as others such as personal or professional development, acquisition of skills and knowledge and consciousness-raising. She argues that the emphasis on a particular perspective is simply a product of the social context of the time in which it dominated educational practice and each is valid in that context. Adult learning could be viewed as political rebellion in a social system that depends on maintaining the power of an elite few by withholding information from the illiterate masses; as a fulfilling of expressed learners' needs in a culture that emphasises consumerism and the immediate gratification of needs; as the acquisition of knowledge and skills in a society that espouses the value of equal access to information by all members of the society; and as a process of critical reflection during a time when individuals are questioning their political and economic systems. Cranton (1994) states that individuals will continue to acquire specific sets of knowledge, engage in learning to solve immediate problems, and question their own and others' assumptions and values, whether the literature of the decade advocates a particular type of adult learning or not.

(d) Adult learning processes

Given the many types of adult learning and the diverse contexts within which people live and work it is difficult to identify general characteristics of adult learning. However, educators and educational theorists have struggled to do so

for many decades. Much of their writing does not rest within a theoretical framework, articulate a philosophical perspective on types of knowledge, or consider social context. Although the universality of the characteristics may be debatable, the following section highlights some of the proposed distinctive characteristics of adult learning.

According to Merriam and Brockett (1997:306), there are marked differences between adults and children that help distinguish learning in adulthood from learning in childhood. The nature of experience differs in the sense that adults are dealing with different developmental issues than children, and there are differences in what motivates adults to participate in learning activities.

The comparatively richer life experiences of the adult have been cited by several authors as a key factor in differentiating adult learning from child learning. Kidd (1973:46) notes that “adults have more experiences, adults have different kinds of experiences, and adult experiences are organised differently”. Adult experiences function as “a rich resource for learning” (Knowles 1980:44) because adults can call upon their past experiences in the formulation of learning activities. The need to make sense out of one’s life experiences is regarded as an incentive for engaging in a learning activity. It is argued that past experiences bring about a learning process that “focuses on modifying, transferring, and reintegrating meanings, values, strategies, and skills, rather than forming and accumulating as in childhood” (Smith 1982:41).

Adult learning is seen to be **voluntary** (Cross 1992). Individuals choose to become involved in informal or formal learning activities as a result of the desire to grow, change or develop. They join a learning group because they want to learn a particular skill or gain knowledge that will help them in their work, at home or in the community. Since adult learning is considered to be voluntary, adult learners are assumed to be highly motivated and interested in content that is relevant to their immediate needs (Cranton 1994.) It is however argued that

there are also voluntary learners who do not exhibit a keen interest or strong motivation (Cranton 1994).

Adult learning is also described as **participatory** or **collaborative** in nature. Practitioners often employ group work and other interactive strategies. They describe themselves as facilitators of a process in which learners share experiences, resources and expertise as equal members of a group (Meyers and Jones 1993; Knowles 1984). This view assumes that adults bring a rich and varied set of life experiences to the learning environment, and that they wish to share these resources with other learners, while at the same time benefitting from the experiences of other members of the group. Such a process makes the learning concrete and relevant rather than abstract or theoretical and thus unrelated to the learners' lives (Kolb 1984). This view corresponds with the constructivist theory – the social construction of knowledge. Although this view is popular and generally accepted, Cranton (1994) claims that learning through participation with others may not be preferred. This author sees a person's psychological type as an important factor in that preference.

Adult learning is regarded as more **problem-centred** than subject-centred. It is assumed that there is a change in time perspective as people mature, from future application of knowledge to immediacy of application (Knowles 1980).

The ability of adult learners to take action and to solve problems is also recognised by Freire (1972). He realised that many people who had been poor all their lives seemed to believe that their situation could never change, and that there was nothing they could do about it. He believed that the first step towards the upliftment of poor and oppressed people is to instil in them a belief that their situation can be changed, and that they have the power to change it. This could be achieved through the development and practice of "the pedagogy of the oppressed" (Freire 1972:30). This means that techniques and methods of teaching and facilitation that are intended to liberate learners should be

developed and implemented. Freire calls for appropriate programmes of learning for adults that would empower them to participate in the transformation of their society. He sees illiteracy as

a handicap to the extent that in literate cultures it interdicts the illiterates by preventing them from completing the cycle in the relationship between language, thought and reality and by closing the doors to writing which represents an important and necessary means of understanding that relationship (Freire 1998: 2).

The learners are encouraged to think critically and helped to focus on relevant issues.

The act of learning to read and write is a creative act that involves a critical comprehension of reality. [Experiential] knowledge gained by the learners as a result of analysing praxis in its social context, opens to them the possibility of new knowledge. There is no more separation between thought-language and objective reality. The reading of a text now demands a "reading" within the social context to which it refers ... In this sense, literacy education for adults becomes an introduction to the effort to systematize the knowledge that rural and urban workers gain in the course of their daily activity - a knowledge that is never self-explanatory but must always be understood in terms of the ends that it serves (Freire 1978: 23-24).

This view is supported by several authors (Allman and Wallis 1995; Mayo and Thompson 1995; Thompson 1980).

In other words, literacy education for adults is a process of challenging them, through critical reflection, regarding their own practical experience, and the ends that motivate them eventually to organise the findings, and thus to replace mere opinion about facts with an increasingly rigorous understanding of their significance. This challenge is based on the practice of thinking about practice through which practice is perfected (Allman and Wallis 1995).

Freire (1978) argues that, if literacy efforts were to achieve their primary objective, i.e. that of contributing effectively to national reconstruction, it would be necessary to establish a dynamic relation between them and all the other forms of social intervention in any way related to or dependent upon literacy. He maintains that literacy education for adults, like all other forms of education, cannot be imposed on the social practice of a society, but must emerge from this practice as one of its dimensions.

Participation in common experiences is encouraged as it stimulates social solidarity rather than individualism. The principle of mutual help, practical creativity in the face of actual problems and the unity of mental and manual labour are experienced daily. The learners work and search together, not only to extend the areas of their knowledge but also to probe them more deeply. They start creating new forms of behaviour in accordance with the responsibility they must take within the community. In the process they, together with their facilitators, assume the role of "subjects of their own learning" (Freire 1978: 43). This education envisages making concrete such values as solidarity, social responsibility, creativity, discipline in the service of the common good, vigilance and a critical spirit.

In adult education, knowledge resulting in practical action, grows out of the unity between theory and practice. For this reason it is not possible to divorce the process of learning from the lives of the learners. Freire (1978: 42) calls this "a real education where the content is in a constant dialectical relation with the needs of the country".

The question facing South Africans is not whether to do literacy education for its own sake or to do it as a means of transformation, but rather how to put it at the service of national reconstruction. For this reason literacy education should become concrete through processes of and projects aimed at social change. Freire (1978) suggests that projects should be developed within the various

administrative organs of the country - hospitals, postal services, public work agencies - where literacy education might enable employees to engage in other new tasks demanded by national reconstruction. Co-operation with organisations whose members are already doing valuable work in the area of literacy is also encouraged, as it can also contribute to joint efforts on behalf of national reconstruction (Freire 1978: 30).

The need for a close relation between those responsible for planning, agriculture, environment and health has been emphasised. The role that adult education may play in primary health care programmes, particularly toward a global strategy for health for all by the year 2000, has been explored by Stensland (1989). The need for involving adult learners in environmental education is stressed by Emmelin.

A basic premise of most environmental education is that problems caused by industrialization and technological development and underdevelopment are pressing and need urgent solutions. It is therefore critical that adults understand how the environment functions for effective decision making and informed citizen participation in the discussion of issues (Emmelin 1989: 133).

According to Emmelin (1989) environmental issues have a two-fold place in adult education. First, they can present problems that need solutions by adult learners. This means that adult learners can play a major role in effecting meaningful positive changes in their environments. They are well placed in the sense that they are experienced members of the community who can initiate environmental projects if they are well educated and equipped to take action. They can participate actively in the social and economic development of their country. Second, environmental issues can be used as relevant and immediate examples in the teaching of adult basic education such as literacy, health, welfare, and in civic, political and community competence.

Orr (1992) supports Emmelin's idea (1989) of involving adult learners in environmental education. He states that attention should not only be given to

literacy and numeracy but also to ecological literacy.

Literacy is the ability to read, numeracy is the ability to count and ecological literacy is the ability to ask "What then?". "What then" is an appropriate question to ask before the last rain forests disappear, before the growth economy consumes itself into oblivion and before we have warmed the planet intolerably. The failure to develop ecological literacy is a sin of omission and of commission ... By failing to include ecological perspectives in any number of subjects, students are taught that ecology is unimportant for history, politics, economics, society and so forth ... The same persons as adults will create businesses, vote, have families, and above all, consume. If they come to reflect on the discrepancy between the splendor of their private lives in a hotter, more toxic and violent world, as ecological illiterates they will have roughly the same success as one trying to balance a check book without knowing arithmetic (Orr 1992: 85).

The importance of both adult and environmental education lies close to the heart of South Africa's current education reform initiatives, and should make meaningful contributions in alleviating many environmental concerns and issues.

2.2.2.1.4 The Importance of Environmental Education in South Africa

Government has responded pro-actively to South Africa's environmental issues through policy-making. Environmental policies in South Africa recognise, and emphasise the need for environmental learning and capacity building.

Environmental education has been seen as

necessary at all levels and programmes of the education and training system, in order to create environmentally literate and active citizens and to ensure that all South Africans, present and future, enjoy a descent quality of life through the sustainable use of resources. (White Paper for Education and Training, March 1995, Chapter 4 Point 20 and the Government Gazette No. 196 of 1995: Page 22).

Other pronouncements of support for environmental education are documented in the following:

- Interim Constitution where a defence is made for fundamental right of citizens to “an environment that is not detrimental to her/his health or well-being” (Bill of Rights 1996:10);
- The RDP document where it is stated that environmental education programmes should be developed to “rekindle our people’s love for the land, to increase environmental consciousness amongst our youth, co-ordinate environmental education policy at all levels, and empower communities to act on environmental issues and to promote environmental ethics” (ANC 1994: 40);
- The *White Paper on a National **Water** Policy for South Africa* (April 1997) and the *National Water Act* (Act 36 of 1998) which guides water management according to principles of equity and sustainability;
- The *White Paper on Development & Promotion of **Tourism** in South Africa* (June 1996) which articulates the important role of environmental management in tourism development and promotion;
- The *Draft White Paper on Integrated **Pollution and Waste** Management* (August 1998) and the *National Waste Management Strategy* (1999) which aim to reduce the generation and the environmental impact of all forms of waste;
- The *Draft White Paper for Sustainable **Coastal Development** in South Africa* (March 1999) which aims to achieve sustainable coastal development through integrated coastal management;
- The *Draft White Paper for a **Population** Policy* (September 1996) which recognises the reciprocal relationships between population, development and the environment;
- The *White Paper: Marine **Fisheries** Policy for South Africa* (May 1997) which provides a long-term vision for the sustainable management of this natural resource;
- The *White Paper on a South African **Land** Policy* (April 1997) which recognises the crucial role of effective, integrated environmental management in poverty alleviation and land reform processes;

- The *White Paper on a **Minerals and Mining** Policy for South Africa* (October 1998) which emphasises the need to integrate environmental impact management into economic development activities and the optimal and environmentally sustainable use of natural resources;
- The *White Paper on an **Energy** Policy for South Africa* (December 1998) recognises the need to ensure that developments in energy are socially, environmentally and economically sustainable;
- The *Discussion Document on an **Agricultural** Policy in South Africa* (1998) which recognises sustainable resource use and the enhancement of the ecological integrity of natural systems as a major goal for policy reform;
- The *White Paper on the Conservation and Sustainable Use of South Africa's **Biological Diversity*** (July 1997);
- The *White Paper on an **Environmental Management** Policy for South Africa* (May 1998) which gives effect to the environmental rights in the Constitution and entrenches environmental sustainability in policy and practice.

Some of these policies are now being enacted through legislation. Key among these is the *National Environmental Management Act (NEMA)* promulgated in 1999. NEMA provides a legislative framework for environmental management in all sectors of economic, social and environmental activities. NEMA states that “*community well-being and empowerment must be promoted through environmental education*”.

The importance of environmental education has also been stressed in other parts of the world. The Report of the World Commission on Environment and Development (UNCED) (1987: 20-21) recommends that the States should regard environmental education programmes “as a major and integral part of all primary, secondary school and university curricula as well as in professional and other in-service courses, with particular attention to the relationship between environmental protection and sustainable development”. The 1980 World Conservation Strategy was quite explicit about the role of education in bringing

about such changes. It argued that:

A new ethic, embracing plants and animals as well as people is required. Ultimately, the behaviour of entire societies towards the biosphere must be transformed if the achievement of conservation objectives is to be assured. A new ethic, embracing plants and animals as well as people is required for human societies to live in harmony with the natural world on which they depend for survival and well being. The long-term task of environmental education is to foster or reinforce attitudes and behaviours compatible with this new ethic (IUCN, UNEP and WWF 1980:13).

This message was repeated in *Caring for the Earth: A Strategy for Sustainable Living* which was prepared as the World's Conservation Strategy for the 1990s. Education has a vital role to play in ensuring that people learn, accept and live by the principle that "living sustainably depends on accepting a duty to seek harmony with other people and with nature" (IUCN, UNEP and WWF 1991: 8).

Sustainable living must be the new pattern for all levels: individuals, communities, nations and the world. To adopt the new pattern will require a significant change in the attitudes and practices of many people. We will need to ensure that education programmes reflect the importance of an ethic for living sustainably (IUCN, UNEP and WWF 1991: 5).

Agenda 21 is the internationally agreed report of the United Nations Conference on Environment and Development or "Earth Summit" which was held in Rio de Janeiro in June 1992. This report devotes a whole chapter (Chapter 36) to the role of environmental education in relation to sustainability:

Education is critical for promoting sustainable development and improving the capacity of the people to address environmental and developmental issues ... It is critical for achieving environmental and ethical awareness, values and attitudes, skills and behaviour consistent with sustainable development and for effective public participation in decision-making (UNCED, 1993: 582).

2.2.2.1.5 Current Approaches to Environmental Education

The need to consider environmental issues within the context of social, historical, political, economic and biophysical contexts has been widely recognised. More recent international and Southern African literature advocates a more comprehensive approach which recognises that meaningful environmental education as processes of social change requires an examination of social, political, economic, historical as well as biophysical factors (Ramphela 1991; Irwin 1989; Wilson and Ramphela 1989; O'Donoghue and McNaught 1989; Greenall 1987).

It has been established that, as passive recipients of transmitted messages, people might be unable to comprehend, critically analyse and interact with the messages they receive. "The idea of message communication to cause behaviour change is questionable as a strategy of education ... [it] cannot accommodate the realities of how people come to socially construct and to change the way they see the world" (O'Donoghue 1993: 30).

An alternative to "transmission pedagogy" has been suggested by Robottom (1991: i) in his comments on a workshop he had attended:

Education seemed to be perceived as a one-way delivery system from experts to lay people, rather than as a process whereby lay people could generate information, knowledge or understanding about the Greenhouse issue.

Several authors have pointed out that active participation in addressing environmental problems is more likely when people have been involved in identifying the problems and suitable actions. The public are "a source of useful ideas [and] a vehicle for social change" (Miller 1993: 57) "Real change is most likely to come from ordinary people" (Wynberg 1993: xxi).

It has also been recognized that responsibility for one's behaviour does not lie exclusively with the individual but also with society and the community. Environmental problems should not be removed from their social (including political, economic and historical) context. Robottom and Hart emphasize the significance of society as opposed to the individual in addressing environmental problems, and suggest that it is more realistic to view environmental problems as

social constructions whose meaning and significance metamorphose, wax and wane according to changeable human interest ... Environmental issues are ... always political struggles, and collective action is usually more productive than individual efforts in the resolution of political struggles (Robottom and Hart 1991: 9).

Thus a more holistic view of environmental problems has been taken and their social aspects have been considered. This view addresses the problems both of treating the environment merely as a physical world and of the individualisation of the cause of, and solutions to, environmental problems.

2.2.2.2 A Strategy for Sustainable Living

A recent world strategy for sustainable living - *Caring for the Earth* - has been published by the World Conservation Union (IUCN), the United Nations Environment Programme (UNEP) and the World Wide Fund for Nature (WWF). This strategy recognises conservation and development as essential parts of one indispensable process. The goal is development that is both people-centred, concentrating on meeting people's needs and improving the human condition, and also conservation-based, maintaining the diversity and productivity of nature (IUCN/UNEP/WWF 1991: 4-5). This world strategy sets out the changes needed to build a sustainable society and calls for the interpretation and adaptation of its principles and actions by various world communities since human societies differ in wealth, quality of life, culture, history, religion, politics, institutions and traditions. The communities are encouraged to develop practical strategies for sustainable living based on the following nine principles (Table 2.1)

TABLE 2.1 THE PRINCIPLES OF A SUSTAINABLE SOCIETY

- Respect and care for the community of life
- Improve the quality of human life
- Conserve the earth's vitality and diversity
- Minimise the depletion of non-renewable resources
- Keep within the earth's carrying capacity
- Change personal attitudes and practices
- Enable communities to care for their own environments
- Provide a national framework for integrating development and conservation
- Create a global alliance

(IUCN/UNEP/WWF 1991: 9-11)

From the principles of a sustainable society it is evident that a significant change in the understanding, attitudes and practices of many people is necessary. Educators will need to ensure that education programmes reflect the importance of an ethic for living sustainably. If a change to more sustainable lifestyles is to be made, local communities must be empowered to manage the resources on which they depend and to have an effective voice in the decisions that affect them. There is little that can be done if the local communities lack the power to act.

There have been increasing calls for education for sustainable living (Schreuder, Le Grange and Reddy 1999; Tilbury 1995; Fien 1993). Sustainable living has been recommended not only in South Africa's current education reforms, but also in the transformation of education in other parts of the world. The following section highlights suggestions on the use of this approach as documented in Curriculum 2005 and in the materials developed by the World Resources Institute (WRI).

2.2.2.3 The World Resources Institute in America

Although the WRI stopped their involvement in the production of environmental education material at the end of 1998, it is worth noting its contribution to improve teaching and learning in environmental education. The WRI was a research and policy institute, helping governments, the private sector, environmental and developmental organisations address a fundamental question, “How can societies meet human needs and nurture economic growth while preserving the natural resources and environmental integrity that make prosperity possible?” (WRI 1997: ii). This institute aimed to generate accurate information about global resources and environmental conditions, analyse emerging issues, and develop creative yet workable policy responses. It published a variety of books, reports, and papers, undertook briefings, seminars and conferences, and offered materials for use in educational settings and in the news media.

The WRI developed a set of national performance standards for learners under the 1994 Goals 2000: Educate America Act (WRI 1997: v). These standards are used to guide the states in setting their own education standards. A teacher’s guide, *Exploring Sustainable Communities* (1997), had been developed to be evaluated, translated and adapted for use by educators in many parts of the world including Australia, the USA, Japan, the United Kingdom, Germany, Vietnam, Russia and South Africa. The teacher’s guide examines global trends in urbanisation and their influence on the type of communities we live in now and which we will inhabit in the future. It discusses the advantages of sustainable communities and encourages students to both envision and work towards the type of community they would like to live in. It also suggests effective learner-centred teaching strategies and class visioning exercises (WRI 1997: 6-10).

Class visioning exercises encourage the students to think about how their community has changed over the past forty or fifty years. Questions such as the

following are asked to encourage the learners to document the changing face of their community:

- What was your community like on your arrival?
- What changes have you observed?
- What changes would you like to see?

After the learners have identified the changes and associated environmental problems, they are encouraged to envision how they would like their communities to be. They are expected to come up with some ideas consistent with sustainability and to understand the concept of moving from a goal or vision to a strategic plan of action. They are also encouraged to understand that a vision with a plan can change the world and to plan toward achieving their community vision.

These exercises further emphasise the influence students can have, both now and as adults, in determining the future of their communities. The students are given an opportunity to identify an environmental or developmental problem in their community, observe and investigate its causes and effects, and to plan how to address it. Critical thinking, active participation, co-operative learning and problem-solving skills are encouraged. This approach to education is not only similar to environmental education for sustainability, but also to the outcomes-based approach of the new national curriculum in South Africa.

2.2.2.4 The Importance of Community-based Environmental Projects

The following section illustrates how a community-based environmental project can provide a framework for the development of a wide range of learning skills

Critical thinking

When the learners are identifying an environmental or developmental problem and investigate its causes and effects, they gather and record information from different sources, e.g. interviews, documents such as government records, newspapers and statistics. They must be able to detect bias in sources and evidence by recognising when someone has promoted his or her own interest or perspective. In other words, they should be able to evaluate reliability and validity of sources and evidence. They should also be able to use sources and evidence to formulate arguments and to state a position.

Processing information

After the learners have collected information they should be able to:

- represent it graphically by drawing graphs, flow diagrams, illustrations and maps;
- interpret graphically represented data by decoding signs and symbols, recognising shapes and features, using a key and reading maps;
- analyse and use graphically represented data by exploring relationships and patterns over time and space and by making decisions, recommendations and evaluations (Department of Education 1997: 16) .

Co-operative learning skills

Co-operative learning skills that promote critical understanding of environmental issues are demonstrated as the learners are always encouraged to work in groups. Skills of working in a group include those associated with:

- group roles, such as facilitator, note taker or scribe, spokesperson, etc.;

- sharing ideas, e.g. listening, responding supportively, participating actively, evaluating ideas and accepting critical comments, and
- managing the process, e.g. keeping time and allocating and taking responsibility for tasks (Department of Education 1997: 16).

Communication skills

When the students are investigating, identifying and analysing a local environmental problem, they interview senior citizens and discuss the findings with their communities. They use narrative inquiry and interpret the stories of their informants. Narrative inquiry is becoming increasingly popular as an investigative methodology within the broader field of educational research. It is argued that much importance in post-positivist research today is placed on meaning-making through continued communication between the researcher and informants (Hones 1998). Hones (1998) claims that through narrative dialogues we can gain a deeper understanding of who we have been, who we are and who we would like to become. This author believes that the individual narratives have lessons for us all as they represent life experiences, deepen understanding and connect the individual story to societal contexts. These narratives are believed to have power to bring multivocality and authority of voices to the attention of researchers, educators and policy-makers. This means that social science, when using interpretive methods, can become a form of self-understanding or self-interpretation as it seeks to relate the stories scholars tell to the stories current in the society at large. By establishing a good research relationship with the informants, and respecting their words, their interpretations and their theories, researchers have the opportunity to re-examine their own theories as well as their own voices.

Problem solving

A systematic approach to problem solving is demonstrated by:

- identifying a local developmental or environmental problem (an issue);
- gathering information by appropriate means, i.e. collect data by investigating the causes of the problem;
- analysing the context, components, causes and effects of the problem;
- using various methodologies to gain different perspectives on the problem;
- developing and negotiating strategies to solve the problem (developing an action plan);
- using democratic and participatory approaches, e.g. communicating proposals to all stakeholders and taking account of feedback;
- evaluating proposals;
- taking appropriate action (implementing an action plan);
- reflecting upon and evaluating the processes and results;
- recording the problem-solving process and its outcomes, reporting and disseminating the results (Department of Education 1997: 17).

Since the new curriculum will open doors for effective learning and teaching of adult and environmental education, it is necessary to examine the learning theory underpinning the implementation of adult and environmental education.

2.2.2.5 Learning Theory Underpinning the Implementation of Adult and Environmental Education

It seems appropriate to outline the classification of different perspectives on learning before examining the learning theory underpinning the implementation of adult and environmental education.

The philosophical concepts of positivism and constructivism provide one way of grouping theories of learning. Positivism regards learning as a process of accumulating knowledge of scientific laws and objective data derived empirically. Behaviouristic and information processing theories of learning fall under the

positivistic paradigm (Cranton 1994: 11). On the other hand, in the constructivist perspective knowledge is constructed by the individual (in a specific social context) who perceives the world and reality from a unique perspective. This view rejects the notion that there is “a” truth “out there” that needs to be discovered, but accepts an ontology based on the relativity of knowledge and “truth”. Learning is a process of construing meaning and transforming understanding. Humanistic and contextual theories of learning fit into the constructivist paradigm (Cranton 1994: 16).

Habermas (1971:53) proposes the following three domains of knowledge that provide another means of classifying theories of learning.

- **Technical knowledge**, which includes information about cause and effect relationships in the environment (the positivist paradigm). Behaviouristic learning theories are therefore concerned with the acquisition of technical knowledge.
- **Practical knowledge**, which is concerned with understanding what others mean. This includes understanding social norms, values and political concepts, as well as making ourselves understood (a component of the constructivist paradigm). Humanistic learning theories are partly concerned with Habermas's practical level of knowledge interest.
- **Emancipatory knowledge**, which is gained through critical self-reflection and which can also be seen as a component of the constructivist paradigm. Mezirow's theory of transformative learning is primarily concerned with emancipatory knowledge (Cranton 1994: 17).

Mezirow (1991: 34) discusses three domains of learning that are based on Habermas's work: instrumental (learning of technical knowledge), communicative (learning of practical knowledge), and emancipatory learning.

In an attempt to place the transformative learning theory in historical and social context, Cranton (1994: 10-21) also introduces the broader perspectives of subject-oriented, consumer-oriented and emancipatory adult learning, and integrates these perspectives with the positivist and constructivist paradigms, as well as the instrumental, communicative and emancipatory domains of learning. This author argues that subject-oriented learning is positivist. It falls into Habermas's domain of technical knowledge and Mezirow's domain of instrumental learning. With regard to consumer-oriented learning Cranton (1994) states that consumer-oriented learning can fit into both positivism and constructivism. She defines emancipatory learning as a process of removing constraints or freeing ourselves from forces that limit our options and our control over our lives. Emancipatory learning is constructivistic and is the fundamental goal of education. It defines the role that education is seen to play in society. These three "knowledge interests" form the basis of socially critical theory. Some authors think that environmental education does not qualify as such if it has no agenda of social change built into it (Greenall and Robottom (1993). This view is drawn from a socially critical theory.

The development of different classification systems by writers is attributed to the fact that adult learning now takes place in such diverse settings as business and industry training sessions, university and college degree programmes, labour education classes, community action groups, self-help groups and literacy programmes (Brookfield 1986: 26).

Both adult and environmental approaches have clearly begun to lean towards a constructivist approach to learning (Freire 1998; Allman and Wallis 1995; Mayo and Thompson 1995; Cranton 1994; Fien 1993; Greenall, Gough and Robottom 1993; Orr 1992; Huckle 1991; Mezirow 1991; Harber 1990; O'Donoghue and McNaught 1989; Greenall 1987). As environmental and adult education theory has developed, so the learning theory that underpins it, has also developed. An analysis of developments in constructivism is therefore useful in identifying the

parallel movements in adult and environmental education.

There are fundamental theoretical differences in the various constructivist approaches. These differences relate to the difficulty in translating a descriptive theory of learning into the practice of teaching (Richardson 1997). Differences of opinion exist between and within two different constructivist approaches: the psychological Piagetian approach to constructivism and the social constructivist approach.

Piagetian Psychological Constructivism

The Piagetian psychological proponents of constructivism see the meaning-making process as individualistic. According to them the individual acts as the sole agent in the process of constructing and reconstructing meaning. The purpose of constructivist teaching is to lead toward higher levels of understanding and analytical capabilities (Schifter and Simon 1992). In order to reach these higher levels, the learners must be actively engaged in reconstructing their existing understandings by restructuring their cognitive maps. The teachers facilitate this cognitive alteration through designing tasks and questions that create dilemmas so that the learners' concepts and thinking processes are challenged (Fosnot 1996; Von Glasersfeld 1995; Ball 1993; Black and Ammon 1992).

The postmodernist critiques of the psychological approach are directed at the cognitive as separate from action, and the lack of attention to power issues, especially those related to knowledge (Harrington 1995; O'Loughlin 1992a, 1992b; Ernest 1991). This argument is taken further by Richardson (1997).

As long as the teacher and text are seen as authoritative, students will, to a certain degree, accept it without question. Authoritative knowledge will be transmitted whether we want it to be or not ... Students will continue to try to figure out what they think the

teacher wants them to learn from the tasks (Richardson 1997: 6).

The individualistic psychological view of learning is therefore seen as separating the "individual from the social, thought from action and the knower from the known" (Richardson 1997: 7). The critique of this form of constructivism highlights the importance of the social elements of learning, and of the power relationships among the facilitators, learners and formal knowledge.

Social Constructivism

This approach suggests that knowledge is constructed by a person in transaction with the environment, that is, both the individual and environment change as a result of this learning process. In terms of school learning, the environment is thought of as a social milieu that affects the actions taken by the learners and the learning that occurs, is affected by those actions (Richardson 1997). It is suggested that knowledge is socially constructed because meaning can only be constructed through the use of language in a social context (Bredo 1994). In other words, the focus of this approach is on the socio-cultural context in which an individual lives.

In this constructivist view learning cannot be separated from action.

Perception and action work together in a dialogical manner. And there is no representation of reality that is privileged, or 'correct'. There are, instead, a variety of interpretations that are useful for different purposes in differing contexts. Knowledge is not thought of as a received, static entity that is separate from the individual. Neither is it separable from the activities within which knowledge was constructed, nor from the community of people with whom one communicates about the ideas (Richardson 1997: 8).

Vygotsky is regarded as a pioneer of the socio-cultural approach (Davydov 1995; Wertsch 1991; Moll 1990). Within this framework the development of an individual relies on social interactions. It is within this social interaction that

cultural meanings are shared within the group, and then internalised by the individual.

As a parallel development to social constructivism there have been increasing calls for a socially critical environmental education (Fien 1993; Greenall, Gough and Robottom 1993; Huckle 1991). Kemmis (Greenall, Gough and Robottom, 1993: 301) has described socially critical schooling as intending “to provide students with a map of existing culture and society and a map of what a better society might be like”. This map is only possible where social reality is constructed by the shared experience of the learners. Greenall, Gough and Robottom (1993: 301) maintain that, like socially critical education, environmental education is concerned with a “critical understanding of, and an informed commitment to, the improvement of society”.

Social theorists have introduced the process of reflexivity which is described as “cultural reconstruction through critical social processes of experiential review” (O’Donoghue 1993: 37). Significant features of reflexivity include, first, the recognition of the value of different forms of knowledge and, second, dialogue and negotiation between them (Beck 1992).

The new curriculum encourages learning and teaching based on social constructivism and aims at empowerment, equality, relevance and quality in education. In achieving the specific need for equality, relevance, quality and empowerment in South African education the teacher is the key person. The following section examines the views of several authors with regard to the importance of teachers in adult and environmental education.

2.3 TEACHERS AS KEY PERSONS AND AGENTS OF CHANGE

Several authors have stressed the importance of pre-and in-service education for teachers.

"Teachers are the frontline troops of change, and progress depends on their own education, motivation and freedom to innovate" (Beeby 1986: 37). Hartshorne shares the same view,

Whatever the educational problem that has to be faced, the key to the situation is the teacher: her academic background and professional training; her further personal and professional development during her teaching career; ... her competence, confidence and commitment in the tasks of education; her understanding of young people and the processes of learning; ... All the structures and mechanisms of the education system ... should exist not for their own purposes but to empower the teacher to do an effective and creative job of work in her everyday contact with learners. It is in this intensely personal relationship with the pupil in the tasks of learning that the real meaning of education lies, and it is on the quality of this relationship that the success or failure of schooling is dependent (Hartshorne 1992: 218).

Freire (1978) suggests that the preparation of facilitators should focus on the integration of theory and practice. The facilitators must think about practice in terms of developing more effective means of practice and evaluate practice as a means of theoretical development. He argues that teacher educators always evaluate the facilitators personally instead of their practice. Some of the teacher educators evaluate to punish and not to educate or improve their own practice. To evaluate also implies re-adjusting and reprogramming on the part of the educator him- or herself. For this reason an evaluation should never be considered as the final step of a particular practice, but rather as "a process through which practice takes us to the concretization of the dream that we are implementing" (Freire 1978: 7).

To put all this into practice requires the preparation of good quality facilitators capable of developing themselves through the training of others. For this reason Freire (1978) invites the students to develop solidarity and social responsibility through their practice of service. They should provide an education that creates

new persons, workers aware of their historical responsibilities and of avenues of effective creative participation in the process of social transformation.

The development of values such as solidarity, social responsibility and creativity would not be possible if the learners continued to be what they were in the colonial educational system, "mere recipients of packaged knowledge, transferred to them by their teachers, reducing the learners to mere incidents of the educational action of the educators" (Freire 1978: 43).

The role of teachers should also be regarded as vital if environmental education is to be one of the social agencies through which the transformation to an ecologically sustainable society is to be achieved (Huckle 1994; Stevenson 1987; Robottom 1984). The preparation of teachers has also been recognised by successive UNESCO-UNEP conferences and reports as a major priority for research and action in promoting environmental education. (UNESCO-UNEP 1988; Wilke, Peyton and Hungerford 1987; UNESCO 1980). The need for equipping teachers with necessary facilitation skills and the skills needed to act responsibly towards the environment has been realised. The influence teachers can have on the learners' perspectives on environmental issues is, in turn, partly dependent upon the teachers' own knowledge and skills. Teacher education is regarded as the "priority of priorities" for action to improve the effectiveness of environmental education (UNESCO-UNEP 1988: 3).

Since adult and environmental educators are keys to the success of adult and environmental learning, there is a great need for them to:

- become innovative and creative facilitators who use group work and teamwork;
- make learning relevant to real-life situations;
- give learners an opportunity to be active, to take responsibility for their own learning, and to think critically and to reason, reflect and act.

This can only be possible if adult and environmental educators themselves have undergone the same learning process and have been exposed to effective learning and teaching strategies. They should be given an opportunity to practise how to use these approaches during micro-teaching sessions, by organising outdoor activities and interacting with communities in order to develop the necessary facilitation skills.

2.4 THE CHALLENGE FOR TEACHER EDUCATION

Two different forms of constructivist teacher education are being advocated today. One form attempts to teach students how to teach in a particular constructivist manner. The approaches that are used, apply to the teaching of particular subject matters and are Piagetian. They involve direct instruction in theory and practice. Another form of constructivist teacher education involves working with teachers and pre-service students to help them understand their own **tacit** understandings, how these have developed and the effects of these understandings on their actions, and to introduce new conceptions and premises as potential alternatives to those held by the students. This approach involves students in investigations of premises and perspectives that may be used by the pre-service students when they begin to teach.

In an attempt to develop a constructivist approach to teaching I decided to use both approaches. It is against this background that prospective adult educators of the Peninsula Technikon were involved in a community-based environmental project at Tsoga Environmental Centre in Langa. The details of how they were involved will be discussed in Chapter 3.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

The primary purpose of this study was to improve my own practice through making a meaningful contribution towards the professional development and conceptual understanding of student teachers. This was attempted by using observations of students' practice, by promoting use of the process of EEFS, thereby encouraging teaching and learning for sustainability, and by integrating theory and practice as well as adult literacy and ecological literacy. In order to achieve this goal, the research was undertaken in a series of phases. This chapter will analyse and reflect upon these phases as well as on procedures and data generating methods. Furthermore, the research sample, data analysis and limitations of the study will be examined. However, it seems appropriate to start by reflecting on the debate about educational research since it gives an idea of my own position and how it was shaped.

3.2 THE DEBATE ABOUT RESEARCH IN EDUCATION

It is suggested that discussions about issues of research in environmental education must be examined in the light of debates that are occurring within the broader context of the field of education (Robottom and Hart 1993: 6). Current educational research supports different orientations to inquiry which have been classified as scientific versus humanistic, quantitative versus qualitative, and positivist versus post-positivist. Keeves (1988) describes the growth of debate between proponents of two major research traditions: the scientific, which seeks causal explanations and the interpretive, which seeks understanding in terms of intentions, motives and stated reasons. Three traditions characterised as empirical-analytical (quantitative), symbolic (qualitative-interpretive), and critical

(qualitative-political) were elaborated by Popkewitz (1984). The following table represents the main research traditions in education.

TABLE 3.1 THREE IMAGES OF ENVIRONMENTAL EDUCATION

	Positivist	Interpretivist	Critical
Purposes			
View of environmental Education	Knowledge "about the environment"	Activities "in the environment"	Action "for the environment"
Educational purpose	Vocational	Liberal/progressive	Socially critical
Learning theory	Sometimes behaviourist	Constructivist	Reconstructivist
Roles			
Goals of environmental education	Externally imposed taken-for-granted	Externally derived but often negotiated	Critiqued (seen as icons of ideology)
Teacher's role	Authority-in-knowledge	Organiser of experiences in the environment	Collaborative participant/inquirer
Students' role	Passive recipients of disciplinary knowledge	Active learners through environmental experiences	Active generators of new knowledge
Curriculum supporters	Disseminators of prepared solutions to environmental problems	External interpreters of the learners' environments	Participants in new problem-solving networks
Role of texts	Pre-existing source of authoritative knowledge about the environment	Pre-existing source of guidance about environmental experiences	Emergent reports of outcomes of critical environmental inquiries

	Positivist	Interpretivist	Critical
Knowledge and power			
View of knowledge	Pre-ordinate Commodity Systematic Personal Objective Derived from experts	Intuitive Semi-structured Personal Subjective Derived from experience	Generative/ Emergent Opportunistic Collaborative Dialectical Derived from inquiry
Organising principles (source of authority)	Disciplines	Personal experience	Environmental issues
Power relationships (PR)	Reinforces PR	Ambivalent about (PR)	Challenges PR
View of research			
Research is	An applied science Objectivist Instrumental Quantitative Acontextual/ Individualistic Deterministic	Interpretivist Subjectivist Constructivist Qualitative Contextual/ individualistic Illuminative	Critically social Dialectical Reconstructivist Qualitative Contextual/ collaborative Emancipatory
Research design	Preordinate/fixed	Preordinate/ responsive	Negotiated/ emergent
Researchers are	External experts	External experts	Internal participants
Prime example	Hungerford, Peyton and Wilke (1983)	Van Matre (1972)	Elliot (1991)

(Adapted from Robottom and Hart, 1993: 26-27)

It is important to capture the essence of the differences among these orientations since they inform debate about research in environmental education.

Positivism

The legitimate goal of positivism is the search for generalisations (theory). Reality exists "out there", and science should discover the true nature of reality so that it can be predicted and controlled. Positivism is based on an objectivist or empiricist epistemology where "knowledge is expert-driven, cumulative and progressive; values are excluded through the adoption of a distant, non-interactive posture; and propositions (hypotheses) are subjected to empirical tests of falsification" (Robottom and Hart 1993: 7).

Positivist forms of inquiry within educational research assume that educational contexts contain law-like generalisations which are identified and manipulated as systems of distinct, observable empirical variables. The task of educational research is seen as quantification of these variables. Positivist approaches to educational problems tend to focus on the effectiveness of an educational programme and on determination of the efficiency in achieving predetermined, unexamined objectives and goals.

Many assumptions of positivism have recently been supplanted by more sophisticated arguments of post-positivism which are discussed below.

Post-positivism

The following section examines two post-positivist research orientations, namely interpretivism and critical theory.

Interpretivism

Interpretivism is based on an entirely different set of assumptions about the world and how we know it, that is on a relativist ontology. Interpretivist orientations to research assume that reality exists only within the context of a mental framework or construct, therefore social reality is not an independent reality, but is socially constructed and can have multiple meanings. The reality of meanings is found in the interpretation that is influenced subjectively by the values and purposes of the researcher. Researchers are not interested in the abstraction (reduction) or approximation (modelling) of a single observable reality, but in the presentation of value-based, multiple, holistic, competing, often conflicting realities of multiple stakeholders and participants. In other words, interpretive understanding is grounded in interactive, field-based inductive methodology, which in turn is embedded in practice and within a context. According to Green (1990), the inquirer seeks the perspectives of and meanings made by the participants, both propositional and tacit, and aims to construct holistic patterns or webs of influence. They presume that human actions can be understood only in terms of meanings and the task of interpretive approaches is to explicate those actions and meanings.

According to Lincoln (1990), interpretivism requires a shift from the notion that science alone is a measure of reality, knowledge and truth, to a notion that reality and knowledge are socially constructed (Berger and Luckmann 1973), that knowledge is problematic and contested (Lather 1988), and that truth is locally and politically situated (Popkewitz 1984). Thus, interpretivism does not shun relativism, subjectivism and constructivism as is the case with positivism.

Codd (1983) states that interpretive approaches are subject to critique, because they limit participation through development of outside researcher (expert) accounts which participants can take or leave without necessarily reflecting on their beliefs and assumptions. He sees interpretivist ideology as conservative in

terms of its imperative for social transformation when compared with critical theory.

Critical Theory

In critical theory issues of methodology are embedded in history. Socially constructed knowledge is not considered to be a matter of deriving timeless, abstract principles, but rather to be about uncovering the historical, structural and value bases of social phenomena as well as the contradictions and distortions within. Green (1990) defines critical knowledge as practical, action-orientated knowledge that enlightens and thereby catalyses social and political change. Inquiry is directed at both understanding and practical transformation of social conditions necessary for emancipation and empowerment. Both epistemology and methodology involve the study of social practices by which communities develop a basis for warranted action and belief. Critical theorists view approaches that divorce social, philosophical and historical questions from the practice of research as impoverished in that they decontextualise the way choices were made and priorities formed. Since critical social science seeks to reassert history, value and ethical choice into the knowledge that we have about social practice, the methods employed represent a cross-checking on the hubris of ideas and power relations that underlie the formation of knowledge itself (Popkewitz 1990).

3.3 THE RESEARCHER'S POSITION

From Table 3.1 it is evident that I am a "straddler of paradigms" because no single orientation can embrace or describe my investigation. When I started doing my research, my priority was to make a meaningful contribution to the professional and conceptual development of my students as well as to environmental improvement and community development in Langa. I was sure that what I wanted to do was valuable, as my students were adult educators who

could play a vital role in developing their communities and in improving their local environments. My main goal was education for empowerment and liberation and my teaching strategies were informed by critical theory. My teaching methods aimed at liberating my students from ignorance and disempowerment, helping them to educate others towards a better understanding of the role of communities in improving their own living conditions.

I did not position myself within a certain tradition in order to ensure that my work will be more acceptable among the academic community. My context, and my particular history and instinct guided me through a process of finding out and attempting to make things better. I did not make an initial survey of the tools available. I felt that the community I really need to serve is the community I work in and the orientation to research and the methods employed therefore had to be responsive to that context.

Although my research appears to meet some of the requirements of a democratic, emancipatory and transformative socially critical orientation, some of the methods employed can be seen as characteristic of postivism. For example, in an attempt to investigate the student teachers' conceptual understanding of sustainable land development, I adapted a test that was developed by Treagust and Haslam (1987) who used it to diagnose students' misconceptions about photosynthesis. This test has two parts, a pre-test and a post-test. For the purposes of this study I used a pre-test only because I wanted to explore the student teachers' prior knowledge before attempting to provide them with new information on the issue to be studied. I felt that the use of a post-test was not necessary since post-positivist research does not focus on the effectiveness of an educational programme and on determination of the efficiency in achieving predetermined objectives and goals. I also followed the responses of the pre-test with interviews and class discussions.

The use of a test can be seen as treating the students as objects (positivistic), but the following section illuminates that the manner in which the test was conducted was much more subjectivist and that the test was more useful in identifying misconceptions, than concept mapping. The following is one of the questions I asked:

Is it necessary to do recycling in Cape Town? Give a reason for your answer.

Although the majority of the student teachers saw recycling as a necessity, the reasons to support their answers revealed misconceptions. For example, some of the students stated that recycling is necessary because it is an important sport activity and it should be promoted in preparation for the Olympic games that will be held in Cape Town.

Since the students were required to give reasons for their answers to all the questions (Appendix 1), the test that is discussed below, made it easy for me to identify their misconceptions.

The Treagust and Haslam Test (1987)

In developing this test, the following concepts related to sustainable land development were identified:

- Environment
- Land as a renewable or non-renewable resource
- Human impact on land resources
- Land pollution
- Recycling
- Green revolution
- Intensive arable farming and
- Sustainable communities.

These concepts were derived from the WRI materials (1997) and from the student teachers' workbook (Winburg 1995). They were considered to be essential foundations upon which the rest of the project could be developed and built.

The students' perspectives on these concepts were identified by means of open-ended questions. The questions were answered verbally and in writing by 50 second-year student teachers at the beginning of February 1998 (Appendix 1). The process of answering these questions seemed interesting to the student teachers. They were divided into two groups of twenty five. The members of the first group had five similar questions (questions 1 - 5) and the second group had questions 6 - 9. Each member of the first group had to choose a partner from the second group and ask the partner questions 1 - 5. The answers were written down by the members of the first group. Each member of the second group had to ask the partner from the first group questions 6 - 9 and write down the answers. Each group classified the answers on the basis of the reasons given and presented them to the whole class. The interviews and the discussion of the answers and their reasons by the students provided an opportunity for me to reflect upon and identify the reasons for the perceived conceptual understanding reflected by the answers.

I could have used concept mapping instead of a test, but I realised that concept mapping would not allow the students to say or write whatever they thought about the concepts. The advantage of open-ended questions is that they provide opportunities for gathering rich data and promoting communication. The open-ended test was best suited for this study because it produced a great variety in the responses and highlighted an urgent need for remedial work.

One may be surprised, as I have been, by some of the student teachers' responses. For example, some of the student teachers associated recycling with sport (cycling) while others associated it with the completion or renewal of the

water cycle. More examples of the student teachers' misconceptions with regard to other concepts are cited in Chapter 4. No matter how absurd the responses are, they seemed to represent some of the students' misconceptions.

From the above discussion it is clear that in this specific context the test was probably not an inappropriate tool for diagnosing the students' misconceptions.

Since "straddling" different research paradigms has been criticised by some researchers (e.g. Janse van Rensburg 1995: 228), the following questions cropped up regularly. As yet, I have not been able to answer them, although on reflection, I feel comfortable with my procedures and outcomes.

1. Should one position oneself within a certain research tradition before one does research, or should one do research while reflecting on how one did it in relation to research traditions?
2. Is there a rule that, in order to do "legitimate" inquiry, research should fit into a particular research orientation?

What made me more comfortable about my position is to learn that a post-positivist interpretive style that has become popular recently involves the use of grounded theory that does not seek to force data to conform with existing theory, but rather develops theory and interpretive categories that are grounded in the data itself (Hones 1998).

Furthermore, a new thinking has emerged with regard to debates about research orientations. The following section examines current debates about these orientations.

The debate about research orientations

According to Robottom (1990) the debate has progressed beyond consideration of quantitative versus qualitative methods of data collection to consideration of research orientations. He states that the distinctiveness among research traditions lies not in their main forms of data collection (methods), but in their “ideology” or “political theory”.

The debate about research orientations attempts to address the fundamental issue of methodological compatibility. According to Walker and Evers (1988) there are three major views concerning the compatibility or commensurability of research traditions.

The first view is that there are epistemologically different orientations that are incommensurable, mutually incompatible and competitive ways of researching the same territory (Smith and Heshusius 1986; Lincoln and Guba 1985). The second view is that there are epistemologically distinct orientations that, though incommensurable, are complementary, equally appropriate ways of approaching different, overlapping, or perhaps even the same research problems. Both of these views imply a fundamental epistemological difference among educational research methods. The third view, or unity thesis, asserts a fundamental epistemological unity of educational research methods, derived from the practical problems addressed, and includes common standards for judging the relative merits of different research traditions. This view has also been called the compatibility thesis (Firestone 1990; Howe and Eisenhart, 1990; Keeves 1988; Walker and Evers 1988).

There are increasing calls to get beyond the debate about research traditions and to move to what scholars in education call a dialogical discourse, which appreciates the variety of available research logics and paradigmatic

perspectives rather than seeking accommodation among them (Bernstein 1983; Ricoeur 1981; Rorty 1979).

If we can agree that educational inquiry is multiparadigmatic there is no need to fuse, no reason or need to find compromise, but there is a need to value different perspectives, assuming that knowledge is a social construction of communities of inquirers operating from various paradigmatic perspectives (Robottom and Hart 1993: 16).

Skrtic (1990: 135) supports this argument by stating that

... the point is not to accommodate or reconcile the multiple paradigms of modern social scientific thought; it is to recognize them as unique, historically situated forms of insight; to understand them and their implications; to learn to speak to them and through them; and to recognize them for what they are ... The task of educational research is not to reconcile these particular paradigms with one another; rather it is to move beyond them through dialogical discourse, to reconcile education with the ideals of democracy and social justice.

These debates together with discussions with my promoter have made me realise that I have not committed any crime by "straddling" research orientations. My promoter convinced me that reflecting on the quality of my research story is more valuable than attempting to locate myself within a particular research tradition. He argues that

Researchers are often more concerned about being purist - if possible deconstructive or post-structural, but at least critical - than about the quality of their research stories. But there must be hope for the slow learners, the straddlers. Even though, like me, they model their approach on critical/reflective orientations to do research in interpretative investigations with data-gathering techniques that strongly remind of empiricism (Schreuder 1999: 6).

The discussions with my promoter made me realise that, instead of sticking meticulously to the letter of specific research traditions, educational research can be made equally legitimate and reliable by the story of the research itself, in which the character, beliefs and context of the researcher are reflected.

Paraphrasing Klausner (1998: 2), Schreuder (1999:6) places emphasis on the importance of narrating research stories by stating that

A culture, a civilization is defined by the stories it tells and by the narrative it sees itself as creating. For us, stories of research can be the most precious and most powerful. For educational research to really make a difference in society, the stories of research must be central to how we attempt to understand our world and ourselves. They embody the very assumptions we make about how we come to know things and what we see as progress. Thus, research can help us define our sense of identity and our attachments to history ... its effects (are) not imposed on us by a mysterious community of distant researchers but (are) part of us. But do we tell research as (a) true story ... as real narrative? Unfortunately, the telling of research is too often lost in jargon, technicality and obscurity.

Gough (1998: 3) shares the same view when he says that

We need to examine the stories in which we participate carefully - to recognize the myths and meanings in their sequences and structures, to be aware of how they are permeated with our histories and hopes, and to have a self-critical awareness of how our interpretations of these stories influence our thoughts and actions.

The practice of situating oneself within a certain research paradigm is rigid. It does not allow one to make meaning by doing and making mistakes. It leaves little room for reflection. The importance for practitioners to reflect critically on the relationship between their practice (the monitored action) and their subjective view of what is being practised (the personal theory that guides their practice), is noted by Robottom (1987: 109). This view sees the researcher as a reflective practitioner.

The following section is a continuation of my research story in relation to action research.

3.4 ACTION RESEARCH

The methodology used in this study contains many elements of what has been described as action research. Before discussing this methodology, it is necessary to throw light on the definition of and the criteria for action research.

Grundy (1982: 353) notes three minimal requirements or "criteria" for action research which are " ... individually necessary and jointly sufficient for action research to exist", namely

- The project takes as its subject matter a social practice, regarding it as strategic action susceptible to improvement;
- The project proceeds through a spiral of cycles of planning, acting, observing and reflecting, with each of these activities being systematically and self-critically implemented and interrelated; and
- The project involves those responsible for the practice in each of the moments of the activity, widening participation in the project gradually to include others affected by the practice and maintaining collaborative control of the process.

Pym (1993) and Savahl (1993:) have added the following condition for emancipatory action research:

- The project involves dialogue, participation, collaboration and collective control which are supported by the essential element of joint reflection and appraisal in order to redirect and transform practice.

In describing criteria for action research, Kemmis (1982) notes that not all work that passes for action research meet these criteria, that some work will fail to meet these criteria, and that some action research will develop towards meeting all these criteria. It is difficult for me to claim that this study meets all these criteria, because the student teachers were, sometimes, not involved in each of the moments of activity. For example, when I planned to start teaching Integrated

Social Science in 1977 I was not able to involve them. They were involved from the reflexive phase of the first cycle of enquiry up to the end of the study.

Kurt Lewin (1946) sees action research as a method of intervention into social problems. In line with Kurt Lewin's idea, the present study represents an intervention by the researcher in a practical teaching situation to improve the teaching of human and social sciences through a variety of teaching strategies. Kemmis (1983) regards "practice" as the strategic action undertaken with commitment in response to a practical problem. The present study therefore represents a practical response to identified practical problems of land pollution, community development and sustainability in adult education.

Any study conducted through action research can - and should - be evaluated and modified continuously as it progresses so as to improve the practice under consideration. Such a method is described as a "self-reflective spiral of cycles of planning, acting, observing and reflecting" (Cohen and Manion 1989; Walker 1985; Kemmis 1983). This was also characteristic of the present study. While my colleagues, student teachers and I were developing and implementing our teaching unit, we were involved in observing, reflecting, evaluating, re-planning and acting according to the results of such evaluation.

Kemmis (1982: 42) sees action research as a form of research carried out by practitioners into their own practice, " ... a participatory form of educational research for educational improvement ... [which] contributes to social change". Defining the emancipatory form of action research Carr and Kemmis (1986:162) state that

Action research is simply a form of self-reflective inquiry undertaken by participants in social (and educational) settings in order to improve rationality and justice of their own social or educational practices, their understanding of these practices, and the situations in which these practices are carried out.

In a revision of this definition, Kemmis and McTaggart (1985: 5) highlight the importance of collaboration: " Action research is a form of collective self-reflective inquiry ... " and state that it is most empowering when undertaken by participants collaboratively (Kemmis, 1988: 42, cited in McNaught and Raubenheimer 1991:3). The present study also aimed at educational improvement through collaborative action. The student teachers shared knowledge and experiences among themselves and worked collaboratively with the community of Langa to improve their social and educational practices.

Many authors emphasise the value of the collective, self-reflective and action elements of action research and see action research as an appropriate inquiry methodology which democratises professional development (Davidoff *et al* 1993; Elliot 1991; McKernan 1991; Robottom 1987; Whitehead 1980). In developing the methodology of this research I have focused on the involvement of student teachers in the development and evaluation of a learning programme, as part of a process of democratisation, empowerment and change.

A central theme for the research process was to enable the empowerment of student teachers through their interaction with the environment and the community, and through this to develop action to improve their own teaching practice. By placing action at the centre of the research process, action research is by definition arguing that educational action matters and classroom or other praxis-based interventions can make a difference to the overall scheme of things. According to Robinson (1994: 258)

... action research in South Africa can ... be argued to have an inherently political agenda, for it is motivated by a sense that teachers (and students) can assume some control of their lives and, by implication, that we are not bound to be passive recipients of a repressive education system.

The basic method of action research has been described as involving recurrent cycles of the following three main phases:

1. **The planning phase**, in which practitioners identify areas for improvement in their practice, and educational activities are identified where improvement is deemed possible.
2. **The action phase**, in which the plan is put into practice in an educational setting. During this phase the practitioners should find ways of monitoring the action which should provide insight into the practice which, in turn, informs the reflective phase.
3. **The reflective phase** in which information collected during the planning and action phase is examined and analysed. After considering the results of the analysis of this three-phase action cycle, the next planning phase is entered. These recurrent cycles of the three phases form the action research spiral, in which the knowledge from one cycle informs the strategic action of the next cycle (Huckle 1995; Elliot 1991; McKernan 1991; McTaggart 1991).

According to Robottom (1987: 111)

... it is the action research spiral of successive cycles, rather than a single cycle of three phases (planning, action and reflection) that allows improvement and rationality and justice of the practice itself, of the practitioners' understanding of the practice and of the practitioners' understanding of the situation in which the practices are carried out.

Flanagan (1984: 6) supports this argument by noting that one cycle of inquiry "... can only be regarded as a beginning" and a single loop should not be considered action research at all.

The present study represents two cycles of enquiry in an action research process to investigate the development of the student teachers' conceptual understanding and the improvement of their practice and their learning programme.

3.4.1 THE FIRST CYCLE OF ENQUIRY: PLANNING AND TEACHING INTEGRATED SOCIAL SCIENCE IN 1997

3.4.1.1 Planning

When I started teaching at Peninsula Technikon in 1997, I was tasked with teaching Integrated Social Science, which is basically an environmental education course. This course is divided into two sections known as Geography or Development Studies (content) and Social Studies Teaching (methodology). I was informed that my predecessor taught the content component from January to June and the method component from July to November. I planned to do the same.

3.4.1.2 Action

I taught Integrated Social Science to a class of first-year students who had registered for the National Diploma in Adult Basic Education and Training (ABET). This diploma is a support mechanism and capacity building for adult educators and develops them professionally. It enables them to address areas such as Literacy, Numeracy, Technology Education, Life Skills, Workplace Guidance and Social Sciences. The diploma is not only empowering and professionalising adult educators, but is also aimed at opening meaningful doors of learning to millions of South Africans who did not receive formal basic education.

All the student teachers are blacks who obtained their senior certificates from the Department of Education and Training. Their age range is reflected in the following table.

TABLE 3.2 THE STUDENT TEACHERS' AGE STRUCTURE

DATE OF BIRTH	NUMBER
1950 – 1955	02
1956 – 1960	00
1961 – 1965	03
1966 – 1970	11
1971 – 1975	23
1976 – 1978	11

The majority of the student teachers are females (84%). About 90 per cent of the students are from the Eastern Cape. Some of them are working in industries, night schools, non-governmental and community-based organisations of Cape Town. Although other student teachers are unemployed, they are allowed to offer voluntary services for the purposes of teaching practice which is a major requirement for the diploma.

I started with the course content which covers the following five topics:

- What is development?
- Water
- Desertification
- Sustainable Land Development and
- Recycling.

To meet the requirements of the section on methodology the students had to develop the necessary skills to teach these topics to their adult learners. When the students were required to plan lessons on the above topics and do micro-teaching in July, it became clear that they had not properly mastered some of the concepts dealt with during the first semester.

3.4.1.3 Reflection

After realising that the student teachers had methodological and conceptual problems, I discussed the problem with them. I tried to identify with them the reasons, as well as suggestions on how we can improve the situation for 1998. The following factors were identified as contributing to the students' inability to teach some of the environmental concepts.

1. There seemed to have been too much content and my pace was too fast. This could be true, because I wanted to finish the content component before June. In addition I was trying to find my feet as a new lecturer in a new environment and my teaching load was heavy as I was teaching eight other subjects.
2. For a number of reasons, I was not able to use effective teaching strategies that could have developed the student teachers' conceptual understanding and their teaching skills. The student teachers were not provided with direct experience in the environment, and the environment was not used as a medium for developing learning and teaching skills that are related to sustainable living. In other words, emphasis was placed on the acquisition of knowledge **about** the environment only.

The following factors did not allow me to use effective teaching strategies:

- 2.1 The timetable had four 35-minute periods that were spread throughout the week and the time was not enough to cover the course content and implement effective teaching strategies.
- 2.2 The teaching venue was a lecture hall (A8) with fixed chairs and tables which encouraged teacher-centred activities.

2.3 The student teachers could not translate some of the English concepts as they do not exist in their mother tongue. They could only understand them by observing and taking action.

I felt bad, but there was nothing we could do to improve the situation in 1997. The only thing we could do was to plan for some essential changes for 1998.

3.4.2 THE SECOND CYCLE OF ENQUIRY: PLANNING AND TEACHING INTEGRATED SOCIAL SCIENCE IN 1998

3.4.2.1 Planning

Fortunately, a new national curriculum was introduced in 1997 and a need was realised by the ABET Unit to rearticulate the National Diploma in ABET so that it could be in line with Curriculum 2005. As the convenor technician, Peninsula Technikon invited other technicians to a meeting in which the student teachers' suggestions were also discussed. The suggestions and discussions culminated into the following plans for 1998.

3.4.2.1.1 Restructuring of the course

I realised the need for moving away from using a content-based approach to the methodology course where I used content to develop lifelong skills and provide insights into concepts and to promote environmental literacy and proper actions towards the environment. I suggested that the course content be reduced in order to give more time to effective teaching strategies and skills development. It was decided that the first two chapters (**What is Development? and Water**) should be dealt with in the first year, and the next three chapters (**Desertification, Sustainable Land Development and Recycling**) in the second year of study.

3.4.2.1.2 Change in the timetable

It was realised that 35-minute periods, spread throughout the week, were not suitable for outcomes-based activities. I realised that we had to lobby for longer periods once a week.

3.4.2.1.2 Change in teaching/learning venues

We had to change the venue of the sessions to rooms that were more suitable for group work and workshops. We required rooms where the tables and chairs were not fixed, but could be moved around to accommodate small groups working together.

3.4.2.1.2.4 Lack of coherence and structure of the course

I realised that we required an appropriate unifying theme that could serve to conceptually organise the content in such a way that concepts are linked in a coherent and logical way.

3.4.2.2 Action

Since the student teachers were in their second year of study, sustainable land development was identified as an appropriate focus and unifying theme to be used to demonstrate the application of environmental education for sustainability and to introduce the essential concepts needed for an understanding of this concept as an environmental issue. This topic was selected from the student teachers' learning programme.

Although there were three topics selected for the second year of study (**desertification, sustainable land development and recycling**), my colleagues at the Technikon felt that the focus should be on sustainable land

development, because desertification and recycling could form part of sustainable land development if emphasis was placed on problem-solving, (i.e. ways of preventing desertification and land pollution).

In addition, overpopulation that has manifested itself in the development of squatter settlements in the townships of Cape Town, has highlighted the need for strategies and actions that focus on careful management of land resources and on ways of becoming sustainable communities. Another factor that was considered, was that land pollution, unemployment, hunger and poverty are major environmental issues in the former black townships of Cape Town.

Having chosen sustainable land development as an appropriate focus, the next step was to identify the essential concepts needed for an understanding of this topic as an environmental issue. The identification of the essential concepts related to sustainable land development was carried out with the assistance of the supervisor and technikon lecturers. It was explained to the lecturers that since desertification, sustainable land development and recycling were selected as themes for the course, they should make a list of concepts they considered important for the student teachers to know and understand in order to be able to take environmental action with their adult learners. A long list with more than twenty concepts was drawn. Since I needed less than ten concepts, a selection process was followed and concepts that were regarded as less important and less relevant than the others, were eliminated. The following nine concepts were selected:

- The environment
- Land as a renewable or non-renewable resource
- Human impact on land resources
- Land pollution
- Littering
- Recycling

- The green revolution
- Intensive arable farming and
- Sustainable communities.

Since it was noted in 1997 that the student teachers had methodological problems with some of the environmental concepts, it was important to investigate their conceptual understanding of sustainable land development at the beginning of 1998. This was done by means of the Treagust and Haslam (1987) test, as discussed previously. The results of the investigation, which highlighted the need for remedial work, are discussed in Chapter 4.

In 1998 the course was structured as follows:

Only the following two topics were selected to be covered in the first year of study: **What is Development?** and **Water**. The following three topics, **Desertification, Sustainable Land Development and Recycling**, were selected to be covered in the second year.

The course content was also integrated with the method of teaching. The aim of integrating subject teaching and method was not to separate the teaching of the concepts from how to handle them in an educational situation. It enabled the student teachers to demonstrate the ability to use appropriate and effective teaching strategies, develop materials and learning programmes for their adult learners.

With regard to the timetable 2-hour periods were allocated for each subject once a week. This made it possible for the lectures to be conducted in a workshop format.

In order to encourage use of group work activities, an ordinary classroom in which chairs and desks could be re-arranged, was used (G22).

Remedial work involved the development and implementation of the teaching unit in 1998. The teaching unit consisted of a number of phases that included a pre-planning phase and field research. The pre-planning phase involved the development of the essential concepts through participatory activities and the training of the students in techniques that would be necessary for fieldwork. Langa (Fig. 5.2), a black township of Cape Town, was used as a resource for fieldwork, and the student teachers were involved in research and in community-based environmental projects. In the course of the teaching unit a variety of teaching strategies were involved. These included a co-operative learning exercise, a simulation game and role play, interviews conducted by students, development of reading texts and worksheets, a map exercise and field research. Each of these teaching strategies will be discussed more fully in Chapter 5.

3.4.2.3 Reflection

This phase focused on critical reflection through narrative inquiry into the students' teaching practice and through evaluation.

3.4.2.3.1 Evaluation

The teaching unit in this study was evaluated by the student teachers and myself. Firstly, there was self-evaluation that was effected through reflection. I recorded everything that was deemed relevant to the purpose of the study in my journal and reflected on it.

Secondly, there was learner evaluation. Student evaluation forms (Appendix 5) were prepared and improved through the involvement and comments of colleagues. The 5-point Likert scale was also used in the students' evaluation forms.

The evaluation of the teaching unit was both formative and summative in the

sense that the student teachers were required to evaluate each and every phase of the teaching unit verbally, and in the end they were required to evaluate the whole teaching unit through the use of evaluation forms (Chapter 5).

3.4.2.3.2 Narrative Inquiry

Another useful form of evaluation that was used in this study, was narrative inquiry. From July to September 1999 I listened to the stories of my students who are teaching in adult learning centres. The stories reflected the manner in which the students taught their learners. I interpreted these stories and attempted to assess both the quality of the teaching unit and the students' understanding of the approach, as well as their understanding of the essential concepts underpinning the topic chosen as the focus of the study. Hopefully this phase, that took place in 1999, may assist in identifying areas that need to be improved in 2000 (a possible third cycle of enquiry which is beyond the scope of the present study). This investigation will report on some of these stories. The students' stories and their interpretations form the subject of Chapter 6.

The following section attempts to throw light on my research story with regard to research methods and techniques that were used in addition to the Treagust and Haslam (1987) test discussed earlier in the study.

3.5 THE DATA GENERATING METHODS USED IN THE STUDY

While making use of techniques which are common to many forms of qualitative inquiry, action research is not distinguished by particular methods or techniques of data collection, but is characterised by a methodological process which is quite different from other methodologies (Stevenson 1995: 200). The action researcher does not only collect data in order to act, but also studies the " ... intentions, consequences and circumstances of the actions he or she has taken, as well as using the information to influence further actions" (Stevenson 1995: 200). It has

been noted that the description of research techniques is a complex undertaking that is made even more complex by the "openly ideological" nature of critical research processes (Fien 1992: 6).

According to Fien (1992: 6), research techniques emerge from a theoretical position and therefore reflect values and beliefs about social reality. This statement emphasises the difficulty in distinguishing between theory and data in action research, because the processes of generating data through participation, observation and reflection involve selections made by the researcher or participants in the process, and therefore imply judgements which are based on theoretical positions and experience.

Elliot (1992: 70-83) recommends that the action researcher make use of a wide range of monitoring techniques, as " ... multi-techniques will help to secure a more penetrating grasp of the situation". He also lists a number of data gathering procedures that an action researcher may undertake and suggest the use of monitoring techniques which provide evidence of how well the course of action is being implemented and which provide evidence of the unintended as well as intended effects.

In this study a variety of techniques were used to gather data. Included amongst these techniques were the interviews, the Treagust and Haslam test (1987), narrative inquiry, photographs and video material, observation and field notes. These techniques are discussed below.

3.5.1 Interviews

For the purpose of the present study focus group and semi-structured interviews were used.

3.5.1.1 Focus group interviews

According to Morgan and Spanish (1984: 253) focus groups bring together several participants to discuss a topic of mutual interest to themselves and the researcher. It is suggested that focus group interviews should be introduced by a “moderator” who should encourage all participants to take part in the discussion. Interaction between the participants should be informal to stimulate in-depth discussion and reflection on the topic, and interviews should be timed to last no more than two hours (Folch-Lyon and Trost 1981: 444). I made use of focus group interviews to get feedback from a group of student teachers on their perceived lack of conceptual understanding and on their perspectives at various stages in the study. These interviews were also used as part of the evaluation of the study.

3.5.1.2 Semi-structured interviews

Semi-structured interviews were used by the student teachers to collect data. They interviewed the residents in Langa (Chapter 5). According to Cohen and Manion (1989) semi-structured interviews are less formal; the interviewer is free to modify the sequence of questions, change wording, explain questions and add to the questions; the interviewer can also probe for more specific answers to clarify and eradicate any misunderstanding. Elliot (1991) recommends that a semi-structured interview begin with the unstructured part, as many of the pre-set questions may be asked without them having to be explicitly raised by the interviewer. This helps to establish a climate in which the interviewee will feel comfortable and will be able to respond more authentically to the questions raised.

From the above discussion it can be seen that interviews were used for a number of purposes in this study: They were not only used for data collection, but also as a teaching strategy that aimed at skills development on the part of the student

teachers.

3.5.2 Photographs and video material

Photographs and video material can be used to collect visual data about situations and events. Initially, at the outset of the research, I used photographs. Photographs constitute a more subjective selection of data than video material.

When we were preparing to go out to Langa with the student teachers, I made arrangements with a video technologist at the Academic Support Services Unit of Peninsula Technikon. On the day of the outing he informed me that he was not able to go with us. I was frustrated and my colleagues in Science Education informed me that they had just bought a video camera and they showed me for about ten minutes, which button to press to take a film. For the first time in my life I learnt how to operate a video camera in Langa. I decided to buy my own video camera so that I could use it whenever I wanted. I learnt how to connect a video camera to a television set and video machine at home and how to transfer the film from a video camera to a cassette.

It is important to note that the skill I acquired through operating a video camera was transferred to some of the student teachers. When I was busy with community members in the field, I asked some of them to operate the video camera. Some of them were taking photographs, using my camera. It was an exciting learning experience for the students and myself.

3.5.3 Narrative inquiry

Having developed and implemented the teaching unit, it was necessary to assess its success or effectiveness in developing the student teachers' conceptual understanding and enhancing their understanding of the use of an outcomes-based environmental approach. Teaching practice was used to assess

the student teachers' ability to plan and use environmental education for sustainability as an outcomes-based approach to teaching.

The students who were employed as well as those who were practising as adult educators were asked to narrate stories about their practice. Arguments in support of narrative inquiry have been outlined earlier in this study. It has been argued that the reconstructed stories of people's lives are a fundamental educational tool.

3.5.4 A research journal

From the beginning of the study I kept a research journal, documenting all activities and experiences related to the research. Through keeping a journal, I was able to keep track of both research activities and my own learning process. I could also reflect on facts, thoughts, perceptions and feelings. Elliot (1991: 77) states that a journal " ... should contain personal accounts of observations, feelings, reactions, interpretations, reflections, hunches, hypotheses and explanations. Accounts should not merely report the 'bald facts' of the situation, but convey a feeling of what it is like to be there participating in it". Meloy (1994: 60) refers to the research journal as " ... a place to make explicit questions and concerns for later answering in organizing, ... a way of imaging a stream that flows through and surrounds the territory of the research ... a journal can hold your heart". Through keeping a journal I was able to link all the different research experiences and I could see key themes emerging.

3.5.5 Observation and field notes

Gold (in Fien 1992: 9) identifies two interim positions on a continuum of participant observation techniques, and describes these as "an observer-as-participant" in which the researcher is known as the researcher, but does not participate in the events, and "a participant-as-observer", in which a researcher participates as fully as possible in the on-going activities of a group. I took the

role of full participant in the research process and participated in the events as fully as possible, because the intention of this study was to engage in emancipatory action research with student teachers and because action research is a collaborative form of enquiry. While I was not involved in an ethnographic study, I used the technique of observation to supplement my other sources of data, and to gain a deeper insight into the research process. Observation was centred around group activities both in the classroom and in the field.

3.6 ANALYSIS AND INTERPRETATION OF DATA

I believed that the involvement of student teachers in the analysis and interpretation of data was a way of empowering them, since critical thinking is perceived to be central to the analysis of data in collaborative research.

Data relating to the student teachers' conceptual understanding of sustainable land development, collected through the Treagust and Haslam test (1987), were analysed quantitatively and qualitatively in collaboration with the student teachers. It is important to note that I also used my personal experiences in the interpretation of the student teachers' perceived lack of conceptual understanding since I went through the same system of education with them (Chapter 4). Collected data on the student teachers' evaluation was presented in the form of percentages and tables that were then described and interpreted. The student teachers were also given an opportunity to analyse and interpret data gathered in the course of the teaching unit.

Schensul and Schensul (1991: 191) recommend that researchers allow enough time for full participation of community researchers in data analysis and to structure the data in a way that would enable the participants to respond to it immediately. They note that participation in the analysis of data can " ... contribute immeasurably to its interpretation because of familiarity with the context of the project". Robottom and Hart (1993: 67) also argue for participation

in data analysis and describe a process of reporting in which successive versions of data sources were distributed among participants for verification and amendment. They further argue that the research agenda should become “internalized” by the research participants so that the participants may maintain a degree of control over the research agenda, including the interpretation and analysis of data. From the above discussion it is clear that to do action research in collaborative contexts implies participation in the analysis and interpretation of data.

3.7 VALIDITY AND RELIABILITY OF THE STUDY

I was initially concerned about the problems of validity in my research but I later realised that reliability and validity in this type of research depends on other factors.

Burke (1997) recommends the following list of strategies that can be used to improve validity of qualitative research (Table 3.3).

**TABLE 3.3: Strategies used to promote qualitative research validity
(Adapted from Burke 1997: 292-293)**

Strategy	Description
1. Low inference descriptors	The use of description phrased very close to the participants' accounts and researchers' field notes. Verbatism (i.e. direct quotations) are a commonly used type of low inference descriptors.
2. Participant feedback	The feedback and discussion of the researcher's interpretations and conclusions with the actual participants and other members of the participant community for verification and insight.
3. Methods triangulation	The use of multiple research methods to study a phenomenon.
4. Investigator triangulation	The use of multiple investigators (i.e. multiple researchers) in collecting and interpreting the data.
5. Peer review	Discussion of the researcher's interpretations and conclusions with other people. This includes discussion with another researcher not directly involved. This peer should be skeptical and play the "devil's advocate", challenging the researcher to provide solid evidence for any interpretations and conclusions. Discussion with peers who are familiar with the research can also help provide useful challenges and insights.
6. Extended fieldwork	When possible, qualitative researchers should collect data in the field over an extended period of time.
7. Reflexivity	This involves self awareness and "critical self-reflection" by the researcher on his or her potential biases and predispositions as these may affect the research process and conclusions.

The low inference descriptors that were used in the study were my field notes and the stories of the participants. I got feedback on interpretations and conclusions from the participants during the discussions in class. A variety of data generating methods were used and investigator triangulation was in the form of research conducted collaboratively with student teachers. Peer review

and reflexivity are also characteristic of this study. Another factor that may guarantee validity of this study is my personal experience. At first I felt that I would be accused of being subjective if I draw on my own experiences, but later I decided to "let my personal experience speak through my own voice" (Brock-Utne 1996: 608), because I was researching my own society in an environment I knew better.

3.8 LIMITATIONS OF THE STUDY

The following are perceived as the limitations of the study:

1. The limited time that I was able to spend with the student teachers was a limitation to the study. Only Tuesdays were convenient for both the student teachers and me. I had two 2-hour periods with the student teachers on Tuesdays from half past eight to half past ten (**Environmental Education**) and from eleven to one o'clock (**Teaching Practice**). Tuesday was the only day the student teachers were free in the afternoon. The time for the follow-up (community involvement) had to be kept to a minimum.
2. Financial restrictions were another problem. My applications for research funding were not successful. I was able to get a bus to transport the student teachers from Peninsula Technikon to Langa for the first time. It became clear that more than ten visits to Langa would exhaust the ABET Unit's funds. I discussed the matter with the student teachers who suggested the use of a train to Langa. This was not a problem for the students who used to commute to Peninsula Technikon. They could use their weekly tickets, as most of them used trains that go via Langa to Peninsula Technikon. The problem lay with the residential students of the Peninsula Technikon. Most of them had no money for travelling and I was compelled to buy train tickets for them. Another problem was their meals for lunch. They used their student cards to buy food at the Peninsula Technikon. Again, I had to use my own money and I managed to prepare

sandwiches and juice for all the student teachers. This could only be sustained for a limited time, and had a definite influence on at least the duration of my investigation.

To ensure that the student teachers had the necessary knowledge needed to take environmental action toward land resource management I decided to determine the extent to which they understood the concepts related to land resource management. The manner in which the diagnostic test was conducted and the results thereof are documented in the next chapter.

CHAPTER FOUR

IDENTIFYING STUDENT TEACHERS' CONCEPTUAL UNDERSTANDING THROUGH OPEN-ENDED QUESTIONS AND INTERVIEWS

4.1 INTRODUCTION

As indicated in Chapter 3, the rationale for setting the open-ended test was to identify the students' conceptual understanding of sustainable land development. Conceptual understanding is seen as a vital prerequisite for the development of the sort of knowledge required for environmental education for sustainability. The essential concepts identified for the preliminary understanding of land resource management as an environmental issue were the following:

- The environment
- Land as a renewable or non-renewable resource
- Human impact on land resources
- Land pollution
- Littering
- Recycling
- The green revolution
- Intensive arable farming and
- Sustainable communities.

4.2 THE STRUCTURE OF THE OPEN-ENDED TEST

The student teachers were required to answer open-ended questions that were based on the above concepts. They had to provide reasons for their answers. To ensure that the questions were applicable and appropriate, a pilot study was undertaken in a small class of first-year ABET students. After the questions had been evaluated, the test was shortened and improved with regard to the structure

of the questions and language usage to eliminate ambiguities. The results discussed below refer to the responses of student teachers to the open-ended test that is included in this study (Appendix 1).

4.3 OPEN-ENDED QUESTION RESULTS

A great variety of data was gathered through the use of open-ended questions that were based on the prior identification of concepts. The great variation in the responses is reflected in tables throughout this chapter.

4.3.1 THE MEANING OF “ENVIRONMENT”

The first question in the test attempted to find out if the students understood the broad meaning of the concept **environment**. The answers to this question are reflected in the table below.

Table 4.1: The meaning of the concept “environment”

	No. of Students	%
Biophysical world, people and social structures	2.0	4.0
Did not answer the question	5.0	10.0
Soil and air	20.0	40.0
Water and trees	12.0	24.0
Plants and animals	11.0	22.0
Total	50.0	100.0

The examination of data relating to the student teachers’ understanding of what the term “environment” means, indicates that the majority of them (86 per cent) have a narrow understanding of this concept. They believed that the environment refers to the bio-physical surroundings only and excluded economic and socio-

political contexts. They did not imagine the environment as interacting patterns of political, social and economic factors within the biological and physical world. In an attempt to establish the reasons underlying this narrow understanding of the environment, I interviewed 5 student teachers. The interviews illuminated that the students who did Geography and Biology in Grade 12 were influenced by the narrow perspective that addressed only the biophysical dimensions of the environmental crisis. Their textbooks did not follow a comprehensive approach which requires an examination of social, political, economic, historical as well as biological factors. The textbooks focused exclusively on the natural sciences, particularly ecology. From the interviews it was also evident that the students were taught **about** the environment only. Most of them were never taught **in** the environment and none of them had an opportunity to take action towards environmental protection and improvement.

4.3.2 LAND AS A RENEWABLE, SEMI-RENEWABLE OR NON-RENEWABLE RESOURCE

The second question aimed at finding out whether land was perceived by the student teachers to be a renewable, semi-renewable or non-renewable resource. The reasons given to support the answers, are summarised in Table 4.2.

Table 4.2 Is land a renewable, semi-renewable or non-renewable resource?

	No. of Students	%
Renewable:		
Can be fertilised and used again	16.0	32.0
Semi-renewable		
Can be used for grazing if it is unsuitable for crop cultivation.	8.0	16.0
Non-renewable		
Cannot be used again if washed away by the floods.	13.0	26.0
Cannot be manufactured by the factories	4.0	8.0
No one can renovate the land	2.0	4.0
It is God's creation (natural). Only human-made things are renewable.	7.0	14.0
Total	50.0	100.0

Only 32 per cent of the student teachers regarded land as a renewable resource as it can be fertilised and used again. The interviews revealed that serious misconceptions were attributed to the language problem. It was difficult for the student teachers to see the difference between renewal, renovation and manufacturing. Some of them argued that when a building is renovated, it is made to look new again.

4.3.3 THE HUMAN IMPACT ON LAND RESOURCES

The student teachers were asked if the increasing human population will have positive or negative effects on land resources. The responses with regard to the nature of human impact on land resources are reflected in Table 4.3. The answers were classified according to those who regarded the impact as positive or negative.

Table 4.3 The Human Impact on Land Resources

	No. of Students	%
Positive Impact		
Many people will assist in managing land resources e.g. farming is labour-intensive.	10.0	20.0
Negative Impact		
Scarcity of land	24.0	48.0
Increased land pollution	16.0	32.0
Total	50	100.0

Only a small percentage (20%) of the student teachers maintained that the increasing human population will have a positive impact on land resources (Table 4.3). This group claimed that many people will assist in managing land resources, for example, a farmer will need as many farm workers as possible. The majority of student teachers (80%) mentioned negative effects which included the following: scarcity of land because the more the people, the greater the use of land, and increased land pollution as more waste will be dumped on land.

Better performance on this question was attributed to the popularity amongst Geography teachers of the section on the effects of population explosion in the grade 10 Geography syllabus. Furthermore, television programmes such as “Ecovision” were mentioned as being effective in conveying the message about the adverse effects of increasing population numbers.

4.3.4 SECTOR MOST RESPONSIBLE FOR LAND POLLUTION

Table 4.4 shows variation in the responses with regard to the sector of the economy which is most responsible for land pollution in Cape Town.

Table 4.4 Sector Most Responsible for Land Pollution in Cape Town

	No. of Students	%
Industry	8.0	16.0
Agriculture	10.0	20.0
Residential areas	26.0	52.0
CBD	6.0	12.0
Total	50.0	100.0

About 52 per cent of the student teachers believed that the residential areas are most responsible for land pollution in Cape Town because the population density is high in residential areas and the rate of land pollution increases with population density. From the interviews it became clear that the student teachers only considered the residential areas which are occupied by the blacks (black townships) which are a mix of shacks, flats for migrant labourers and brick houses. About 20 per cent of the answers indicated that agriculture was most responsible for land pollution, because poisonous pesticides pollute the land, especially when rainfall occurs or when land is irrigated. Almost 16 per cent of

the student teachers mentioned the industrial sector, because oil and chemicals from manufactured products are disposed on the land, whilst 12 per cent of them stated that the CBD was responsible for land pollution, because traffic congestion resulted in smoke from the exhaust pipes of vehicles. This answer showed that these student teachers confused land pollution with air pollution.

4.3.5 MOST COMMON FORM OF LAND POLLUTION IN CAPE TOWN

Differences of opinion relating to the form of land pollution which is regarded as most common in Cape Town are reflected in the following table.

Table 4.5 Most common form of land pollution in Cape Town.

	No. of Students	%
Industrial waste	8.0	16.0
Littering	33.0	66.0
Sewage	3.0	6.0
Smoke from exhaust pipes of vehicles	6.0	12.0
Total	50.0	100.0

Littering was believed to be the most common form of land pollution in Cape Town by 66 per cent of the student teachers (Table 4.5). They pointed out that plastic bags, papers and plastic bottles are not only visible on street pavements, but are also hanging on fences in the townships. This response reflected that the student teachers were aware of the presence of land pollution in Cape Town. They had observed it and identified it as one of the environmental problems facing their communities.

4.3.6 THE NECESSITY OF RECYCLING IN CAPE TOWN

The following table contains answers to the question which attempted to find out whether it is necessary to do recycling in Cape Town or not. The reasons for the answers given are also provided.

Table 4.6 Necessity of recycling in Cape Town

	No. of Students	%
Yes		
Littering is one of the problems facing Cape Town and re-using materials saves money and cleans the environment	14.0	28.0
Recycling is an important sport activity	7.0	14.0
The farmers need rain which will not be available if the cycle is not completed	23.0	46.0
No		
Uncertain	0.0	0.0
Did not know what recycling was all about	6.0	12.0
Total	50.0	100.0

Although the majority of student teachers (88%) saw recycling as a necessity in Cape Town, some of the reasons to support this were unsatisfactory. These reasons revealed serious misconceptions on the part of the student teachers with regard to recycling. For example, about 46 per cent of them associated recycling with the completion or renewal of the water cycle. They stated that recycling is necessary in Cape Town because the farmers need rain for their vineyards and

orchards, and the people of Cape Town need clean water which will not be available if the cycle has not been completed. About 14 per cent of the student teachers associated recycling with sport (cycling). They pointed out that recycling has become one of the important sport activities in Cape Town and its promotion is necessary if we want the Olympic games to be held in Cape Town. Only 28 per cent of them stated that recycling is necessary because littering is one of the problems facing Cape Town, and re-using materials saves money and cleans the environment. About 12 per cent of the student teachers were not sure whether it was necessary or not to do recycling in Cape Town, because they did not know what recycling was all about.

The misconceptions relating to recycling were attributed to the fact that the majority of teachers did not use fieldwork and visual aids such as videos and slides which would have enabled the learners to see the process of recycling in action and would have developed their conceptual understanding. The student teachers stressed that as English second language speakers they experience difficulty in understanding the concepts through the use of definitions only. They further pointed out that if they had previously been involved in fieldwork and model building activities, they would have performed better in the test.

4.3.7 THE GREEN REVOLUTION IN SOUTH AFRICA

The answers relating to whether the student teachers would like to see a green revolution in South Africa or not, are shown in Table 4.7.

Table 4.7 The Green Revolution in South Africa

	No. of Students	%
Yes People will get fresh vegetables and the environment will be green and beautiful.	4.0	8.0
No The revolution results in wars, e.g. in France	21.0	42.0
Many people lose jobs because the machines do all the work, e.g. in England	18.0	36.0
Uncertain	7.0	14.0
Total	50.0	100.0

About 78 per cent of the student teachers indicated that they would not like to see a green revolution in South Africa, but they gave different reasons. One group (42%) associated the green revolution with the French Revolution and stated that many people died during the revolution in France. They pointed out that they hate revolution, because it results in wars. Another group (36%) associated the green revolution with the Industrial Revolution. They mentioned that they would not like to see it in South Africa, because there is already a high unemployment rate, and in England many people lost their jobs because the machines did all the work that was done by hand. Almost 14 per cent of the student teachers were not sure if the green revolution was necessary in South

Africa, because there is no more apartheid. About 8 per cent of the student teachers stated that they would like to see the green revolution in South Africa, because people will get fresh vegetables and the environment will be green and beautiful.

From the above student teachers' responses it is evident that there is no correct answer to this question because a green revolution, in the popular sense, means a change in lifestyles that will be less harmful to the environment.

The interviews and class discussions of the student teachers revealed that the misconceptions relating to the green revolution were attributed to the students' confusion with regard to the history knowledge they gained in grades 10, 11 and 12. In history they learnt about the French and the Industrial Revolutions and they did not know that the term "revolution" can mean something else other than revolts, rebellions or wars.

4.3.8 INTENSIVE ARABLE FARMING: GOOD OR BAD?

The responses in the following table reflect the student teachers conceptual understanding of intensive arable farming. The students had to respond to the question that aimed at finding out whether they regarded intensive arable farming as good or bad, and then supply reasons for their answers. I was hoping that the responses of the student teachers to this question would give me an indication that they understood the difference between intensive and extensive farming as well as the difference between arable and pastoral farming.

The majority of answers as to whether intensive arable farming was good or bad reflected a serious deficiency in the student teachers' grasp of the concept of intensive arable farming. Although all of them regarded intensive arable farming as good (Table 4.8), the reasons given by most of them revealed that they did not understand this concept. For example, about 28 per cent of them stated that

intensive arable farming was good because many cattle, sheep and goats can be kept in arid regions. Almost 22 per cent of them pointed out that this type of farming enables the farmers to have large farms in dry lands.

During the interviews the student teachers explained that they confused **arable** with **arid** and regarded the two words as synonyms. They stated that they associated arid regions with dry areas and thought that arable farming is farming that takes place in dry lands.

Whilst 18 per cent of the student teachers maintained that intensive arable farming was good because the crops can be grown over a large area, 32 per cent claimed that it is good because high yields of crops are produced in a small area. It was only this small group (32%) which gave the correct answer. The large group (68%) could not differentiate between arable and pastoral farming, and between intensive and extensive arable farming.

Table 4.8 Intensive arable farming: good or bad?

	No. of Students	%
Good		
Many cattle, sheep and goats can be kept in arid regions	14.0	28.0
It enables farmers to have large farms in dry lands	11.0	22.0
The crops can be grown over a large area	9.0	18.0
High yields of crops are produced in a small area	16.0	32.0
Bad	0.0	0.0
Uncertain	0.0	0.0
Total	50.0	100.0

4.3.9 SUSTAINABLE COMMUNITIES

The final question attempted to find out if the student teachers would like to live in sustainable communities. The responses in Table 4.9 reflect their conceptual understanding of sustainable communities.

Table 4.9 Sustainable Communities

	No. of Students	%
Yes		
Sustainable communities have healthful liveable environments and resources are used efficiently with little or no waste	12.0	24.0
White communities can sustain themselves, but it is expensive to buy houses in white residential areas	11.0	22.0
No		
Could not provide reasons for answers	15.0	30.0
People sustain injuries in sustainable communities	3.0	6.0
Uncertain		
If one is poor and then goes to live among rich people, one will not feel happy.	9.0	18.0
Total	50.0	100.0

An examination of data relating to whether the student teachers would like to live in sustainable communities or not indicated that about 46 per cent of them would like to live in sustainable communities, but only 24 per cent of them seemed to understand the meaning of sustainable communities. This group mentioned that they would like to live in sustainable communities because sustainable communities have healthful, liveable environments and resources are used efficiently with little or no waste. Another group (22%) associated the concept of sustainable communities with the white South African communities and stated that they would like to live in white communities, but their problem is that they cannot afford to buy expensive houses in white residential areas.

The same misconception was reflected from the answers of 18 per cent of the student teachers. They pointed out that they were not certain whether it was a good idea or not to live in sustainable communities, because if one is poor and then goes to live among rich people, one will not feel happy. About 36 per cent of the student teachers indicated that they would not like to live in sustainable communities, but 30 percent of them could not provide reasons for their answers. About 6 per cent of them mentioned that people sustain injuries in sustainable communities.

Again the student teachers mentioned that they were confused by the English terms. They could not see the difference in meaning between **sustaining** or **maintaining** yourself, **sustaining injuries** and **sustainable communities**.

I understood why the student teachers could not grasp the meaning of the English concepts because I experienced the same situation during my learning process, especially when I was preparing for matric examinations. I used words and terms without understanding their meanings.

From the above analysis it is evident that student teachers who have registered for the three-year National Diploma in Adult Basic Education and Training at the

Peninsula Technikon had serious misconceptions with regard to land resource management as an environmental issue.

Although the students' misconceptions offered an ideal situation for learning and a direction for the present study, I was concerned about the influence these misconceptions could have on my students' practice if no remedial work is done. Furthermore, these misconceptions could hinder any form of action. It is not possible to address environmental problems if sufficient knowledge about those problems has not been acquired. If action is to be taken, there must be adequate acquisition of knowledge and conceptual understanding. Since environmental education for sustainability promotes action needed for environmental protection and improvement, the need for conceptual understanding and development is great.

It is against this background that the diagnosed misconceptions outlined above led to the development of the teaching unit which used environmental education for sustainability as a framework and approach to teaching land resource management. The aim of the teaching unit was to eradicate misconceptions and expose the students to challenging learning experiences so that action towards the solution of problems related to land resource mismanagement could be taken. The details of the teaching unit are presented in Chapter 5.

CHAPTER FIVE

THE TEACHING UNIT

5.1 INTRODUCTION

The teaching unit discussed in this chapter was developed to promote the student teachers' understanding of environmental education for sustainability as an approach to the teaching of land resource management which has been identified as a local environmental issue. The teaching unit was not only developed to demonstrate the use of the process of EEFS that encourages teaching and learning for sustainability, but also to eradicate the misconceptions identified in the previous chapter. The process of EEFS that enables integration of adult literacy and ecological literacy is identified by the criteria in Chapter 2 and in Table 5.1 below.

In this chapter the teaching unit is described as it was developed and taught. In the course of the discussion the methodology that underpins environmental education for sustainability as discussed in Chapter 2, is applied. The organisation of the chapter follows the development of the teaching unit. The first section deals with the conceptual development necessary for the understanding of the issue to be dealt with. Section 2 focuses attention on fieldwork which was used as a teaching strategy both to enhance the students' conceptual development and to involve them through practice in reaching solutions and deciding on a plan of action. Each section also reflects formative evaluation as it occurred throughout the implementation of the teaching unit. The third section evaluates the teaching unit. The implementation of environmental education for sustainability as a means to eradicate misconceptions as well as a teaching approach is evaluated. The manner in which the teaching unit as a whole was evaluated is also described in this chapter.

Table 5.1 The criteria necessary for an accepted environmental approach to education

An accepted environmental approach to education should:

- Examine social, political, economic, historical and biophysical factors and their interrelationships and interdependence;
- be participatory and practice-based. Learning experiences through which people may play a part in making their society a better place in which to live, should be provided;
- be enquiry-based so that current beliefs and practices may be regarded as problematic, as open to self-and peer-analysis and-critique, and as having the potential for improvement through participant research;
- Provide opportunities for critical thinking so that participants can be empowered to make appropriate changes to achieve environmental education objectives they favour;
- Provide opportunities for the development of problem-solving skills necessary for the improvement of the quality and sustainability of natural and social environments;
- Promote conceptualisation and conceptual development rather than factual recall;
- Be collaborative because collective action is usually more productive than individual efforts;
- Be community-based and involve participants in the active investigation and resolution of real-world problems of relevance to the communities in which they live.

(Adapted from Fien 1993)

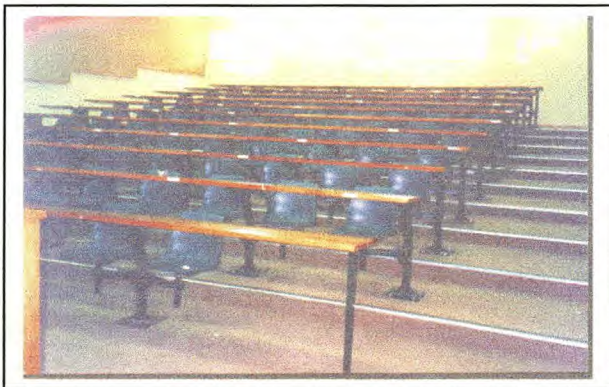
5.2 CONCEPTUAL DEVELOPMENT AS A PRELIMINARY TO ENVIRONMENTAL EDUCATION FOR SUSTAINABILITY

The very fact that the open-ended test revealed such a severe lack of conceptual understanding gave me as a lecturer, direction in terms of the

teaching strategies to be used. I was aware that shared understanding may be acquired through shared experience and active participation in the learning process. The students could have been given definitions for memorisation. This, however, would be contrary to the social constructivist learning theory. I therefore felt that the most appropriate teaching strategies for the students' conceptual development were the following: a co-operative learning exercise, interviews conducted by the students, visioning, a simulation game and role playing. The students were also expected to do activities from their workbook, *Learning about Development*. These teaching strategies were implemented during 2-hour lecturing periods on Tuesdays from 17 February 1998 to 09 June 1998.

5.2.1 A Co-operative Learning Exercise

It is important to note that before the student teachers were given a co-operative learning exercise I had to change the teaching or learning venue, because it was unsuitable for group activities. This venue was a lecture theatre (A8) that had fixed chairs and a pulpit for transmitting knowledge to the students. I used an ordinary classroom in which the chairs could be re-arranged (G22).



Room A8



Room G22

The student teachers were divided into five groups of ten and were given the opportunity to construct their own meaning of the concepts pertaining to the

environment, recycling, the green revolution and intensive arable farming (i.e. intensive crop farming) by using library resources. On the basis of their reading, each group had to bring pictures or draw diagrams of the environment, recycling, the green revolution and intensive arable farming which would act as stimuli to further discussion. At the end of the discussion each group leader used the group's teaching aid to explain the linkages or interrelationships between social, economic, political and biophysical factors of the environment. The features and the processes involved in recycling, the green revolution and intensive arable farming were also explained by means of the groups' teaching aids. Group members had to assist their leader in responding to questions from other groups.

At the end of this discussion I added more information on the above concepts in the form of handouts, diagrams and videos.

The co-operative learning exercise worked well in that the discussions were lively and challenging. The students were responsive and the meaning of the concepts emerged through negotiation which culminated in shared understanding. During this process I was the facilitator. The students who previously had misconceptions with regard to the environment, the green revolution, recycling and intensive arable farming, were given an opportunity to develop an understanding of the concepts which far exceeded their understanding had they simply worked as individuals or had they simply been taught the definitions through the transmission mode. The level of this understanding will become evident as the study progresses. The use of visual aids also enhanced their conceptual understanding, as they were allowed to pose questions, argue and critically evaluate the teaching aids in terms of their applicability and accuracy.

5.2.2. The Simulation Game and Role Playing

It was felt that certain concepts, such as renewable and non-renewable resources, littering and the impact of the increasing human population on land resources, would be better developed through strategies other than the

collaborative group exercise used for the previous concepts. For that reason I decided to use a simulation game and role playing to demonstrate the effect of the increasing human population on land resources. The game involved the staging of a have or have-not situation and was designed to extrapolate the concepts as a result of the interaction in the course of the game. The interaction provided an opportunity for the discussion of possible ways of conserving land and for the discussion of whether land was renewable or non-renewable. The simulation game and role playing also enabled the role players to realise the need to use land resources in a way that would maintain environmental sustainability. Suggestions as to why land resources should be used in a manner that could sustain the environment, and how this could be done, emanated from the various groups.

The use of a simulation game and role playing stimulated the learning of the relationship between overpopulation and land resources. The students were interested and motivated. The game was kept simple and the students entered into its spirit very quickly. They displayed real human feelings that helped to develop empathy. A further benefit of this activity is that the students' involvement in simulation and gaming activities was developed to a high degree.

5.2.3 Interviews

There was uncertainty about the sector of the economy that is most responsible for land pollution in Cape Town. Because the project was based on real problems, I felt that the students needed to be exposed to the sorts of channels and resources within the community that could be utilised in the resolution of such problems. For this reason it was felt that for this particular concept the best source of information would be the municipal authorities. The students made appointments for the interviews with them. In the course of these interviews the students suggested that it would be useful to obtain documentary proof from the municipal authorities about the sector of the economy that is most responsible for land pollution in Cape Town.

This was the first time these student teachers were exposed to this type of data and their research skills were developed. They felt that this was a worthwhile exercise. They expressed their appreciation of the municipal officials' warmth and willingness to be interviewed. They also realised that members of the community could be co-operative if the interviews are conducted in a respectful and peaceful manner. The success of these interviews encouraged the students to become more interested to be involved in community projects.

5.2.4 Visioning

Visioning was considered to be the best strategy for developing the student teachers' conceptual understanding with regard to sustainable communities. I used the Teachers' Guide on Exploring Sustainable Communities. This guide is part of the Teachers' Guides to World Resources series developed by the Environmental Education Project of the World Resources Institute (WRI). The following five lessons were adapted and used.

Lesson 1: Change: A look at your community

The students had to think about how their community had changed over the past forty or fifty years. In addition they had to research the history of their community by interviewing people who had lived there for a long time. The following questions were asked:

- What was your community like on your arrival?
- What changes have you observed?
- What changes would you like to see?

The student teachers had to document the changing face of their community by compiling a list of significant changes on sheets of newsprint pads and by preparing an exhibit on bulletin boards. The focus was on the effects of rural – urban migration that was encouraged by the system of labour migration in

Cape Town. Attention was focused specifically on the development of squatter settlements and increased land pollution in Cape Town's black townships in general and the Langa township in particular. The student teachers had to look for maps and photographs of the township in earlier days and display them.

Lesson 2: Vision: What could your community be?

The student teachers did a brainstorming activity that allowed them to explore the possibility of envisioning and ultimately shaping change in their community. The main problem was the use of public open spaces as dumping grounds for waste, and the possibility of addressing this problem was brainstormed.

Lesson 3: Principles of Sustainability

In this lesson the concept of sustainable development was introduced and applied to the communities, and the students' visions for the future were discussed in the light of the principles of sustainability and refined accordingly. Sustainable development was defined as the integration of the following four principles:

- **Environment** – a healthful, liveable urban environment, where decision-making takes long-term impacts and consequences into account, and efforts are made to prevent problems before they occur.
- **Economy** – sustainable jobs and businesses where decision-making takes the interdependence of economic, environmental and social well-being into account.
- **Equity** – promotion of fair and equal treatment across generations and among different groups in society.
- **Efficiency** – efficient use of energy and resources, with little or no waste.

In groups the students had to brainstorm how to apply these principles to a community and what a sustainable community would look like.

Lesson 4: Moving toward sustainable communities: Five case studies

In this lesson a series of case studies highlighted the ideas and strategies of people from several parts of the world who are taking the first steps toward sustainability for their communities. The case studies were presented in two parts: the first laid out a problem and asked some questions, and the second told how the people in that city addressed the problem. The students were divided into five groups and each group read the problem statements in its case study and then took on the role assigned, and brainstormed solutions. Each group reported on the problems in its case study and presented its proposed solutions to the class. Later they were given the second part of the study and compared their solutions with those of the studies.

Lesson 5: New visions

The students re-examined their community visions through the lens of the principles of sustainability and then incorporated more sustainable options into their visions. They agreed on one common vision statement, namely to make their community healthy, clean and green. They also agreed with the statement that “ a vision without a plan is just a dream, and a plan without a vision is just drudgery, but a vision with a plan can change the world”. The next step was to plan toward achieving their community vision.

Through visioning, the student teachers were able to:

- understand the concept of moving from a goal or vision to a strategic plan of action to accomplish the goal;
- understand how citizens can participate in public life;
- develop a sense of empowerment in terms of their ability to shape the future of their community;
- compare and contrast differing sets of ideas and values by identifying similarities and differences; and
- develop means of organising information by using a common theme.

5.2.5 Activities from the students' workbook

The students were required to plan activities from each chapter of their workbook for their adult learners. Attention was focused on the following two chapters:

Chapter 4 - Sustainable Land Development, and

Chapter 5 - Recycling

The students had to discuss how they could apply chapters 4 and 5 of their workbook to their community. They had to respond to the following three questions with suggestions, description of activities, lesson plans and/or materials for adult learners:

1. What can you do to enable your adult learners to identify the problem?
2. How can you help learners to investigate the causes and effects of the problem?
3. What activities can you plan with your learners to address this problem?

The responses of the groups to these questions were presented, discussed and evaluated.

The responses to the first question included the following: use of codes, e.g. stories about environmental problems such as malnutrition and the importance of starting vegetable garden projects, pictures showing environmental problems such as littering and the benefits of recycling, case studies, videos, films, songs, poems and informative reading texts. These responses made me realise the importance of giving my students an opportunity to be creative. I decided to ask each group to write a story or an informative reading text on a particular environmental problem and develop a worksheet based on the story or reading text to help adult learners understand the story or reading text. Although this was not an easy exercise for my students, they were exposed to the possibility and reality of using environmental topics to teach adult literacy.

These activities provided opportunities for the student teachers to plan how to link theory in their workbooks with practice in their community environments. This was a useful exercise as it prepared the student teachers for the translation of classroom knowledge into environmental action.

The use of pictures, diagrams, simulation games, role playing, interviews, workbooks, group discussions and visioning provided an opportunity for the students' conceptual development through active participation. I did not tell the students what the meaning of the concepts were; instead I acted as a facilitator.

Having reached this stage, the students, in my opinion, were competent and confident enough to move into the next stage, which was education for action.

5.3 EDUCATION FOR ACTION: THE DEVELOPMENT OF FIELDWORK AS AN APPROPRIATE STRATEGY (THE PLANNING PHASE)

The students were aware that the preliminary phase was an introduction to the investigation of a real issue in their local community, that of land pollution in the Langa township. In preparing for the investigation of this problem the students and I formulated a set of procedures which would be adopted to investigate and address the problem on Tuesday 14 July 1998. The students suggested that before anything could be done, a reconnaissance of the area had to be undertaken.

Fieldwork was identified as the most appropriate strategy for the investigation. The students felt that fieldwork should be conducted in order to:

1. Observe and take photographs of land pollution in Langa;
2. Identify places affected by land pollution and mark them on the map of Langa;
3. Investigate the causes and effects of land pollution by means of interviews;

4. Address the problem by taking a joint action with the personnel of Tsoga Environmental Centre and the community of Langa.

What was noteworthy was the high degree of relevance and sophistication of the students' suggestions. I believe that this was made possible because of the students' conceptual development and because of the previous teaching strategies that had been employed.

Since the students were expected to mark land pollution spots on the map, the first planning stage for fieldwork aimed at familiarizing them with the map of the Langa township.

5.3.1 Map Exercises

I divided the students into five groups of ten and distributed the 1:50 000 topographical map – 3318 DCBELLVILLE, amongst them. In addition they had to refer to a 1:100 000 map of the Western Cape and a street plan of Langa.

Using a 1:50 000 topographical map, the student teachers were required to trace and isolate the features listed below using different shadings for each feature.

1. The road from Peninsula Technikon to Langa, i.e. Modderdam road and N2;
2. Railway line and stations from Bellville via Pentech and Langa, to Cape Town;
3. Urban settlements or suburbs along the railway line;
4. The streets of Langa and the Tsoga Environmental Centre;
5. Informal settlements and hostels; and
6. Open spaces and sports fields.

These tracings resulted into the following field maps (Fig. 5.1 and 5.2).

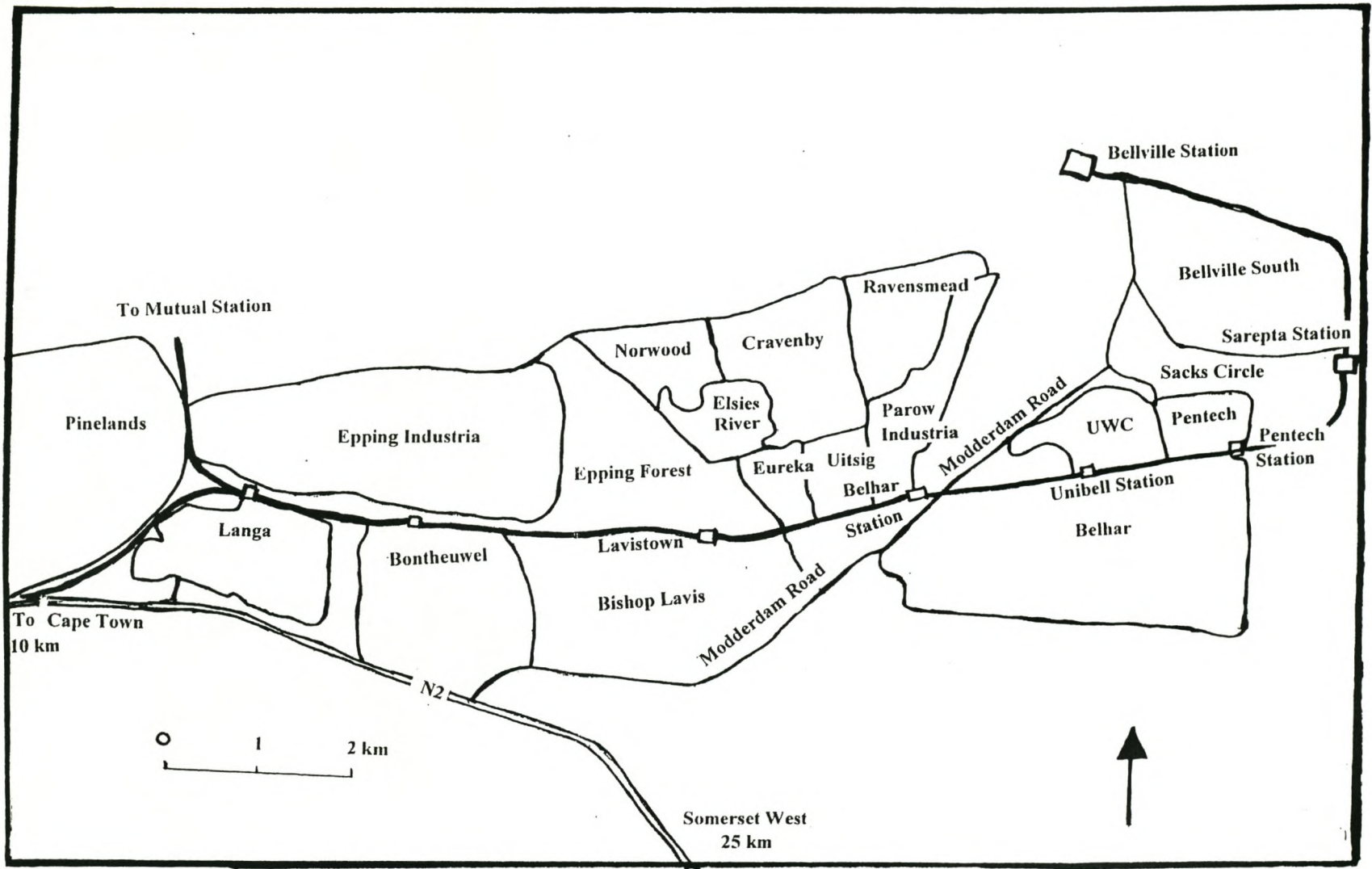


Fig. 5.1

TOPOGRAPHICAL MAP OF BELLVILLE (3318 DC)

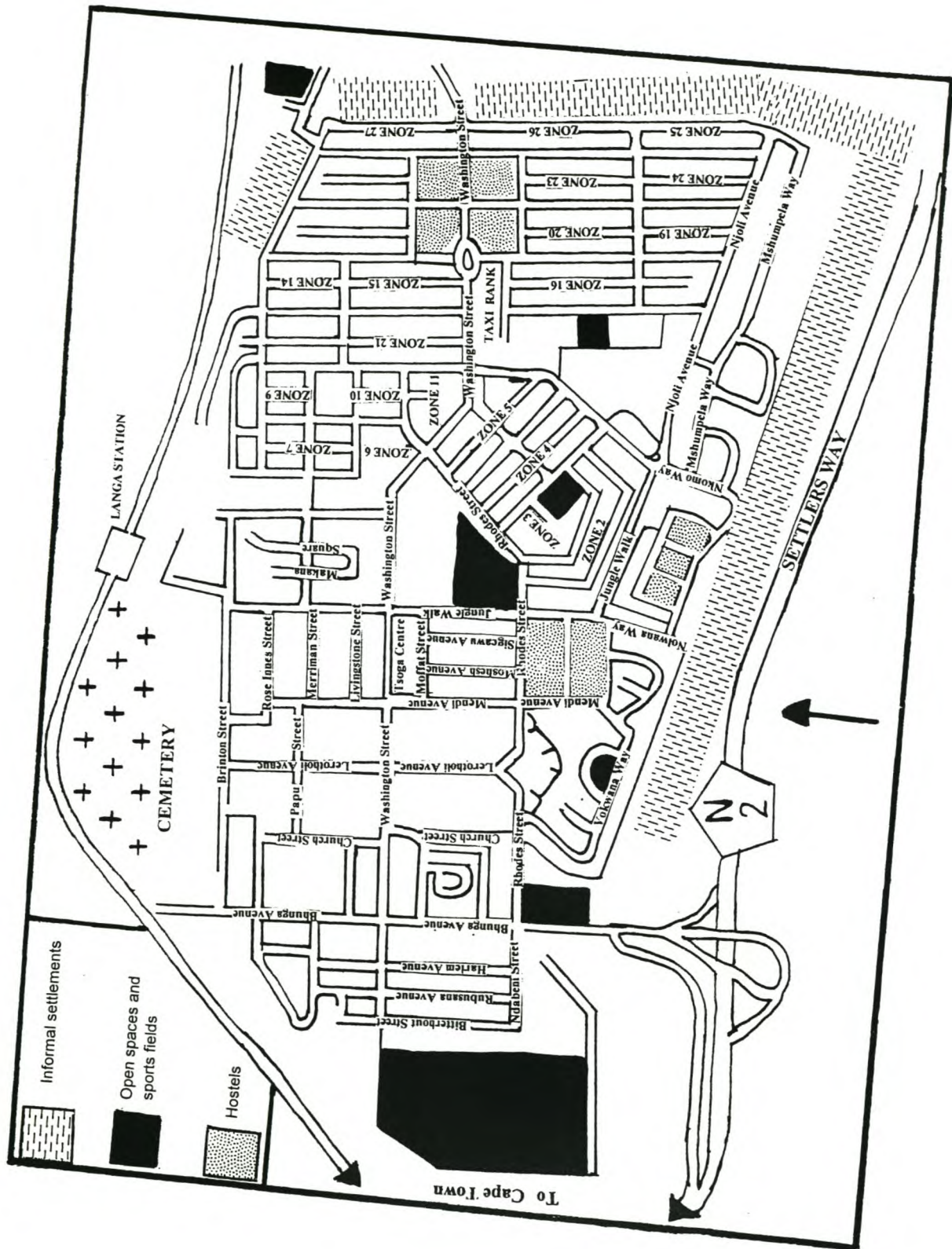


Fig. 5.2

THE STREET PLAN OF LANGA

The student teachers managed to draw the above features and use the maps effectively because of their conceptual development and prior training in map work. The students were active and not only were their cartographic skills developed, but they were actively involved in the planning and selection of sites to be visited. The student teachers' verbal evaluation of this stage also confirmed their understanding of the problem-solving strategy in which they were engaged.

5.3.2 Construction and Development of Worksheets

The second preparatory stage was the development of the worksheets for use in the field on Tuesday 21 July 1998. Each group was required to construct a worksheet on a chart. All the charts with the worksheets were pasted on the chalkboard and the questions were compared. The best questions in terms of appropriateness were selected from the five groups and modified. In other words, the worksheets were discussed, analysed and evaluated. One student teacher wrote the refined questions on a separate chart. After a long discussion it was decided to change the format of the worksheet (Appendix 2).

The construction, development and use of worksheets developed the students' communication and critical thinking skills. The researcher swapped roles and acted as a co-learner instead of being the facilitator.

5.3.3 Structured Interviews

Since the student teachers had to investigate the causes and effects of land pollution, it was necessary for them to be familiar with the questions for the interviews. Working in groups the student teachers were required to write relevant and appropriate questions on newsprint pads which were pasted on the chalkboard for discussion, analysis and evaluation. This took place on Tuesday 28 July 1998. The final product is included in this study as Appendix 3. This exercise developed the students' questioning and critical thinking skills.

During the planning phase, which included the use of interviews, the map exercise and the development of worksheets, I noted the following aspects which need highlighting:

1. The students' level of competence within a set of participatory teaching strategies was raised. The students developed as critical thinkers and problem-solvers.
2. A wide range of skills and values was developed. Not only cognitive skills were developed, but also the following:
 - (a) Geographical skills such as cartography;
 - (b) Environmental skills, e.g. problem-solving;
 - (c) Social skills, e.g. team work and leadership skills.

Providing the opportunities described above for the students in order to develop their conceptual understanding through active participation in the learning process, proved to be not only worthwhile, but also exciting. I was surprised and delighted by the extent and depth of the students' conceptual and skills development.

These series of activities highlighted the value of the role of the lecturer as a facilitator and a co-learner and emphasised the necessity of broadening the spectrum of pedagogical approaches beyond the transmission mode. A further benefit to me was the realisation that learners, given the opportunities, are capable of taking responsibility for their own learning.

Two further points need to be mentioned.

- The student teachers were exposed to a real learning and teaching situation which encapsulated a critical thinking approach within their peer group.
- Each student teacher was exposed to the implementation of a variety of

Stellenbosch University <http://scholar.sun.ac.za>
teaching strategies in practice. All of these strategies were participatory and collaborative and thus central to Fien's notion of an approach to education for the environment (1993).

5.3.4 Fieldwork Phase

The implementation of the fieldwork units was determined by the students' suggestions on why fieldwork should be undertaken during the pre-fieldwork phase. It was decided that fieldwork should be conducted in the following three phases.

Phase 1: A Reconnaissance of Langa Township

The first phase was an exploratory trip of Langa by the student teachers and myself. The Tsoga Environmental Centre was visited on Tuesday 04 August 1998. Tsoga, which means "wake up" in Sotho, is a community-based organisation which aims at promoting a new perspective which demystifies the concept of environment in disadvantaged communities. It was established in 1994. The aims of Tsoga are achieved through a holistic, issue-based education and training approach that is relevant, gender sensitive and action-orientated. Tsoga Environmental Resource Centre initiates and co-ordinates a variety of programmes in different areas of environment and development (Appendix 4).

The students were welcomed by the staff of Tsoga and were informed about the history, and the aims and objectives of Tsoga.



Tsoga Environmental Resource Centre



Students at Tsoga Environmental Centre

The staff of Tsoga guided the tour.



Students' tour guided by Tsoga staff

They introduced the students to the following community projects.

1. Community Development and Outreach

This project is the backbone of Tsoga's existence and is divided into the following five categories:

- Clean and Green
- Green Parks programme,
- Schools Programme,
- Food Gardening programme, and
- Nursery programme.

2. Youth Development and Training Project

The youth programme is divided into two sections. The first section focuses on training and empowerment. The youth members formed the Tsoga Enviro Club. They participate in team building, leadership and trust building activities, and attend workshops and youth conferences. The second section focuses on

skills development. This section assists in waste removal from the township, and the recycling programme is administered by the youth.

3. Literacy Project

This programme is not just about reading and writing only; it also involves environmental education and access to the Langa community library. Adult learners are exposed to relevant areas of environmental education and are empowered with food gardening skills for income generation and for their own consumption.

During the tour the students took photographs and used their maps to mark the areas affected by land pollution. They also expressed their appreciation and need for being involved in community-based environmental projects. They were given an opportunity by Tsoga authorities to go back to Peninsula Technikon and plan how they could be involved in some of the projects.

Phase 2: Investigating Causes and Effects of Land Pollution in Langa

The second phase involved a visit to the hostels and to the Joe Slovo squatter settlements in Langa on Tuesday 11 August 1998. The students used structured interviews to investigate the causes and effects of land pollution. They also observed and recorded on the worksheets the amount and type of waste produced in Langa (Appendix 2). From the responses it became evident that littering was the most common form of land pollution in Langa, and it occurred predominantly around squatter settlements and hostels, which were initially erected for the male labour migrants.

The effects were a variety of diseases, especially TB. The students were also informed about a published report on the high incidence of TB in Langa. Some of the respondents expressed the desire to take voluntary action together with the students and Tsoga staff, but some mentioned that they would like to be paid, because they were not employed.

The fieldwork experiences provided the data and the incentives that formed the basis on which the students could develop their plan of action to address the problem of land pollution in Langa. The field experiences had the following benefits:

1. The student teachers could use the data gathering tools and could analyse and reflect on the data. This was confirmed by the student teachers themselves when they stated that during this phase they were so used to interviewing that they took less time per person in the Joe Slovo squatter settlement than in the hostels where they first started.
2. They could work co-operatively and collaboratively.
3. In the field the student teachers showed great enthusiasm and excitement. The greatest enthusiasm was evoked by the use of maps which revealed the student teachers' ability to make decisions as they had to associate and locate the real land pollution spots on the maps.
4. They could record data on the worksheets accurately. Each group discussed the findings before recording them.
4. They understood the use of fieldwork as a teaching strategy
5. The community showed appreciation and willingness to work with the students. They regarded the students involvement in their projects as an encouragement that added more value to their projects.

The students were exposed to an appropriate strategy for the gathering of information which could lead to action and make it possible to find solutions to real problems. Thus the students were not doing a meaningless exercise, but were using fieldwork as a vehicle for the resolution of problems rather than being an end in itself. This emphasises the way in which the adoption of environmental education for sustainability as an approach to teaching is able to shift the emphasis from teaching **about** and **in** the environment to teaching **for** the environment.

Phase 3: Development and Implementation of an Action Plan

This phase is divided into two sections. The first section is the development of a plan of action in the classroom at Peninsula Technikon on Tuesday, 18 August 1998. This section can be regarded as the post-fieldwork phase, as the student teachers reflected on the findings of phases 1 and 2.

(a) Development of an Action Plan

The student teachers had to decide on the community projects in which they would like to be involved. They agreed on one problem, namely litter and garbage in public open spaces. Having identified the problem, the student teachers discussed a plan of action. The following problem-solving strategies emerged from their group discussions:

1. Conduct litter clean-ups
2. Create parks in public open spaces
3. Fence public open spaces and convert them into community gardens
4. Improve waste management
5. Educate the community.

From the above suggestions it became clear that the student teachers would be involved in the following five community projects:

1. Litter clean-ups especially in public open spaces
2. Green Parks Programme
3. Food Gardening Programme
4. Recycling Project
5. Literacy Project that integrates reading and writing with environmental education.

It was decided that the groups should take turns and be involved in all five programmes. Since there were five groups of ten and five projects, it was easy to draw up the timetable for five days. It was further decided that only

It was planned that the following timetable would be used.

DAY	DATE	PROJECT	GROUP
TUESDAY	25 – 08 – 98	Litter clean-ups Green Parks Programme Food Gardening Programme Recycling Project Literacy Project	1 2 3 4 5
TUESDAY	01 – 09 – 98	Litter clean-ups Green Parks Programme Food Gardening Programme Recycling Project Literacy Project	2 3 4 5 1
TUESDAY	08 – 09 – 98	Litter clean-ups Green Parks Programme Food Gardening Programme Recycling Project Literacy Project	3 4 5 1 2
TUESDAY	15 – 09 – 98	Litter clean-ups Green Parks Programme Food Gardening Programme Recycling Project Literacy Project	4 5 1 2 3
TUESDAY	22 – 09 – 98	Litter clean-ups Green Parks Programme Food Gardening Programme Recycling Project Literacy Project	5 1 2 3 4

Five full days were allocated for each project, i.e. each project leader would work with 10 students for 5 days and each group would have an opportunity to participate in each project for the whole day. I discussed the timetable with the project leaders who approved it.

The fact that the student teachers could develop a plan of action and its timetable is an indication of the fact that they understood what is meant by environmental education for sustainability. The planning skills, problem-solving strategies, action and community involvement in the protection and improvement of the environment, discussed above, is the focus of environmental education for sustainability – the key to addressing environmental problems. A plan of action, therefore, was consonant with the socially critical learning theory which has gained popularity in recent years.

The second section of phase 3 is the implementation of the above action plan on the suggested dates.

(b) Implementation of an Action Plan

The following photographs show the involvement and active participation of the student teachers in community projects.



Involvement of students in the Parks programme



Students involved in recycling project



Students involved in community gardening, cleaning campaigns and literacy programmes.



The involvement of the students in these community projects provided the students with practical experiences and established a good relationship with the community.

5.4 SUMMATIVE EVALUATION OF THE TEACHING UNIT

The focus of evaluation in the present study was the worth of the teaching unit in terms of using an accepted environmental approach and the worth of this approach as a teaching approach. The student teachers and I evaluated the teaching unit. Firstly, there was self-evaluation which was effected through reflection. I recorded everything that was deemed relevant to the purpose of the study in my journal and reflected on it. The main emphasis was placed on interpretation of the behaviour and responses of the student teachers during the whole interaction process.

Secondly, there was learner evaluation. The student teachers were required to evaluate each and every phase of the teaching unit verbally. In other words, evaluation was formative and it took place as an on-going process through the teaching unit. In the end the student teachers were required to evaluate the whole teaching unit by making use of evaluation forms (Appendix 5).

The rest of this chapter presents the evaluation of the teaching unit, in terms of its use of environmental education for sustainability as an approach, by the student teachers and myself. Attention is also focused on my evaluation of this approach as a teaching approach.

5.4.1 Evaluation by the student teachers

The student teachers' evaluation of the teaching unit is reflected in Table 5.2 below.

TABLE 5.2 STUDENT TEACHERS' EVALUATION OF THE USE OF ENVIRONMENTAL EDUCATION FOR SUSTAINABILITY AS AN APPROACH IN THE TEACHING UNIT

(Scores in percentages)

PART ONE:	1	2	3	4	5
1. The extent to which the teaching unit gave you an opportunity to:					
(a) Participate actively from the beginning to the end of the unit				12	78
(b) Develop an informed concern for the environment			6	28	66
(c) Develop lifestyles for sustainable use of land resources			8	19	73
(d) Develop skills			6	8	86
(e) Explore and address an environmental problem				12	88
(f) Consider both social as well as biophysical factors			6	80	14
(g) To interact with the community in the solution of environmental problems			2	10	88
2. Shift in emphasis of the unit from:					
(a) Top-down messages to local co-operative and participatory action			4	14	82
(b) Nature experience approaches to action learning			8	12	80
(c) Conservation of natural resources to environmental sustainability			16	74	10
3. The extent to which the teaching unit:				14	86
(a) Improved your conceptual understanding			12	10	78
(b) Enhanced your understanding of environmental education for sustainability as an approach					

TABLE 5.2

(CONTINUED)
(Scores in percentages)

PART TWO:		1	2	3	4	5
1.	Part of the fieldwork (preparation, actual fieldwork and follow-up)					
	Found:					
1.1	Most interesting		10	72	18	
1.2	Most effective		32	68		
1.3	Most boring	100				
1.4	Most rewarding			90	10	
1.5	Easiest to understand			100		
1.6	Most practical		02	88	10	
1.7	Hardest to understand	100				
1.8	Most difficult?	36	64			

KEY:**PART ONE:**

- 1 - Very weak
- 2 - Weak
- 3 - Satisfactory
- 4 - Good
- 5 - Excellent

PART TWO:

- 1 - None
- 2 - Preparation
- 3 - Field excursion
- 4 - Follow up

More than 75 per cent of the student teachers indicated that participation from the beginning to the end of the teaching unit was excellent. It is worth noting that all the student teachers felt that the teaching unit had helped them to develop lifestyles for sustainable use of land resources and an informed concern for the environment.

All the student teachers pointed out that the teaching unit had helped them to develop the following skills to a great extent: observation, identification, recording, associating, communication, decision-making and problem-solving.

The opportunity provided by the teaching unit to explore and address environmental issues was also described as excellent by more than 85 per cent of the student teachers. It is important to note that the same percentage of the student teachers described the opportunity given by the teaching unit to interact with other people in addressing environmental problems as excellent. These responses show that it is not enough to explore environmental issues. After the issues have been explored they should be addressed, as the teaching unit provided the opportunity to do so.

The fact that more than 80 per cent of the student teachers described the consideration of both social and biophysical factors in the teaching unit as good, reflected a shift of the teaching unit from nature experience approaches to broader experiential or action learning. This shift was confirmed by about 82 per cent of the student teachers who described the shift towards action learning and local co-operative and participatory action as excellent. The extent to which the teaching unit promoted environmental sustainability was described as good by 74 per cent of the student teachers.

It is significant to note that all the student teachers felt that the teaching unit enhanced their understanding of environmental education for sustainability as an approach to teaching, which was the main aim of this study. Furthermore, about 85 per cent of them maintained that the teaching unit was excellent in helping them to improve their conceptual understanding.

All the student teachers stated that fieldwork was interesting to them and more than 70 per cent of them regarded the actual fieldwork as most interesting. The majority of the student teachers pointed out that the fieldwork was most effective, most rewarding, most practical and easiest to understand.

Again it is worth noting that all the student teachers found no part of the teaching unit boring or hard to understand. More than 60 per cent of them, however, felt that the preparation was difficult as they were expected to draw accurate maps and to develop worksheets and interview schedules before

5.4.2 Researcher's evaluation

The evaluation of the teaching unit in terms of using the currently accepted environmental approach will not be repeated in this section, since it has already been presented in different phases of the teaching unit in this chapter (5.3.1; 5.3.2; 5.3.3; 5.3.4). The following section focuses on the researcher's evaluation of environmental education for sustainability as a teaching approach.

Evaluation of Environmental Education For Sustainability as a Teaching Strategy

After I have been engaged in processes of environmental education for sustainability, I was compelled to evaluate it in practice as a teaching approach. I identified the following strengths and weaknesses associated with this approach to teaching.

Strengths

Environmental education for sustainability shows the following strong points:

- encouraging active participation on the part of the learners. Active learning results in learning with understanding.
- allowing for the use of a variety of learner-centred teaching strategies including fieldwork, games and simulation, model building and visioning. The use of these teaching strategies generates enthusiasm for learning.
- promoting conceptual understanding needed for the resolution of real-world problems.

- developing communication skills, skills needed for fieldwork activities, and critical thinking, by providing opportunities for dialogue, encounter and reflection (O'Donoghue, 1993).
- allowing the teacher or lecturer to swap roles. For example, in the initial stage before the open-ended test was administered, my role was that of a lecturer and as transmitter of knowledge. When the students were engaged in co-operative learning exercises, I acted as a facilitator, but in the construction and development of worksheets, my role was that of a co-learner.
- providing opportunities for critical thinking and evaluation.
- promoting societal investigation and resolution of local environmental problems.

In general, environmental education for sustainability as process of change improves the quality of both teaching and learning. It is similar to an outcomes-based approach, hence it achieves the aims of Curriculum 2005.

Weaknesses

The following is a perceived disadvantage of environmental education for sustainability.

It is time-consuming, both in design and in use. The time factor was one of the problems that I encountered. This approach therefore highlights the need for the reduction of the course content and emphasis on skills development.

It has been demonstrated in this chapter that if the students are given opportunities for critical thinking and problem-solving, they are capable of taking responsibility for their own learning. It has also been emphasised that there must be a shift from the transmission style of teaching. A variety of

participatory teaching strategies that develop conceptual understanding and skills necessary for sustainable living have to be employed. This chapter also stresses the importance of using field research as a means toward the resolution of environmental problems, and not as a way of inculcating “appreciation” of the environment, as used to be the case in the teaching of environmental sciences. Finally, it has been demonstrated that the involvement of the students in community-based environmental projects is an inspiration to the community and it bridges the gap which used to exist between the community and educational centres or institutions of higher learning.

The extent to which the teaching unit improved the student teachers’ conceptual understanding was demonstrated by the students’ ability to teach the concepts and to use environmental education for sustainability as a teaching approach during teaching practice sessions. This ability is reflected in the students’ teaching practice stories which are portrayed in Chapter 6.

REFLECTING ON THE STUDENT TEACHERS' PRACTICE

6.1 INTRODUCTION

The results of the open-ended test, discussed in Chapter 4, revealed the range and level of the student teachers' misconceptions with regard to the concepts that were identified as central to an understanding of land resource management as an environmental issue. Chapter 5 described an attempt to address the identified misconceptions through engaging in processes of environmental education for sustainable communities as described in Chapter 2. The aim of the current chapter is to reflect on the student teachers' practice. The interviews and observations of students at work in the community were not only aimed at providing feedback for the purposes of future programme design, but also at monitoring what students did with their learning experiences regarding environmental education for sustainability as a theme in a different teaching situation (adult literacy classes). The student teachers were asked to introduce themselves and to describe how they teach their learners.

The first section focuses on the teaching practice stories narrated by twelve third-year student teachers who are doing a national diploma in ABET at Peninsula Technikon. The second section examines these stories in the light of the students' understanding of environmental concepts and Environmental Education for Sustainability as an approach to learning and teaching.

6.2 TEACHING PRACTICE STORIES OF TWELVE STUDENT TEACHERS

The first story is narrated by Mirriam Mangali who is from Peddie in the Eastern Cape. Mirriam is employed as an adult educator at Mzamomhle Adult Learning Centre in Phillipi.



Mirriam Mangali at Mzamomhle Adult Learning Centre in Phillipi

Since all my learners stay in squatter camps where littering is a problem, I use topics that are relevant to their lives. For example, I encourage them to discuss the importance of keeping their environment clean and ways of preventing land pollution. I collect pictures of polluted areas and pictures of green and clean places and ask them in which area they would like to live in. They always choose green and clean places. I encourage them to have vision, and to discuss in their groups how they can make their polluted area look like the one they have chosen. After group presentations I encourage them to start recycling projects.

One day when we were discussing about the advantages of recycling one of my learners told us that at his workplace he had seen a cardboard going through a machine and something else came out of the machine. He did not realise that what was actually taking place, was recycling. His classmates were interested to see what he was talking about. The class is planning to visit his workplace in Milnerton. I am busy with the arrangements for the outing.

From the discussions of the topics I let my learners construct simple sentences such as:

I like to live in a green and clean place.

I must collect paper and plastic.

I must sell paper and plastic so that I can get money, and so on.

These sentences become their reading text. I also let them choose difficult words from the reading text and they must then try to explain the meaning of these words. Then I ask questions to see if all of them understood the reading text. After that they practise to write the sentences.

Pumla Mgwebeni is from Umtata in the Eastern Cape. She is doing her teaching practice at Luyolo Adult Learning Centre in Gugulethu.



Phumla Mgwebeni at Luyolo Adult Learning Centre in Gugulethu.

When I teach my adult learners how to communicate in English, I use the problem-posing and problem-solving approaches. I first group my learners and then plan activities that enable them to identify local environmental problems. For example, I use codes that encourage my learners to think critically and identify environmental problems. I also plan activities that allow my learners to investigate the causes and effects of the problem. I always stress the fact that it is not enough to identify local environmental problems. The important thing is to come up with an action plan and to try and address the problem. I therefore plan activities that enable my learners to draw up an action plan and let them discuss in their groups how they will implement their action plans. The action plans become their reading texts.

Nomthandazo Silo is from Lady Frere in the Eastern Cape. She is doing teaching practice at Lukhanyo Adult Learning Centre in Bellville South.



**Nomthandazo Silo at Lukhanyo
Adult Learning Centre in
Bellville South**

I write stories about what is happening in other places. For example, I wrote a simple story about community gardening in Langa. I wrote this story from what I heard when we were involved in a community garden project in Langa in 1998. The story is about a woman called Nosicelo who is from the Eastern Cape. Nosicelo is not employed. She stays with her husband in a hostel called New Flats. Nosicelo heard that there was a group of unemployed women who were cultivating crops at Tsoga environmental centre. She joined this group of women. This helped her, because she no longer needed to buy vegetables. After selling their vegetables this group of women opened a bank account. They are now planning to open a laundrette and get more money.

After reading a story I give my adult learners a chance to read. Then they try to explain difficult words, answer questions that are based on the text and try to construct and write sentences.

The stories stimulate oral discussions in class. For example, from Nosicelo's story my learners discussed how they can also start a garden project and generate money. I also use short and simple stories about crime, violence, improving living conditions, housing, unemployment, AIDS and TB, because the environment includes biophysical as well as social problems.

Barbara Manona is from Zwelitsha in the Eastern Cape. She has been employed as an adult educator since 1994 at Duens (the bakery), Consol Glass, Metrorail and Mpumalanga Adult Learning Centre in Khayelitsha.



Barbara Manona at Mpumalanga Adult Learning Centre in Khayelitsha

I plan outcomes-based activities for my learners. I use the environment as the phase organiser when teaching literacy, numeracy and lifeskills. Literacy, numeracy and life skills are known as learning programmes. I plan different activities for different learning programmes. For example, if I use **water wastage** as a programme organiser, I let my learners investigate **for literacy** local stories to find out how water was used and stored in different ways in the past. If my learners come up with these stories, it means that they are able to use language for learning, which is specific outcome number six for Literacy and Language Communication.

For numeracy I let my learners measure for one week how much water is wasted at one tap during break times at the learning centre by placing a bucket under the tap. I give the learners an opportunity to report on their findings. Once my learners do different measuring activities, I know that they are able to measure with confidence and competence in a variety of ways, and that is specific outcome number five of Mathematical Literacy and Mathematics. If they report on their findings, it means that they are able to use language for learning again.

For lifeskills I let my learners develop a plan of action to stop water wastage at the learning centre during break times. Afterwards they do presentations of their action plans. If my learners develop an action plan to stop water wastage, that means they are able to make sound judgements about the development, utilisation and management of resources, and that is specific outcome number four for Human and Social Sciences. If they do presentations of their action plans, it again means they are able to use language for learning.

Matsebetso Lehata is from Mount Fletcher in the Eastern Cape. She is doing teaching practice at Luyolo Adult Learning Centre in Gugulethu.

**Matsebetso Lehata at Luyolo
Adult Learning Centre in
Gugulethu.**



After doing a needs analysis for my learners, I found that most of them wanted me to teach them English Communication, because they have to use English at their workplaces. I record stories and useful programmes, like Ecovision from the television, and bring the tape recorder to class. My learners listen to the stories. Then they discuss in their groups what they have heard. The spokesperson from each group reports to the whole class. After my learners have constructed sentences on the story, I write the sentences on the chalkboard. I ask them to choose difficult words. After these difficult words have been explained by those who can, I let each one of them practise to write the sentences.

Sonwabo Bongoza is from Butterworth in the Eastern Cape. He is teaching at Imizamo Yethu Adult Learning Centre in Khayelitsha.

I use both the classroom and the environment for teaching and learning. I have realised that outdoor activities are important, as they make learning interesting. I experienced this when we were involved in community projects at Tsoga in Langa last year. It was my first time to learn outside the classroom. I understood better by seeing and doing things in the environment.



Sonwabo Bongoza at Imizamo Yethu Adult Learning Centre in Khayelitsha

Before the outings took place we were given a test to write. It was difficult for me to explain or define some of the concepts, but after being involved in greening, gardening and recycling projects, I could understand the meaning of the terms, such as green revolution, recycling, intensive arable farming and so on.

I would like my learners to experience what I have experienced. I would like them to enjoy learning. I would like them to learn with understanding as I did.

Ntombizohlanga Magoda is from Willowvale in the Eastern Cape. She is employed as an adult educator at Zanokhanyo Adult Learning Centre in Kraaifontein.

I listen to my learners' experiences. I ask my learners to share their experiences in class and I use these experiences as a starting point and build my lessons on them. The learners discuss these experiences and form

sentences from them. I also develop worksheets and let my learners observe, record and report. For example, they observed the amount of littering on the way from their homes to the learning centre. They classified and recorded the contents of their rubbish bins as glass, paper, plastic, metal and organic. Then they reported their findings in class. From their findings they discussed a plan of action.

**Ntombizohlanga Magoda at
Zanokhanyo Adult Learning Centre
in Kraaifontein**



I also use littering as a programme organiser for numeracy teaching. For example, my learners learn to count the number of plastic bottles, cartons, used globes or glass jars. They also draw pictures and relate these pictures to number symbols and words. They write number symbols and words next to the pictures. For example:



= 1 = one



= 2 = two

They also pick up different objects, e.g. stones, from the litter and then trace the shapes of these objects in their drawing books. For example:



circle



triangle



square

Nomhlobo Eurenda Myo is from Oudtshoorn in the Western Cape. She is doing teaching practice at African Products in Bellville.



**Eurenda Myo
at African
Products in
Bellville**

I use visual aids such as charts, flash cards and pictures. I always put the flash cards in one box so that the learners can take them out and arrange them correctly. Sometimes I ask my learners to put the flash cards in appropriate spaces on the chart. I make sure that my learners understand what is in the picture. I encourage them to look at the picture, describe what is happening and identify an environmental or developmental problem. I use these visual aids when I teach literacy, numeracy and life skills. I also take my learners outside and teach them the road signs. In other words my learners learn by seeing and doing things. If they do not do well I reflect on my own teaching and plan to do things differently until they do well.

Monelwa Jiya is from Maclear in the Eastern Cape. She is doing teaching practice at Nolungile Adult Learning Centre in Khayelitsha.



**Monelwa Jiya
at Nolungile
Adult Learning
Centre in
Khayelitsha**

I encourage my learners to identify and discuss their local environmental problems. They also discuss how they can address these problems. I also encourage them to share with other members of the community what they have learned at the learning centre. I have learnt that co-operation between centres of learning and communities is good. It leads to joint intervention in the solution of environmental or developmental problems. For example, when we were working with the community at Tsoga in Langa last year, the people were impressed and encouraged to see the students from Peninsula Technikon. They stated that they did not know that what they were doing, was appreciated. They thought that it was a low-class activity which was meant for uneducated people.

Constance Lutango is from Cala in the Eastern Cape. She is doing teaching practice at St Francis Adult Learning Centre in Langa.



**Constance
Lutango at St
Francis Adult
Learning
Centre in
Langa**

I use the grounds of the learning centre for learning, because I believe that learning does not end within the four walls of the classroom. I believe that our

own surroundings can provide meaningful and realistic learning opportunities.

I use a vegetable garden to teach literacy, numeracy and life skills, which are the three learning programmes of the foundation phase.

When teaching literacy, I let my learners observe and describe what they see in the garden. They describe the types of vegetables, the size of the plots, the number of footpaths, the location of the garden and how it is protected or maintained. They form sentences which become their reading text. They practise how to read and write these sentences.

When I teach numeracy, I give my learners an opportunity to count the number of plots and relate these plots to number symbols and words. I ask them to draw *one* plot and next to the diagram of the plot they write *one* in numbers and *one* in words. If they draw *two* plots, they write *two* in numbers and in words next to the diagram. I also ask my learners to describe the shapes of the various objects they see in the garden as *circles*, *triangles* and *squares*.

When I teach lifeskills, I show my learners pictures of people who suffer from TB or malnutrition. I ask them to draw up a plan of action or to discuss ways of preventing TB or malnutrition. My learners have always mentioned fresh vegetables as a solution. I encourage them to grow their own vegetables for their families.

Cynthia Nomalizo Fetsha is from Mdantsane in East London. She is doing teaching practice at Eskom in Bellville.

My belief is in group activities. Every time I go into the classroom, I ask my learners to re-arrange their desks and form groups. I always encourage them to discuss topics that are useful and relevant to their lives, such as personal hygiene, AIDS, nutrition and water pollution. Then they select a spokesperson from each group who reports on what they have discussed.

**Cynthia Fetsha
at Eskom in
Bellville.**



I believe that presentations build the learners' confidence and improve communication skills. My learners are now used to group work. They like it. At first they were shy and reluctant to participate. I also encourage active participation in addressing developmental and environmental problems.

Temba Bebe is from Umtata in the Eastern Cape. He is doing teaching practice at St Francis Adult Learning Centre in Langa.



**Themba Bebe at
St Francis Adult
Learning Centre
in Langa**

I believe in group work. I always ask my learners to form groups and to discuss topics that are relevant to their lives. I also use environmental topics such as littering and recycling to teach them literacy. They first discuss the causes and effects of littering. Then I give them a reading text on the problem

of littering. They practise how to read. After that I give my learners an opportunity to choose and explain difficult words. To test their understanding of the reading text, I use a worksheet with a list of questions.

Sometimes I ask my learners to come up with an action plan in order to address a particular environmental problem. The aim by doing this is to encourage the learners to do things for themselves. If they manage to identify an environmental problem, I want them to come up with practical solutions. I believe that the problem-posing or problem-solving approach is the best for adult learners.

6.2 ANALYSIS OF TEACHING PRACTICE STORIES

The following section examines the above teaching practice stories in terms of the development of the student teachers' conceptual understanding and their understanding of environmental education for sustainability as an approach which can be used to meet the needs of outcomes-based education.

6.2.1 The development of the student teachers' conceptual understanding

From the teaching practice stories narrated above, it is evident that the student teachers' conceptual understanding was developed by the teaching unit. Sonwabo Bongoza states that he understood concepts, such as green revolution, recycling and intensive arable farming, better after having been involved in greening, community gardening and recycling projects in Langa. He also claims that he learnt with understanding by seeing and doing things.

Although Sonwabo did not mention all the concepts he understood, his story highlights the importance of practical activities in conceptual development. Practical activities of the teaching unit enabled him to realise that the land can be fertilised and used again. His involvement in greening and gardening projects made him realise that the green revolution is different from the French or the Industrial revolution.

After the student teachers had learnt how to move from vision to reality through the use of visioning exercises and action planning in the teaching unit, they understood the meaning of sustainable communities better. They realised the importance of collaborative action in moving towards sustainable communities. Monelwa Jiya's story reflects this point clearly. Cynthia Fetsha also encourages active participation in environmental and developmental projects.

Nomtandazo Silo is able to write simple stories on environmental topics and use them as reading texts for her learners. These topics include community gardening in Langa, crime, violence, AIDS and TB. She points out that **the environment** includes bio-physical as well as social problems. She regards the environment as interacting patterns of political, social and economic factors. It is important to note that Nomtandazo was one of the student teachers who regarded the environment as bio-physical surroundings only before the implementation of the teaching unit (Chapter 4).

Themba Bebe uses littering as a reading text for his learners. Since the use of relevant topics to the learners' lives is emphasised in adult learning, Themba chose littering because he realised that it is **the most common form of land pollution in the residential areas of Cape Town**, especially in the former black townships. His choice of using littering reflects his understanding of **the negative human impact on land resources**. He is also aware that **the residential areas are most responsible for land pollution in Cape Town**. The above interpretation also applies to Ntombizohlanga Magoda's story. Ntombizohlanga does not only use littering as a reading text, but she also uses littering as a programme organiser for numeracy teaching.

Both Temba Bebe and Mirriam Mangali are able to facilitate group discussions about **recycling**. By being involved in recycling projects they not only show a much better understanding of the concept, but they have also come to realise that recycling is necessary to address the problem of land pollution in Cape Town and that it saves money as materials are re-used.

6.2.2 The students' understanding of Environmental Education for Sustainability as a focus and an approach to learning and teaching

From the student teachers' stories it is apparent that they understand that sustainability itself, and some of its constituent principles (recycling, resource use, self-sufficiency, etc.), are excellent *focus points* for adult teaching and learning. The approach we followed in EEFS also seems to have been embraced by the students as an effective *approach* to learning and teaching. The following section highlights how they use sustainability as a focus and an approach for adult teaching and learning.

6.2.2.1 Sustainability as a focus for adult teaching and learning

Interesting is the fact that, while my students are addressing the problem of adult illiteracy in their practice, an important aspect is the obvious development of ecological literacy that is recommended by Orr (1992). Orr (1992) feels strongly that ecological literacy should be developed so that the people can be able to participate in the transition to sustainability. According to him, ecological literacy implies a broad understanding of how people and societies relate to each other and to natural systems, and how they might do so sustainably. He further states that the ecologically literate person has the knowledge necessary to comprehend interrelatedness, and an attitude of care or stewardship. Such a person would also have the practical competence required to act on the basis of knowledge and feeling. From Orr's argument (1992: 86) it is evident that competence can only be derived from the experience of doing and the mastery of "practice" and that knowing, caring and practical competence constitute the basis of ecological literacy.

In an attempt to develop ecological literacy the student teachers use environmental topics such as littering, water wastage, vegetable garden and recycling for developing communication, reading, critical thinking and writing skills in their adult learners. It is important to note that the student teachers use relevant environmental topics to the learners' lives.

6.2.2.2 Sustainability as process of change in adult teaching and learning

Another interesting aspect seems to be the emergence of the elements of socially critical education when my students use the approach we follow in EEFS. The students may have experienced the benefits of education that empowered them to become actively involved in managing their own environment, and seemingly wanted their learners to experience the same emancipation from powerlessness.

Pumla and Temba state that they use the problem-posing and problem-solving approaches which encourage their learners not only to identify local environmental problems, but also to investigate their causes and effects. They also encourage the learners to develop and implement an action plan. Temba emphasises that he would like to see his learners doing things for themselves.

Miriam uses a visioning approach by bringing pictures of polluted and clean areas and letting her learners choose the area of their dreams. From this the learners realise the need to make their own polluted areas look clean.

The student teachers realise the importance of outdoor activities in the learning process. Sonwabo uses both the classroom and the environment for teaching and learning. Nomhlobo sometimes takes her learners outside and teach them the road signs. Constance uses the vegetable garden for learning, and Miriam is planning to visit a recycling project in Milnerton with her learners. The student teachers understand that learning does not end within the four walls of the classroom. This corresponds well with Orr's statement (1992: 87) that direct experience in the natural world is not only essential in understanding the environment, but is also conducive to good thinking. He claims that ecological literacy is difficult because we have come to believe that education is solely an indoor activity.

The student teachers use these outdoor activities to inform their decisions and plans for initiating their own environmental projects. After Constance has

taught numeracy in the garden, she lets her learners discuss the advantages of having a vegetable garden and encourages them to lay out their own gardens for their children at home. Mirriam's outing to a recycling project will be an encouragement for her learners to start a recycling project.

The student teachers encourage collaborative action. Monelwa believes that co-operation between the centres of learning and communities leads to joint intervention in addressing environmental problems. She claims that her experience in community projects in Langa has made her realise the importance of sharing knowledge and experiences with other people. She therefore encourages her learners to share what they have learned with other members of the community.

From the above discussion it is evident that that the learning experiences in my module have influenced all those interviewed, although they teach something else. In my attempt to help emancipate my students from powerlessness, I created opportunities where they could develop the necessary knowledge, attitudes and skills to empower their own learners so that they can make positive changes to their environments. In the final analysis I seem to have done two things: clearing up conceptual misunderstandings and showing that the way education occurs is as important as its content. In other words, I have tried to make sense of an effective approach, recommended for environmental sustainability, in a practical way.

6.2.3 Understanding relationship between EEFS and outcomes-based education

An outcomes-based approach

- places much more emphasis on the process of learning than on the products thereof;
- stresses that learning should be relevant and connected to real-life situations (Department of Education, 1997: 7). The learners should

know what they are learning and why. The student teachers therefore use environmental topics that are relevant to the learners' lives;

- places emphasis on critical thinking, reasoning, reflection and action. The teaching practice stories reflect that the student teachers use problem-posing materials to stimulate thinking. For example, they use codes, such as pictures, stories and tape recorders, and let their learners identify an environmental problem and think deeply about it. The student teachers also provide opportunities for their learners to develop an action plan and, after reflecting on their action plan, they encourage them to take action. This action-based learning and the use of a variety of teaching aids indicate that the student teachers understand that the learners learn best by seeing and doing things. They want their learners to learn with understanding, to see in order to remember and to do in order to understand;
- encourages active participation on the part of the learners. The student teachers do not only encourage active participation in the classroom, but also in community-based environmental projects. For many adult learners this means being empowered to participate as active citizens;
- advocates an integration of knowledge, skills, values and attitudes in the learning process. The teaching practice stories indicate that adult learners gain knowledge about environmental problems. The use of practical activities by the student teachers provide an opportunity for the learners to also develop a wide range of skills which include communication, presentation and problem-solving skills. Positive attitudes and values are also developed. For example, adult learners are encouraged to be responsible citizens, to be pro-active and to take responsibility for their own learning. The student teachers understand that the new curriculum rejects a rigid division between education and training, academic and applied knowledge, head and hand, and knowledge and skills;
- recommends that teachers should be facilitators who use group work and team work in encouraging an approach to learning that subscribes to the theory of social construction of knowledge. From the teaching

practice stories it is evident that the student teachers realise the worth of such approaches and are able to facilitate group activities;

- uses new terminology such as phase organiser, learning programmes, community involvement, critical and specific outcomes, and sees learning programmes as guides that allow teachers to be innovative and creative in developing encounters where learning can take place. The teaching practice stories reflect that the student teachers understand the terminology of the new national curriculum. Barbara, Constance and Ntombizohlanga use the environment as the phase organiser. They have also used different programme organisers such as water wastage, a vegetable garden and littering to teach literacy, numeracy and life skills;
- places emphasis on outcomes which are the results expected at the end of the learning process. The learners should demonstrate these outcomes in a variety of ways and not by means of the examinations only. The teaching practice stories indicate that the student teachers are attempting to take their learners to these end points by using learner-centred teaching strategies which develop the ability of adult learners to think critically, and to research and analyse things for themselves.

From the teaching practice stories it is evident that it is possible to use sustainability as a focus for adult learning and teaching and to integrate adult literacy with ecological literacy. The teaching of ecological literacy is not important to adult learning and teaching only, but to all education. If it is neglected in the education system of a country, the citizens will be “ecological illiterates (who) will have roughly the same success as one trying to balance a check book without knowing arithmetic” (Orr 1992: 85). It is against this background that use of environmental education for sustainability as an approach to learning and teaching is recommended in chapter 7.

CHAPTER SEVEN

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

7.1 INTRODUCTION

The former South African education system did not pay sufficient attention to adult or lifelong learning, especially with regard to marginalised communities, and to environmental education. However, in the new South African curriculum both these are treated as priority areas. Environmental problems have also created the need for assimilating the principles of environmental education in the formal curriculum. Consequently, current education reforms in South Africa have placed emphasis on the need to integrate environmental education at all levels of the education and training system (Department of Education and Training, 1995). These education reforms also encourage the use of outcomes-based approaches in the learning process.

Against this background the aim of the study has been to develop conceptual understanding of the student teachers with regard to land resource management as an environmental issue so that they can be able to integrate adult literacy with ecological literacy and involve their learners in education processes relevant to the challenge of building a sustainable society. Another objective was to integrate theory and practice by promoting use of the process of EEFS in the human and social sciences, thereby encouraging teaching and learning for sustainability. These student teachers are prospective adult literacy educators who could contribute to social change by using the process of EEFS in their adult learning centres. In other words the core idea of the research was to investigate how, through focusing on local environmental issues, and using the principles of both EEFS and outcomes-based education, these students can be better equipped for their task as adult literacy educators.

A review of the available literature in environmental education, adult education and outcomes-based education provides the practitioner with a considerable body of theory. The problem that the practitioner faces, is how to relate the theory to practice. This study attempted to address this problem through action research, which was identified as one of the methods that could give me an opportunity to develop, implement and monitor the activities, and still be in an advantageous position to continuously evaluate the project.

7.2 RESULTS OF THE RESEARCH

Since this study was based on the broad theoretical context provided by debates on effective ways of contributing to social change, a means to bridge the gap between theory and practice was essential. The solution emerged through an analysis of currently accepted literature, which included the Tbilisi Principles for environmental education, Curriculum 2005 and Fien's guiding principles for education for sustainability (1993) (See Table 5.1), which inform both environmental education for sustainability and a socially critical learning theory.

This analysis made it possible for me to identify and isolate a set of criteria which could be used both as guiding principles and as principles of procedure for the implementation of an outcomes-based approach to teaching with a focus on environmental education. The application of these guidelines was instrumental in achieving most of the goals of the present study.

Since an environmental approach adopted by this study cannot be separated from the ideas of the social constructivist learning theory, the choice of teaching strategies and the procedures that were to be followed in the teaching unit were informed by this particular learning theory.

Furthermore, the learning theory embedded within adult education and environmental education for sustainability requires an exploration of the learner's

prior knowledge before an attempt can be made to provide new information on the issue to be studied. For this reason it was necessary to identify the student teachers' initial conceptual understanding of land resource management as an environmental issue. My intervention through the Treagust and Haslam two-tier test (1987), as discussed in chapter 3, revealed considerable misconceptions that highlighted the need for a multifaceted intervention.

The development of the teaching unit that followed therefore incorporated a variety of participatory teaching strategies. These included a co-operative learning exercise, a simulation game, role play, student-conducted interviews, visioning, development of reading texts and worksheets, a map exercise and field research. These teaching strategies were chosen because of their potential to involve students in participatory learning, leading to critical thinking and problem-solving, which is central to an environmental approach adopted for the study (Chapter 2).

The use of participatory teaching strategies in the learning process proved worthwhile in that:

1. We could work towards achieving the aims of both adult and environmental education through the development of the key concepts, skills and values.
2. The students as prospective adult literacy educators were exposed to real learning and teaching situations which required a critical thinking approach.
3. Each student teacher was exposed to the implementation of a variety of teaching strategies in practice. These strategies, being participatory and collaborative, are central to the notion of education for sustainability.

4. The value of the role of the teacher as a facilitator and a co-learner was highlighted, and the fact that effective teaching does not depend on a transmission mode was illustrated.
5. The student teachers were familiarised with the procedures involved when using environmental education for sustainability as an approach or a teaching strategy.
6. The student teachers were also introduced to the idea of using environmental issues as topics when developing literacy programmes for their adult learners. They used this idea even when they taught numeracy and lifeskills.

Against the above background the following factors may be highlighted:

1. If the processes of environmental education for sustainability can be used as an approach to teaching, it can contribute to a shift in the learners' perspectives so that they become aware of the need to address their local environmental problems.
2. In working towards achieving the aims of environmental education for sustainability we may also be achieving the aims and principles of adult education and Curriculum 2005. For example, when the learners are identifying and investigating a local environmental problem, they are expected to demonstrate the ability to think critically, process information, develop communication, problem-solving and co-operative learning skills.
3. If the processes of environmental education for sustainability are adopted, a variety of participatory teaching strategies that develop skills necessary for sustainable living have to be used. This entails a shift from teaching **about** the environment only, to teaching **about, in and for** the environment.

4. Students, if given opportunities for critical thinking and problem-solving, are capable of taking responsibility for their own learning. This highlights the value of the role of the teacher as a facilitator and a co-learner.
5. If environmental education for sustainability is used as an approach to teaching, it has potential to develop the students' conceptual understanding and enable them to use these concepts when developing their literacy teaching programmes.
6. Environmental education for sustainability may make learning more relevant to the lives of the learners since their learning experiences will be related to their real world. In this way the learners realise that the environment is part of them and they are also part of the environment. This has implications for the learning programmes. Our learning programmes have to provide opportunities for real-world experiences. Relevance of learning to the learners' lives is one of the principles of adult learning.

7.3 RECOMMENDATIONS

If we believe strongly that environmental education for sustainability can contribute to social change and the general improvement of education, and if we see educators as agents of change, it is important that educators should be aware of the value of using this approach to teach the learning areas in their learning centres. This awareness can be fostered through:

1. The formation of regional and district learning area associations to function as a forum that enables adult educators to share their expertise, experiences and problems in environmental education for sustainability with their colleagues, and constantly to seek the services of experts from organisations active in environmental matters.

2. In-service centres for adult educators at national and local levels concentrating on effective teaching strategies, including the use of environmental education for sustainability. These centres should be in partnership with education departments of tertiary institutions.
3. The employment of suitably qualified advisers who will help adult educators who experience problems with regard to the implementation of environmental education.
4. Regular workshops both at the national and the local level should be conducted for adult educators as well as their lecturers on how to develop and implement environmentally-based teaching units or learning programmes.
5. Adult educators as well as their lecturers should work together to design learning programmes that are relevant to their various local environments.
6. A compulsory, practical fieldwork project, prepared and conducted during the last two years of the tertiary programme, either individually or in groups, should be introduced. This implies a form of evaluation.
7. The setting of environmental projects which place emphasis on the local environment, and the development of teaching resources that promote reflexive learning.

This last recommendation that projects should focus on environmental issues in the learners' local environment is motivated by the following:

- (a) The study and resolution of a local environmental concern is clearly more practical than taking on a national or international issue. It is also more

likely to be familiar to the learners, and thus to enable the mobilisation of non-scientific experiential knowledge.

- (b) By working on an issue such as the pollution of a local river, rather than water pollution in South Africa in general, the learners are more likely to encounter and understand the issue in its social context. The social features (history, economics, politics) of the issue are thus likely to become evident, and through engaging with them, dialogue might be stimulated.
- (c) By focusing on local environmental issues, the learners will be encouraged to work with members of their own community. This might foster group concern and remedial action in the community.
- (d) The project design should encourage and support adult learners in developing solutions to environmental problems. This approach recognises the value of local knowledge and solutions and does not assume that an externally located “expert” knows the required solution. Social change seems more probable if people “on the ground” participate in developing and implementing solutions to environmental problems, rather than the change being imposed from outside. Furthermore, learning and understanding would be enhanced through action-taking associated with the attempted resolution of real problems.

To support environmental project work the following should be included in both pre-and in-service programmes of adult literacy educators:

- (a) Guidance on the methodology of project work and the benefits of that methodology to motivate adult educators to make full use of the potential it presents;

- (b) Instruction on the nature of the environment crisis to enable adult educators to choose meaningful and appropriate project topics;
- (c) Exposure to organizations active in environmental matters to enable adult educators to contact or refer their learners to appropriate sources of support for project work;
- (d) Development and adaptation of suitable resources and exposure to resource materials which could support project work.

For resource materials to support socially critical environmental education through project work it is recommended that they incorporate the following features:

- (a) Resources should guide adult learners and their educators in becoming active participants in the democratic functioning of local life. This might include mention of the democratic structures in their community and insight into democratic processes. This recommendation is motivated by the view that learning and knowledge can most usefully contribute to social change through the processes of participation, social justice and democracy.
- (b) Resources should support adult learners and their educators in their choice of project topics by including ideas for practicable projects in their local environment. In particular, examples of successful projects should be included, as these may provide an inspiring vision of what is possible.
- (c) Resources should be developed to help information seekers respond appropriately to environmental days. The costly production of posters to promote environmental days should be reconsidered, in view of the seemingly limited educational potential of their existing design and

content.

8. Networking should be supported. Environmental information resources should be effectively marketed and distributed, e.g. through national strategies, and there should be co-operation between libraries and environmental organisations to ensure that the required information is available.
9. Consideration should be given to the inclusion of compulsory questions in the General Education and Training (GET) examinations for ABET Level 4, based on knowledge acquired through local project work, especially in the human and social sciences.

7.4 CONCLUSIONS

A review of the relevant literature and the results of the research conducted suggest that the conventional approaches to adult literacy education are more likely to perpetuate the status quo than to contribute to the fundamental change required for the resolution of illiteracy. An alternative approach embedded in socially critical theory, which underpins the implementation of environmental education for sustainability, is perceived as being more likely to contribute to appropriate social change through developing environmental literacy. This theory encourages reflexive learning through the processes of dialogue, encounter and reflection within a social and historical context.

Since educators are regarded as agents of change, it will be important for both pre-service and in-service centres to develop learning programmes that will enable adult educators to include ecological perspectives in a number of learning areas. The new NEEP Project initiated by the Minister of Education and Training in South Africa has created an opportunity for adult educators who are qualified to teach environmental education in an effective way. Unfortunately there can be no good adult educators if there are no good teacher educators or lecturers.

The present study is an attempt to encourage adult educators and their lecturers not to treat adult literacy in isolation to environmental literacy and political literacy. The integration of adult literacy, environmental literacy and political literacy may contribute to social change in the sense that adult learners will not only be able to read and write, but will also be empowered to be pro-active and take informed decisions and actions towards the resolution of their local environmental problems. This study therefore attempts to encourage adult education for social transformation through the processes of environmental education for sustainability.

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APPENDIX 1

NAME: _____

AGE: _____

SEX: _____

HOME TOWN: _____

ANSWER THE FOLLOWING QUESTIONS:

1. Does the term "environment" refer to our bio-physical surroundings only?

Give a reason for your answer. _____

2. Is land a ~~renewable~~ or non-renewable resource?

Give a reason for your answer. _____

3. What will be the effect of the increasing human population on land resources?
Will it be positive or negative?

Give a reason for your answer. _____

APPENDIX 1 (CONTINUED)

4. Which sector of the economy do you think is most responsible for land pollution in Cape Town?

Give a reason for your answer. _____

5. What form of land pollution do you believe to be most common in Cape Town?

Give a reason for your answer. _____

6. Is it necessary to do recycling in Cape Town?

Give a reason for your answer. _____

7. Would you like to see a green revolution in South Africa?

Give a reason for your answer. _____

APPENDIX 1 (CONTINUED)

8. Is intensive arable farming good or bad?

Give a reason for your answer. _____

9. Would you like to live in a sustainable community?

Give a reason for your answer. _____

APPENDIX 2

WORKSHEET ON THE AMOUNT OF WASTE PRODUCED IN LANGA

Write the name of the street and sort the rubbish under the following headings:

Name of street:		Date:			
Type of litter	Paper e.g. envelopes, milk carton, wrapping paper	Plastic e.g. plastic bottle, plastic wrap	Glass e.g. beer bottle, glass coffee jar	Organic e.g. egg shells, banana peel	Metal e.g. jam tin, cooldrink tin
Totals					

APPENDIX 3

**STRUCTURED INTERVIEWS ON THE CAUSES AND EFFECTS OF LAND
POLLUTION IN LANGA.**

1. What do you think are the causes of land pollution?

2. What are the effects of land pollution?

3. Would you like us to assist you in addressing this problem?

4. If yes, when would you like us to assist you?

APPENDIX 4

MISSION, PROGRAMMES, AIMS AND OBJECTIVES OF TSOGA ENVIRONMENTAL RESOURCE CENTRE.

AIMS AND OBJECTIVES

The aims of Tsoga are achieved through a holistic, issue based education and training approach that is relevant; gender sensitive and action orientated.

These aims are to:

- To increase the awareness in the community of environmental issues.
- To facilitate a community -based clean and green campaign.
- To support particularly youth and women in becoming more responsible and assertive.
- To run literacy classes integrated with environmental education.
- To encourage and enable disadvantaged communities to play an active role in policy formulation.
- To facilitate information sharing locally, regionally nationally, and internationally i.e. networking.

TSOGA
("Wake up!" in Sotho)



GHANDI'S
SEVEN SINS OF THE WORLD
Wealth without Work
Pleasure without Consciousness
Knowledge without Character
Commerce without Morality
Science without Humanity
Worship without sacrifice
Politics without Principle

TSOGA ENVIRONMENTAL RESOURCE CENTRE



Tsoga is a community-based organisation aimed at promoting a new perspective amongst South Africans which in particular, demystifies the concept of environment in disadvantaged communities.

PROGRAMMES

Tsoga Environmental Resource Centre initiates and co-ordinates a variety of programmes in different areas of environment and development. Some of these are:

Literacy Programme

- Environmental lessons
- Debates on topical issues
- Numeracy
- Constitutional rights
- Reading and writing skills (levels 1 - 3)

Schools Programme

- Visits to schools
- Showing enviro videos and slides
- Empowering teachers on environmental issues
- Establishing environmental clubs
- Food and gardening competitions

Placements

- Offering placements to students studying environmental courses at school, college or universities, as well as to interested community members.

Enviro Education

- Working with street committee representatives
- Running workshops
- Facilitating clean and green activities
- Training and establishing nurseries

Clean-up and Greening Programmes

- Facilitating community clean-ups followed by greening of open spaces.

Research

- Undertake research on relevant Literature issues related to environment .

Youth

- Environmental awareness workshops
- Life and leadership skills
- Hiking and camping
- Social trips (excursions)
- Debates
- Networking

APPENDIX 5

STUDENT TEACHERS' EVALUATION OF THE USE OF ENVIRONMENTAL EDUCATION FOR SUSTAINABILITY AS AN APPROACH IN THE TEACHING UNIT

PART ONE

1. Please indicate your feelings about the use of environmental education for sustainability as an approach in the teaching unit by circling the appropriate rating in the column next to each question.
2. The ratings to be used are:

1. Very weak	4. Good
2. Weak	5. Excellent
3. Satisfactory	

1. The extent to which the teaching unit gave you an opportunity to:					
(a) Participate actively from the beginning to the end of the unit	1	2	3	4	5
(b) Develop of an informed concern for the environment	1	2	3	4	5
(a) Develop lifestyles for sustainable use of land resources	1	2	3	4	5
(b) Develop skills	1	2	3	4	5
(c) Explore and address an environmental issue	1	2	3	4	5
(d) Consider both social as well as biophysical factors	1	2	3	4	5
(e) To interact with other people in the solution of an environmental problem	1	2	3	4	5
1. Shift in emphasis of the teaching unit from:					
(a) Top-down messages to local co-operative and participatory action	1	2	3	4	5
(a) Nature experience approaches to action learning	1	2	3	4	5
(b) Conservation of natural resources to sustainability	1	2	3	4	5

APPENDIX 5 (CONTINUED)

3. The extent to which the teaching unit :					
(a) Improved your conceptual understanding	1	2	3	4	5
(b) Enhanced your understanding of environmental education for sustainability as an approach to teaching	1	2	3	4	5