ADULT CONCEPTIONS OF THE ENVIRONMENT: AN ANALYSIS OF A FORMAL CURRICULUM IN ENVIRONMENTAL EDUCATION

Shaada Reddy

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ABSTRACT

This research reports on an evaluation of conceptions of the environment held by a group of students at the University of Cape Town. This group of students were all registered for the degree of Bachelor of Education, and included in their curricula the elective in Environmental Education.

The research attempts to describe the constructivist approach as implemented in the course in Environmental Education over a prescribed period, and to explore the impact of such an approach on student conceptions.

The research was conducted primarily through the use of two questionnaires together with unstructured interviews. The results of the questionnaires and interviews were used to assess both qualitatively and quantitatively the development of student conceptions of the environment. The first questionnaire was administered early on in the course, while the second was administered towards the end of the course. In this way it was possible to make a comparative study of the responses.

The results indicate that the course contributed to some shift in student conceptions of the environment, and that it contributed also towards the development of environmental attitudes, values and behaviour.

The work concludes with suggestions for developing aspects of the course design, in the light of insights gained by this research.

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TABLE OF CONTENTS

ABSTRACT i

ACKNOWLEDGEMENTS ii

CONTENTS iii

PREAMBLE 1

CHAPTER 1 : **INTRODUCTION** 3

1.1 RESEARCH METHODOLOGY 5
1.2 LIMITATIONS OF THE STUDY 6
1.3 STRUCTURE OF THE THESIS 7

CHAPTER 2 : **CONCEPTIONS OF THE ENVIRONMENT: DEFINITIONS AND GUIDING PRINCIPLES** 9

2.1 ENVIRONMENTAL EDUCATION 10
2.2 CONCEPTIONS 13
2.3 ATTITUDES, VALUES, BELIEFS AND BEHAVIOUR 15
2.3.1 HISTORICAL INFLUENCES 17
2.3.2 LANGUAGE 19

2.4 THE CONCEPT OF CONSTRUCTIVISM 21
2.4.1 REALIST AND RADICAL CONSTRUCTIVISM 23
2.4.2 THE CONSTRUCTIVIST VIEW OF LEARNING 24
2.4.3 CONCEPTIONS AND MISCONCEPTIONS 25
2.4.4 CONCEPTUAL GROWTH AND CHANGE 26
2.4.5 IMPLICATIONS OF A CONSTRUCTIVIST APPROACH 27
2.5 TEACHER BELIEFS AND ATTITUDES 30
2.6 ENVIRONMENTAL EDUCATION AND GROUP LEARNING 31
2.7 ENVIRONMENTAL EDUCATION IN THE BED PROGRAMME AT UCT 35

CHAPTER 3 : **METHODOLOGY : THE USE OF QUESTIONNAIRES** 38

3.1 THE DEVELOPMENT OF THE QUESTIONNAIRE 39
3.1.1 SOURCES OF INFORMATION 39
3.1.2 INFORMAL INTERVIEWS AND CLASSROOM OBSERVATIONS 40
3.1.3 THE CONSTRUCTIVIST APPROACH 41
3.2 THE QUESTIONNAIRES 42
3.3 QUESTIONNAIRE DESIGN AND COMPOSITION 44
3.3.1 COMPOSITION OF INTERVENTION 1 45
3.3.2 COMPOSITION OF INTERVENTION 2 49

CHAPTER 4 : **RESPONSES TO THE QUESTIONNAIRES: PRESENTATION AND ANALYSIS OF RESULTS** 55

4.1 PRELIMINARY DATA: THE ENVIRONMENTS IN WHICH THE STUDENTS TEACH 56
4.2 RESPONSES TO INTERVENTION 1 59
4.2.1 EXPECTATIONS AND NEEDS 59
4.2.2 PREPARATION FOR THE COURSE 61
4.2.3 ENVIRONMENTAL LITERACY 62
4.2.4 DEVELOPMENT OF STUDENT KNOWLEDGE 63

4.2.5 Skills development 64
4.2.6 Attitudes towards the environment 65
4.2.7 Conceptual change and skills development in future teaching 67
4.2.8 Fulfilment of needs and expectations 68
4.3 Responses to Intervention 2 69
4.3.1 Reasons for choosing to study environmental education 69
4.3.2 Student environmental attitudes 71
4.3.3 Student behavioural orientations 74
4.3.4 Social influences in the work environment 74
4.3.5 Perceived changes in teaching methods 76
4.3.6 Factors influencing the conceptual development of students 78
4.4 Comparison and analysis of the results 78

CHAPTER 5 : **CONCLUSIONS AND RECOMMENDATIONS** 86

REFERENCES 93

APPENDICES

PREAMBLE

The motivation for this study arose from a personal awareness that public concern in South Africa about environmental issues has notably increased during the last decade. Public reaction in South Africa to issues such as the dumping or storing of toxic wastes (AECI sulphur dumps), land degradation from poor farming practices in the Northern Cape, the fear of water pollution from industrial effluent (Saldanha steel mill) and dune mining (St Lucia), is increasingly evident, and is further intensified as environmental problems impact increasingly on the daily lives of people.

Consequently, the debate in contemporary literature on environmental education and the environment has shifted, from what was simply a concern with nature conservation and environmental awareness, to include issues which concern the interrelationship between environmental problems on the one hand, and socio-political, economic and historical developments on the other. For example, in order to address issues such as the threats posed to human health through exposure to lead, or through the destruction of the ozone layer, it is necessary firstly to be aware of the existence of such issues; such awareness then in turn might promote discussion and thought about the environment, as well as about practices which contribute to conserving the environment. The interdependence of humans and the environment thus becomes manifest in this way.

The purpose of this investigation is to study the ways in which adults construct their conceptions of the environment. The study focuses on a group of students

who are practising teachers, and who are currently registered for the degree of Bachelor of Education at the University of Cape Town.

The study attempts to address three questions:

- what are the environmental experiences of teachers (who will be referred to in this thesis as students)?
- how do they construct their conceptions of the environment? and
- are they aware of the environment, and of their role in it?

The second aim of this thesis is to evaluate the structure and the nature of the BEd Environmental Education course with a view to assessing

- whether this course has the capacity to engage with the conceptual models embedded with the students as they enter the course, and so to uncover personal belief systems which regulate the ways in which students learn; and
- whether the student participation in the course contributes towards a change in their conceptions of the environment.

Chapter 1

Introduction

The Bachelor of Education degree is a post-graduate programme for teachers. At the University of Cape Town this degree programme comprises a number of courses, some of which are compulsory, while others are chosen from a set of electives. Students are required to complete a total of five courses.

This thesis is an analysis of the environmental conceptions which are held by the students who have enrolled for the elective "Environmental Education in the Secondary School" in 1995. These students have already had some years of teaching experience in either primary or secondary schools. In essence the course aims to develop student conceptions of the environment through the acquisition of knowledge and skills, and a consideration of attitudes, values and behaviour. The course aims to achieve these ends through the teaching of knowledge, ideas and skills, as well as encouraging students to reflect critically on a range of local and global environmental issues. It is explicitly intended for students to develop an environmental ethic which will manifest itself in responsible environmental behaviour. This intention is in accord with Greenall's (1986) view that "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 behaviour compatible with this new ethic" (Greenall, 1986;10).

The course adopts a *constructivist* approach; that is, students are directly involved in the construction of their knowledge, through a carefully designed process of enquiry and investigation. This is in contrast to the traditional approach, the essence of which is the transmission of a body of knowledge. The constructivist approach allows students to construct their own understanding of issues by drawing on a combination of experience, through communication with others, and through critical reflection. In this manner their own environmental education comes about through their being direct participants in contemporary environmental discourses.

Environmental behaviour develops from an understanding of environmental issues, and these issues contain political, social and economic components or perspectives (Blignaut 1991). An appreciation of such perspectives forms the basis for the development of an environmental ethic which emphasises peoples' personal and collective responsibility for conserving the environment, and the rights that they have with respect to the environment. There is thus a distinct focus on the interdependence between humans and the natural environment.

The analysis of students' environmental conceptions prior to their involvement in the course, and the evaluation of their conceptions both early on in the course, as well as towards the end, provided some indication and understanding, of the shifts in knowledge, attitudes and behaviour which could be attributed directly to the actual course.

The research focuses primarily on the development of the affective domain, that is, student attitudes and values, but it also recognises the development of cognitive (knowledge) and psychomotor (skills) acquisition. Development of the affective domain could, for example, refine students' ability to think more critically about their role and responsibility to the environment. While it is difficult to ascertain the nature of these shifts or developments in knowledge and

skills, it is nevertheless recognised that these shifts do occur. This research seeks to understand why they do, and to ascertain how the course has contributed to these shifts.

However, the results of this study need to be interpreted with the necessary degree of caution, in the sense that development in any domain is a *dynamic* process. In addition teacher development, according to Clacherty, "is largely a subjective experiential and personal occurrence and therefore does not readily open itself to assessment and evaluation" (Clacherty, 1988;57).

In summary, the aim of this research is to investigate the changes in students' conceptions with regard to the environment as a result of an environmental education course. It also seeks to establish whether the students enrolled in the BEd environmental education course are developing attitudes, values, behaviour, and a growth in confidence that may lead to their active participation in environmental issues. It is also hoped that this research will offer guidelines for further modifications and improvements to the course. In particular the research will clarify those aspects of the course that make a significant contribution to the development of meaningful and relevant environmental conceptions.

1.1 Research methodology

A social investigation strategy was used to collect and analyse data about the students' conceptions of the environment. The primary assessment technique used two questionnaires: the first questionnaire was administered at the start of the course, and the second towards the end of the course. The two sets of questionnaires were designed to elicit both qualitative and quantitative information about the nature of student development during the course.

At the time of submitting the research proposal the first questionnaire had fortuitously already been administered to the BEd group (when the course started in the first semester of 1995) by the course co-ordinator, Kevin Winter of the Environmental and Geographical Science Department, UCT. The first questionnaire was used to gather baseline data to understand student responses to questions, such as "What is environmental education?". The second questionnaire was designed and administered towards the end of the course, and to some degree mirrored the first intervention. The two questionnaires provided some yardsticks for comparisons, and suggested how the students' conceptions had altered through their involvement in the course.

Observation of course lessons, as well as semi-structured interviews with a random sample from the group of twenty-seven students, allowed the researcher to gain valuable insights about the course and to consider other factors relevant in the understanding of student conceptions.

1.2 Limitations of the study

Investigations of this nature are always subject to limitations of various kinds, and it is as well to bear these in mind when assessing the results. Some of the limitations are as follows:

- The sample was small, although most of the students in the group completed the exercise. Also, the composition of the group changed slightly between the two interventions. However, even though the composition and quantity of the group for the two interventions varied, the same number of respondents completed the questionnaires. A total of 24 students responded to the first intervention while 27 responded to the second, with 18 students being common to both groups.
- The group and its opinions are representative of only a section of the general population, which confines this research to a core study rather than a representative sample.

- There is the concern that the outcome of the research could have been anticipated, given the intentions of the course co-ordinator and design of the course; Such intentions are likely to influence the design of the questionnaire and introduce a bias
- Questionnaires as a means of eliciting information, are problematic as they may dictate the research results. Students might well respond to the questions in terms of what they believe is expected of them.
- It is difficult to attribute development of any kind to specific causes or practices because personal development is influenced by a multitude of variables, not all of which will have been taken into account in this study. It would therefore be inaccurate to conclude categorically that any shifts in conceptions are principally as a result of the environmental education course.
- It would have been preferable to undertake a long-term study to describe and explain how the course had influenced teacher practise and personal responses to environmental issues.
- The research results may show that some shift has occurred in the students' conceptions, but further work needs to be carried out to ascertain whether these shifts actually develop to a degree which may realistically result in permanent behavioural change.
- Due to time constraints it was not possible to administer a pilot questionnaire which would have alerted the researcher to some of the weaknesses inherent in the second questionnaire..

1.3 Structure of the thesis

The remainder of this work is organised as follows. Chapter 2 examines the literature on environmental education and the impact of constructivist thinking on the practice of environmental education. It provides a theoretical framework for the investigation of student conceptions of the environment.

Chapter 3 discusses the methodology employed to examine changes in student conceptions of the environment. Chapter 4 provides a presentation of the data with an analysis of the findings. The thesis culminates with a set of conclusions and some recommendations in Chapter 5.

Chapter 2

Conceptions of the environment: definitions and guiding principles

Chapter two explores the way in which a constructivist approach is used in environmental education to encourage learners to formulate ways of constructing knowledge and the learning thereof. To do this it is necessary to establish some theoretical basis from which to depart. Therefore, this chapter will first briefly discuss the nature of environmental education. Secondly, it will discuss the nature of conceptions, and how these conceptions are influenced by inherent attitudes, values, beliefs and behaviour. This will be followed by a discussion of social and political ideologies which influence beliefs and attitudes about the environment, and which relate to environmental conceptions.

Central to the discussion in this chapter is the debate on the acquisition or construction of knowledge and how this is embedded in the consciousness. The constructivist approach, which was adopted in the BEd course, provided a framework for the environmental education courses. Various aspects of this approach are reviewed. This chapter, therefore, situates environmental education within a constructivist paradigm, because a central aim of the course is to encourage critical reflection and the reassessment of student beliefs, attitudes, values and behaviour.

2.1 Environmental education

A conservative approach to teaching and learning is characterised by the acquisition of knowledge, skills and values. Environmental educationalists are critical of this approach to learning largely because it negates a more holistic approach to learning and because it does not address all three domains of human development: the cognitive, the affective and the psychomotor (Irwin, 1990b). Environmental education goes beyond the mere acquisition of knowledge, skills and values; it is concerned about the relationships between people, their culture and biophysical surroundings, and how this contributes to their attitude towards the environment (Irwin, 1990b). These concerns are embodied within a definition of environmental education put forward by the World Conservation Union (IUCN) (1991):

"Environmental education is the process of recognising values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man, his culture and his biophysical surroundings. Environmental education also entails practice in decision-making and self-formulation of a code of behaviour about issues concerning environmental quality."

Huckle (1983) draws attention to *three* different forms of environmental education, viz.

- education **about** the environment (that is, the accumulation of facts about the environment, for example, pollution, land degradation, fauna and flora);
- education **from** the environment (for example, the use of outdoor education); and
- education **for** the environment (for example, education for awareness, concern and action).

Traditionally, most education programmes adopt a conservative approach by being based on education about and from the environment; on the other hand, education for the environment has been labelled as a radical approach, which promotes social change. Furthermore, education for the environment challenges the teaching-learning process by emphasising student-centred learning which encourages *co-operation* between educators and students (Maher, 1986; Ingleton, 1995). It may promote learning experiences which enable students to develop their own ideas, attitudes and values once they have been exposed to information about the environment.

According to Maher (1986), therefore, "environmental education is dangerous knowledge because it challenges the traditional features of curriculum knowledge through its emphasis on knowledge of relevance, its interdisciplinarity, and its emphasis on studying information and values which question socio-political and economic processes" (Maher, 1986; 23). Environmental education, in the opinion of Irwin (1990b), has the potential to generate and sustain social values appropriate to an ecologically sustainable future, even though it operates within a milieu which is to a large degree structured by economic, industrial and political power designed to serve the interests of profit.

Consequently, a major aim of environmental education for the environment is to encourage the development of an environmental ethic which serves to clarify and challenge values and attitudes and may result in actions that are distinct from accepted norms (Hungerford and Volk, 1990). Ashley (1995) provides support by claiming that "if we wish to change things, then our approach must not be through moral exhortation of the individual but through a curriculum which addresses the ethical problems of the economic system that determines our lives" (Ashley, 1995; 16).

This approach to environmental education therefore increasingly addresses environmental concerns such as industrial pollution or deforestation, while it simultaneously attempts to clarify the role of the individual in the creation of environmental problems, and in the search for solutions to these problems. In this way the connection between limited resources and the implications for society of such limitations, are emphasised (Gigliotti,1992). To consider the individual's role with respect to environmental problems, it is necessary to take account of their conceptions of the environment. Robertson (1994) suggests that a constructivist approach to environmental education would assist students to become aware of the way in which "invented traditions" (Robertson 1994) in relation to the environment are conceptualised, accepted and circulated. Furthermore, a constructivist approach would enable students to question and explore their various conceptual orientations, with a view to integrating knowledge about the environment with attitudes, values and behaviour towards the environment.

According to Gigliotti (1992), however, the need for environmental education arises from the need for society to reassess its behaviour with respect to the environment. He claims that people are generally concerned about environmental problems, but that they have "weak substantive knowledge about how environments work, how societal and personal actions impact on the environment, and how environmental problems impact society" (Gigliotti, 1992; 22). Consequently, adverse actions need to be addressed by encouraging a change not only in practices, but also in attitudes towards the environment.

Therefore, to consider the ways in which environmental education could influence attitudinal and behavioural change, it is necessary to examine how initial attitudes, beliefs, values and behaviour are constructed.

2.2 Conceptions

Chou and Roth (1995) define a *concept* as

> *a way of grouping objects or events in terms of essential similarities.*

They claim, however, that concepts are not as personal nor are they as evaluative, as constructs, which provide meaning to their personal understanding. "Therefore it is necessary to identify constructs beyond those environmental concepts for appropriate use in environmental education" (Chou and Roth, 1995; 36).

A construct is, according to Robertson (1994), an intellectual device through which events are construed. It organises experiences into categories and consequently, in terms of constructivist epistemology, permits an interpretation of reality through "conceptual filters".

For Ballantyne and Packer (1994), the relationship between conceptions and knowledge, attitudes/values and behavioural orientations is a mutually dependent one, in which conceptions are constructed from the thoughts, feelings and actions associated with varying phenomena. Consequently, peoples' *conceptions* influence ways in which they respond to or assimilate further learning experiences. Similarly, Posner et al (1982) believe that "inquiry and learning occur against the background of the learners' current concepts" (Posner et al, 1982; 212) which the learner utilises to organise his/her investigation to make various phenomena intelligible.

The pre-instructional conceptions of students may, however, be in contrast to what is taught, and this could account for poor performance in taught courses. According to Duit (1994) such conceptions are resistant to change by instruction. He claims that research has revealed that instruction often fails to guide

students from their preinstructional knowledge to the subject matter intended (Duit, 1994;4648). The results of such research therefore prompt a reassessment of instructional aims and the development of new instructional designs.

According to Posner et al (1982), for students to respond favourably to instruction the following conditions should be fulfilled:

- they need to experience dissatisfaction with existing conceptions;
- new conceptions should be intelligible to them; and
- new conceptions need to appear plausible.

It is, however, somewhat optimistic to expect that students will automatically respond to stimuli presented through instruction to the extent that they will abruptly shift from one conception to another. A more likely scenario suggested by Posner (1982) is that they will *accommodate* , in varying degrees, some aspects of the received instruction through which they will formulate new conceptions. They respond in this manner because changes are often perceived in a threatening manner and, therefore, unless students become aware of their dissatisfaction with their current conceptions, there will be a resistance to change.

From Posner's research, it seems clear that in order to understand the conceptions which students hold of the environment, it is necessary to assess their pre-instructional conceptions as well as the development of their conceptions, as they engage in instruction. In the case of the environmental education course presented at the University of Cape Town, the aim of the course is to present learners with experiences which will encourage the development of environmental knowledge, skills and attitudes, and to suggest appropriate behaviour. Through the process of group interaction, and by reflecting on existing beliefs and attitudes, and reassessment thereof, students

may experience what Posner describes as dissatisfaction with existing conceptions, or they may accept the plausibility of new conceptions.

Environmental conceptions may therefore be described as conceptions which encompass and are influenced by:

- knowledge and understanding of the environment;
- a personal environmental ethic or approach;
- the development of environmental attitudes and values; and
- the development of behaviour sympathetic to the environment

However, conceptions are constructed within a social milieu in which, for example, specific language or words are used to express concepts (Lemons, 1989). To have a clear understanding of conceptions, it is therefore necessary to reach a clear understanding of the meanings of words which in turn acquire meaning through cultural or societal influences. It thus becomes necessary to examine the effects of social influences on the meanings of words or language which are integral to the construction of personal conceptions. In other words, thought processes which result in the construction of conceptions may be described as "reflections of the social practices that surround their use" (Lutz, 1992; 182).

2.3 Attitudes, values, beliefs and behaviour

The previous section has outlined how conceptions are constructed. This section will suggest reasons for the varying conceptions encompassing attitudes, values, beliefs and behaviour.

According to Veitch and Arkkelin, "the relationships among the processes of environmental perception, cognition and evaluation as well as their effects on behaviour can best be summarised in the notion of environmental attitudes"(Veitch and Arkkelin, 1995; 102). Attitudes involve ways in which we

think about, feel about and behave towards something. Furthermore, Veitch and Arkkelin state that beliefs and values are two important cognitive foundations of attitudes, with beliefs constituting the "building blocks" of attitudes (cited in Bem, 1970). Bem's building blocks theory distinguishes between primitive beliefs, which are regarded as self-evident and are based on direct experience, and higher-order beliefs, which involve "the insertion of a conscious premise in the thought process of arriving at the belief". Thus, a belief can be thought of as a conclusion to a syllogism (Veitch and Arkkelin, 1995; 104), that is, of a deductive scheme in a formal argument. For example, in the syllogism "all men are mortal; Socrates is a man; therefore Socrates is mortal", the conclusion is "Socrates is mortal".

Beliefs, however, whether primitive or higher-order, carry meanings which are acquired and understood through their specific social, cultural, political and economic attributes.

Values are defined as basic preferences for certain end states. Thus, for Veitch and Arkkelin, values serve as the *functional* basis for attitudes. For Clacherty, "values are seen as enduring beliefs upon which people would normally choose to base their actions, whereas attitudes, which are usually determined by values, are situation specific" (Clacherty, 1988; 31). Clacherty makes the further point, that it is generally accepted that there is a high degree of consistency between attitudes and values, while on the other hand the link between these two and behaviour is more tenuous. He claims that while one might expect behaviour to match attitudes, research has shown that there appears to be a lack of consistency between peoples' attitudes and their behaviour, in that an attitude which may apply in one context does not necessarily translate into another, so that the result is situationally different behaviour. He cites Fishbein (1967c, 477), who points out that

"What little evidence there is to support any relationship between attitude and behaviour comes from studies showing that a person tends to bring his attitude into line with his behaviour rather than from studies demonstrating that behaviour is a function of attitude".

The preceding discussion concerns the ways in which attitudes, values, beliefs and behaviour are internalised. The picture is incomplete, however, without some consideration of the historical influence of social practice on the development of attitudes, values, beliefs and behaviour, and consequently on environmental conceptions.

2.3.1 Historical influences

Moore (1995) subscribes to the view that "educational practice of any individual is informed by a set of values, interests and theories, that may be said to constitute an ideology". He defines an ideology as the collection of theories about the world held by an individual. These theories may possibly be inconsistent, contradictory, and invoked in different settings. Furthermore, ideology influences the choices that individuals make. Khan (1992) points out that ideology includes a particular set of social values, which in turn influences interaction with the environment. Consequently, "the nature of a community's action will be conditioned by the ideology informing its behaviour" (Khan, 1992; 10).

In South Africa, according to Khan (1992), perceptions of the environment have been shaped by political forces of the past. She claims that historico-political forces such as colonisation, the dispossession of blacks, the effect of racial attitudes, discriminatory legislation and the imposition of the apartheid system from 1948, have all had a significant impact on the development of environmental attitudes. Furthermore, she suggests that an historical

perspective permits a proper understanding of the impact of white settlement on the environment as well as on the natural economy of the indigenous people.

Given that approximately 70% of the students in the BEd environmental education group are African, it is particularly important to consider the effects of socio-political forces on the development of attitudes, values and beliefs, and ultimately on the ways in which their conceptions of the environment will have been constructed.

Early conservation theories emphasised the protection of wildlife and the preservation of the natural environment, and excluded a consideration of the views and the needs of blacks. These theories were in fact developed to curtail what was seen as misuse of the land by blacks (Khan 1992). According to Khan (1992), no account was taken of pre-colonial ecological practices and ideas. "While it is true that a formal conservation ethic was not part of the traditional African way of life, when customs and taboos were strictly followed, these in effect protected the environment". Furthermore, "Africans (whether San, Khoi or Bantu) adhered to a well developed land ethic which was founded on the belief that the individual was an integral part of nature, not separate from it" (Khan, 1992; 5). South African environmental history, from colonial times to the apartheid era, according to Khan (1992) presents a Eurocentric vision of the past in which blacks were consistently denied any meaningful role, by their being forcibly removed to settlements devoid of any environmental stimuli. Many were thus spiritually and physically alienated from the land. Their belief that the individual was an integral part of nature was persistently eroded by the imposition of political dictates, which compelled them to live under conditions that contributed to neglect of environmental concerns. Racially discriminatory legislation, according to Khan (1990), has been singled out as a major factor in the formation of negative environmental perceptions and attitudes among black South Africans, and socio-political factors such as disempowerment, the

homelands policy and the Group Areas Act profoundly affected the attitudes, beliefs and values which people have of the environment. For example, conditions such as poverty, inequality and physical and spiritual estrangement from the land often led to behaviour which resulted in environmental degradation. These conditions also contributed to beliefs and attitudes which awarded low priority to environmental concerns.

Moore (1995), citing Von Glasersfeld (1984), claims that the ideas which constrain the manner in which we construct our experience "spring from the history of our construction, because at any moment, whatever has been done limits what can be done now" (In: Von Glasersfeld, 1984;30) The socio-political constraints imposed during the apartheid era provide an example of this view.

2.3.2 Language

There are linguistic factors which have also militated against the development of environmental ideas amongst Blacks. For example, according to Mr C Dikeni, a linguist in the Department of African Languages at the University of Cape Town, the vocabularies of Black languages such as Xhosa and Zulu have no terms for environmental concepts such as sustainable development, ecosystems, desertification or environmental ethics, and this deficiency constitutes a further barrier to entering the discourse on the environment. Hence it may be argued that as past experiences influence ideas and interpretations of future experiences, language itself defines and limits thinking. Mahlios and Maxson suggest that students' beliefs should be examined with a view to identifying the conceptual devices which they utilise to make sense of their worlds (Mahlios and Maxson, 1995). These authors believe that "metaphors represent larger constructs" which are used to organise thinking and plan actions (1995;193). It is their contention that the manner in which language is used by the individual, itself provides a guide to that individual's unique conceptualisation of the environment.

Language, according to Moore (1995), is socially constructed, and learning and knowledge cannot be separated from the language from which they are constituted. However, successful learning will only be evident "if it can be articulated in the language(s) of the discipline." (Moore, 1995; 28).

The majority of the students in the BEd environmental education group are African. They have suffered, in varying degrees, the effects of discriminatory practices in South Africa. They have elected to study environmental education and have come into the course as relative newcomers to the discipline of environmental education, and it is important to bear in mind that they are having to do this through the medium of English, which for many is a second or third language.

Moore (1995) argues that " a student is only able to articulate the discourse of a discipline once s/he has a conceptual grip of the material under discussion, and a sense of how language is used to express ideas in that discipline". He continues: "... the challenge to the newcomer is to acquire not only the linguistic cues, but to acquire also the succeeding layers of sedimented meaning that have accumulated behind the terms in that discipline" (Moore, 1995; 26). Without these, language could be a barrier which the student has to struggle against, and which would impact on the student's conceptions. For example, a student's understanding of sustainable development may not coincide with what the educator is trying to put across, because the student may be constructing her/his own understanding of the term, using as a basis the vocabulary which s/he holds. Communication involves shared meaning (Miller, 1989) which has to transcend the possible obstruction of previous experience or understanding. Consequently, the meanings or concepts that students bring to a new situation could prevent new ideas from being understood in the intended way, or it could

cause such dissonance and ultimately confusion that the learner is less motivated to persue a line of thinking.

Thus environmental educators in South Africa not only have to acquaint learners with environmental knowledge to equip them to participate in the discipline, but they also have to seek the means by which they can encourage learners to re-evaluate the attitudes and values which they have about the environment.

The preceding discussion concerns the construction of attitudes, values, beliefs and behaviour as social phenomena. The development of a theory of knowledge based on the constructivist approach follows next. Here one considers the alternate ways in which knowledge is constructed, particularly from the perspective of the individual learner, and his or her interaction with society. These notions relate to this thesis in that they provide a conceptual framework for exploring the diverse ways in which the students in the BEd environmental education course interpret the material with which they are confronted. Furthermore, the constructivist approach to knowledge development provides a way of understanding how environmental education is conceptualised. It constitutes a means of engaging with the conceptual views held by the students as they enter the BEd course in environmental education. It encourages the students to deconstruct, their conceptions of the environment, with a view to making their perceptions of the world more evident.

2.4 The concept of constructivism

Constructivism is an approach to education which requires fundamental shifts in traditional views of how people learn, and of the conceptions they hold of the world. According to Cobb (1994), the idea that learners passively receive information has been replaced by the belief that learners actively construct knowledge as they strive to make sense of their worlds. "Empirical support for this position is provided by numerous studies that demonstrate that the

understandings that students acquire in instructional situations are frequently very different from those that the teacher intended" (Cobb, 1994; 1049). Constructivism in education, for Candy (1989), is concerned with how learners construe (or interpret) events and ideas, and how they construct (build or assemble) structures of meaning. He proposes that "the constant dialectical interplay between construing and constructing is at the heart of a constructivist approach to education... (Candy, 1989; 108 cited in Strachan 1995). The main hypotheses which underpin the notion of constructivism are, according to Lerman (1989), that "Knowledge is actively constructed by the cognizing subject, not passively received from the environment" and "coming to know is an adaptive process that organizes one's experiential world; it does not discover an independent, pre-existing world outside the mind of the knower" (cited in Klein & Merritt, 1994; 15).

The historical roots of constructivism go back to the 18th century. Moore (1990), citing Von Glasersfeld (1984), traces the emergence of constructivism from Giambattista Vico (1710) and Immanuel Kant (1783) through to Piaget (1937) and Dewey (1938, 1963). According to Moore, "modern proponents of constructivism are at pains to demonstrate the pedigree of this philosophical tradition precisely because it undermines the powerful and entrenched traditions of realism" (Moore, 1995; 16). He continues by asserting that the character of constructivism may best be understood by recognising that it stands in contrast to the assumptions of realism. Constructivism, unlike realism, focuses on the ways in which the human mind constructs its account of its own experience.

According to Robertson (1994), constructivism contrasts with the positivist-empiricist view of knowledge. Empiricists, he claims "understand knowledge as that which has been confirmed through observations and logic and accumulated inductively" (Robertson, 1994; 22). He further contends that behaviourist approaches to research in education continue with this epistemology by

concentrating on "behaviours that are readily quantifiable and that allow for statistical analysis and well-defined conclusions" (Robertson, 1994; 2). Millar, (cited in Robertson 1994) contends that an important consequence of behaviourist research approaches is that students' cognitive activities are ignored, and that only inputs and outputs are of consequence. Moore (1995), on the other hand, quotes Von Glasersfeld (1984) who claims that "what we experience, cognize, and come to know is necessarily built up of our own building blocks and can be explained in no other way than in terms of our ways and means of building" (Von Glasersfeld, 1984; 39).

The constructivist theory of knowledge therefore explores the manner in which learners interpret both the material through which they learn, as well as the knowledge which they gain through previous experience. When researching theories of learning or of epistemology, the approach of constructivist researchers is to demonstrate the importance of students' cognitive abilities, as manifested in their ability to construct conceptions, which are in turn labelled with language symbols (Robertson, 1994).

2.4.1 Realist and radical constructivism

It has been argued (Cobb (1994)) that constructivism itself is not a completely homogeneous theory, but that there exist within it two alternative approaches: the *realist* and the *radical.* The distinction between these two approaches lies in their differing perspectives of the general function of cognition: for realists, cognition is the process by which learners construct mental structures that reflect external structures in the environment; radical constructivists, on the other hand, contend that cognition serves to organise the learner's experiential world rather than to uncover ontological reality. Cobb (1994) reflects, however, on the following philosophical dilemma which confronts realist constructivists: that learners do not have direct access to the external environment, which in turn suggests that interpretation of the external environment is in terms of their

current knowledge structures. "Consequently it is impossible, in principle, to explain how they can construct internal knowledge structures that correspond to the structure of the environment".(Cobb, 1994; 1049). He suggests that what happens in the learning process is that learners construct mental representations that mirror the structure of the instructional materials in their environment.

Radical constructivism, according to Cobb (1994), has been profoundly influenced by the theories of Jean Piaget. For radical constructivists, therefore, learners construct ways of knowing solely on the basis of their personal experiences, as they attempt to make sense of their worlds. Realist constructivists, on the other hand, argue that this radical position is solipsistic; in other words, it accepts that the self can know nothing but its own modifications, and that the self is the only existent thing. Radical constructivists seem not to acknowledge that such private worlds have been influenced by society and by the ideologies generated within these societies. Robertson (1994) asserts, "individual learning does not occur in a social, political or historical vacuum" (Robertson, 1994; 29). Therefore radical constructivists give substantial consideration to knowledge which is socio-culturally situated, as well as to individual experience.

This debate between the realist and radical approaches to constructivism highlights the need to transcend the Cartesian dualism between ontological reality and subjective experience. Cobb suggests that knowledge evolves historically and that it differs from one cultural group to another. This view questions the belief of realists that knowledge has fixed ahistorical foundations.

2.4.2 The constructivist view of learning

The constructivist view of learning holds that learners attempt to make sense out of their world by *constructing* knowledge. That is, knowledge cannot be taught:

it is constructed by the learner. This contradicts a more traditional view that learning is a passive action in which educators instruct and learners absorb what they are taught. In addition to its definition, as a mode of learning, constructivism may also be regarded as a methodology for conducting research, with the aim of understanding *how* learners make sense of their diverse worlds.

Ausubel, cited in Duit (1994), declared : "The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly." Duit, however, points out that students' pre-instructional conceptions are often in contrast to what they are taught and, furthermore, such conceptions have proved to be resistant to change (Duit, 1994). Nevertheless, in order to design, develop and assess instructional interventions which will aid learners in making sense of their worlds, it is important to understand their conceptions. For Duit, conceptions denote a mental representation of some features of the external world or of theoretical domains.

2.4.3 Conceptions and misconceptions

Duit 1994) contends that people develop conceptions and misconceptions in a number of ways. He suggests that *conceptions* are developed

- through language, which contains a large stock of worldviews;
- through interactions with family members, friends or society in general; and
- through the mass media and through sense impressions.

Misconceptions, he claims, are "misunderstandings that are induced through prior formal teaching" (Duit, 1994; 4649). Misconceptions may arise through a variety of mechanisms, according to Duit; for example,

- empirical studies have shown that teachers sometimes hold misconceptions either because they were poorly trained or because of unfamiliarity with the subject area;

- faulty ideas may have survived for generations because they were simply passed on as accepted ideas without question;
- misconceptions occurred because students interpreted what they were taught in a way different to what the teacher intended - *these,* according to Duit, appear to be the most difficult to modify in instruction.

Both conceptions and misconceptions significantly affect the way in which students learn or try to make sense of information which they encounter. Duit (1994) claims that limited progress in the intended outcome is often observed: "Their preinstructional conceptions are not merely "fuzzy" ideas, but are consistent to an astonishing degree,"(Duit, 1994; 4650) and are thus highly resistant to change. Candy (cited in Strachan 1995) points out that learners are self-constructing which implies that there is some organised belief system around which their constructions are arranged so that behaviour must be seen as purposeful and logical, at least from within the learner's own frame of reference. Individuals create models for themselves which guide their actions, and learning therefore proceeds from personal models which "if not disproved are assimilated into explanatory schema as though they were demonstrably true. After a while they become so thoroughly internalised that to all intents and purposes, they are true for the individual" (Candy, 1989 cited in Strachan, 1995). Once a particular conception is developed and accepted , all further information will be processed against the background of this conception. In this manner conceptions grow and in turn shape the development of other conceptions.

2.4.4 Conceptual growth and change

The educator's role within the constructivist paradigm is thus no longer one of putting information into learners' heads, but rather one of assisting learners in their constructions of knowledge. Learners, according to Resnick and Collins (1994), need to develop organising schemas in order to understand and retain new information. "The richer and more appropriate to the new knowledge these

schemas are, the faster and more fully the new ideas will be assimilated" (Resnick and Collins, 1994; 835). The strategies favoured by educators to assist learners in the development of such organising schema, according to Resnick and Collins, may be divided into two types: conceptual growth, and conceptual change. "Conceptual growth approaches start from aspects of students' preinstructional conceptions that are generally in accordance with the conceptions to be taught"... and "the core of already appropriate ideas is enlarged" (Duit, 1994; 4651) from the learners' preinstructional conceptions to the new conceptions which are internalised. Conceptual growth, therefore, may be attained through sequential development from the learner's existing knowledge. Conceptual change strategies, on the other hand, favour cognitive conflict or dissonance, with a consequent restructuring of existing conceptions. This strategy, according to Duit, is problematic in that students have great difficulty in experiencing and dealing with cognitive dissonance, which they find too demanding, and the benefits of which do not appear sufficiently attractive. The extent to which ideologies are subscribed to will determine, in large measure, the degree of difficulty experienced with cognitive dissonance. Moore (1995) argues that the more *consciously* held and explicit an ideology, the greater will be the ability of an individual to consider alternative forms of practice when presented with alternative guiding ideologies. Contrariwise, the less consciously held an ideology, the more powerfully the ideology may work to legitimate certain practices as "natural" or commonsense (Moore, 1995; 7). Fensham and Northfield (1993) believe, however, that conceptual change will occur with *time* and with consistent *exposure* to the ideas of others, as well as to such experiences which challenge the adequacy of current ideas.

2.4.5 Implications of a constructivist approach

The philosophy of constructivism postulates an approach to learning, the basis of which is that learners are actively involved in the process. It also aims to

extend knowledge by improving investigative and analytical skills. Environmental education focuses on real-life problems and encourages investigation, with the aim of helping learners to develop the knowledge and skills necessary to seek solutions in the environmental domain (Klein and Merritt, 1994). It encourages learner participation not only in the development of investigative and thinking skills, but also with a view to assisting learners in gaining the necessary confidence to clarify and air their own views and beliefs, in relation to others in the group. The responsibility for learning, however, lies with the learner, so that the role of the educator is one of *assisting* learners to construct knowledge.

Ballantyne and Packer (1994) explore the application of a constructivist approach to environmental education as a means of integrating the teaching and development of environmental knowledge, attitudes and behaviour. In terms of this approach, learners construct environmental conceptions according to the manner in which they relate to particular aspects of knowledge, attitudes and behavioural orientations pertaining to an environmental phenomenon (Ballantyne and Bain, 1994). These conceptions in turn influence the way in which they interact with the world. "This implies that since learners may come to a learning task with different conceptions, they will learn different things from the same event" (Driver, cited in Ballantyne and Packer, 1994; 7); furthermore, they will apply what they learn in diverse ways.

It is therefore the contention of Ballantyne and Packer that in the design of meaningful learning experiences, educators need to be aware of the range of conceptions, and also of possible misconceptions, held by learners. Furthermore, educators should recognise that these conceptions may support or interfere with new information presented in learning experiences, which may affect any desired learning outcomes. For example, *support* for existing conceptions is evident when the assimilation of new information involves not a

radical change in conceptions, but rather an extension of current conceptions in order to grasp the new knowledge. On the other hand, *interference* with the assimilation of new knowledge may be attributed to conceptual conflict which requires a shift from one belief system to another (Ballantyne and Packer, 1994). According to Moore (1995), however, "individuals may hold *multiple* conceptions about the same idea, but apply these differently in different situations". He continues by asserting that different conceptions are, however, "related and can be shown to have a form of hierarchy of inclusiveness" (Moore, 1995; 9).

Teaching strategies, therefore, may be designed and employed *either* to change conceptions or remove misconceptions, *or* to extend conceptions. "Thus the constructivist framework provides a teaching approach which links an individual's conception of a phenomenon with their knowledge, attitudes/values and behaviour in relation to that phenomenon" (Ballantyne and Packer, 1994; 10).

The work of Posner, Strike, Hewson and Gertzog (1982) makes the claim that, within a constructivist framework, learning is commonly interpreted to be largely synonymous with conceptual change, which they define to be the *replacement* of existing understandings (and attitudes and behaviours) with a more appropriate alternative. Ballantyne and Bain (1994), however, propose what they feel is a more appropriate interpretation, viz. that of *conceptual enhancement*, the defining feature of which is that it challenges and enriches a learners' understanding by confronting the learner with alternative viewpoints and evidence. During this process no conscious attempt is made to shift the learner from one environmental orientation to another, even though the possibility exists for such a shift to occur (Ballantyne and Bain, 1994). They suggest that teaching strategies which induce cognitive conflict in learners have been shown to be effective in enhancing or developing conceptions. For example, cognitive conflict "motivates learners to resolve dissonance by seeking

new information, or by trying to reorganise their existing knowledge" (Ballantyne and Bain, 1994; 5). Thus Ballantyne and Bain's proposal extends Duit's (1994) argument by declaring that cognitive conflict in learners does not necessarily imply radical conceptual change, but that such strategies may be used to develop conceptual growth by restructuring existing conceptions.

Within the constructivist approach, knowledge is understood to be a construction of the human mind, and therefore an active process. Consequently, learners categorise their experiences in diverse and multiple ways, which result in diverse and sometimes contradictory conceptions. The following section is devoted to the experiences and consequently the beliefs and attitudes of the BEd students (who are teachers) in their working environment.

2.5 Teacher beliefs and attitudes

A new teacher begins work not only with his or her newly acquired teaching training, but also with a life experience, which includes years of formal school education. These experiences enable teachers to shape their ideas, beliefs and their attitudes towards teaching and learning. However, these are also influenced by their working environment which, to a large extent, may be described as one in which the "necessary knowledge, competencies and values are predefined and stored in curricula, tests and accredited textbooks" (Posch, 1993; 26). The expectation, therefore, according to Posch (1993), is that teachers will prepare learners to meet demands which have been defined *a priori*. Furthermore, education at the pretertiary level is situated within a culture which exhibits the following features (Posch, 1993; 26):

- a predominance of systematic knowledge, which favours academic knowledge production, over controversial areas of knowledge and the process of knowledge generation;

- specialisation in subject areas with clearly defined disciplinary boundaries, with a consequent disregard for real-life inter-disciplinary situations;
- a transmission-mode of teaching which facilitates the retention of systematic knowledge and thus discourages reflection and critical analysis;
- a prevalence of top-down communication which facilitates the control of predefined knowledge structures and discourages self-control amongst students or teachers.

These characteristics contribute to the manner in which teachers develop and shape their beliefs and attitudes about education, and hence also the way in which they understand and teach their subjects. Raymond and Santos (1995) suggest that "beliefs expose our fundamental ideas about our life experiences and directly affect our actions whether we consciously acknowledge those beliefs or not" and, "teacher beliefs directly influence teacher actions... and in turn teacher actions affect student's belief systems" (Raymond and Santos, 1995; 58).

The particular beliefs of students are a central factor in the manner in which the course material is assimilated. It is therefore imperative that these attitudes and other factors be taken into consideration in the design of such courses, which will in turn attempt to influence the development of student conceptions of the environment. In the following section the focus shifts to issues relevant to the design of such courses.

2.6 Environmental education and group learning

It has been the traditional assumption that the acquisition of knowledge about the environment would suffice in order to promote a greater awareness of, and more responsible behaviour towards, the environment. However, it is clear that a broader approach is necessary if the desired objectives are to be achieved successfully. The acquisition of knowledge about the environment remains

important, but it is also clear that successful approaches to environmental education must include the development of the proper attitudes, values and skills, in order to promote in society a thoroughgoing appreciation of environmental concerns (Hungerford and Volk, 1990).

It is also important that courses in environmental education be structured in such a way that they provide students with a perspective in which to assess and assimilate environmental issues. Thus a broad, global view should be presented, in addition to coverage of topics having a more specific or more localised significance such as, for example, pollution and deforestation, or environmental problems in developing countries (Turley, 1995).

Environmental education courses therefore aim to develop an approach to learning which give students the opportunity to (Phillips, 1995; 27)

- develop their knowledge and understanding about the environment;
- foster positive attitudes towards the management of the environment; and
- encourage behaviour which is consistent with sustainable development.

However, these aims have to be achieved in courses which are offered to participants holding diverse societal and cultural conceptions of the environment. It is therefore essential that the varying conceptions and needs of the class be identified and taken into consideration in the course design. According to Ballantyne and Packer (1994), courses that favour a constructivist approach to environmental education may, through this approach,

- help students to become aware of different conceptions which they hold;
- compare the relevance and merits of different conceptions;
- emphasise inconsistencies of conceptions; and
- create cognitive conflict within the learner,

thereby encouraging reflection on existing conceptions.

They assert also that a balanced environmental educational programme should incorporate a range of strategies designed to address the dimensions of environmental knowledge, attitudes/values and behavioural orientations (Ballantyne and Packer, 1994;15). They argue that the constructivist approach has been most commonly implemented in the context of cognitive rather than affective or behavioural development (Ballantyne and Packer, 1994), and believe that cognitive development is best promoted through group learning situations which, for example, generate interpersonal controversies.

Central to a constructivist approach in the design of course material is the notion that learning is a group experience. This experience ideally begins when a student is encouraged to adopt a position on an issue in response to differing positions held by other students. Such a situation often encourages questioning, evaluation and criticism of the underlying reasons for promoting a particular line of thinking, in an effort to reach some consensus on an issue. These situations "are seen to be effective in facilitating conceptual enhancement and enabling the learner to integrate and elaborate knowledge in new ways" (Ballantyne and Bain, 1994; 5), because a state of cognitive conflict is aroused, and this motivates the student to seek an understanding of an issue which considers opposing perspectives. "Thus controversies can be used to encourage students to explore problems in greater depth by drawing on the ideas and experiences of others, often with a high degree of emotional involvement and commitment" (Ballantyne and Bain, 1994; 5). Constructive controversies, according to Ballantyne and Bain, should be entertained within environments which encourage students to challenge the ideas of others co-operatively, with a view to solving problems collectively.

Consequently, they claim that "research using the structured controversy instructional format indicates that controversy, compared with concurrence-seeking and individualistic study, promotes higher achievement and retention,

greater searches for information, more accurate understanding of different perspectives, continuing motivation and positive attitudes toward controversy and classmates" (Ballantyne and Bain, 1994; 6).

By having to elaborate on or defend their own conceptions within the group, students develop their conceptions, particularly within the knowledge dimension, but also within the affective and behavioural dimensions, through the process of cognitive conflict. They are in this manner alerted to dissatisfaction with conceptions which they may find inadequate, and the extent of their dissatisfaction will determine whether or not their conceptions will undergo change. Mahlios and Maxon caution that part of the failure of some students to learn programme concepts may be a result of the clash between the views they hold, and those contained in the preparation programmes (Mahlios and Maxson, 1995). The need therefore exists within such programmes to prepare students for changes that are likely to conflict with the values to which they have become accustomed (IUCN/UNEP/WWF,1991; 52). Students should therefore become aware of the aims of the constructivist approach which are incorporated into the programmes, in an attempt to introduce and encourage the processes of reflection on and reassessment of their conceptions.

The emphasis is thus shifted to the educator, who has to facilitate the groups' establishment and grasp of a multiplicity of understandings, with which they have to deal in the constructivist learning process. Cobb (1994) refers to the educators' knowledge and understanding of conceptual development which would guide educators in their selection of developmentally appropriate tasks, which would in turn provide learners with the encouragement to construct their own meanings. Educators therefore remain a necessary part of the educational process, but the thrust of the educator's role undergoes a shift. Within the constructivist approach, therefore, "the view of isolated students interacting with the environment is being displaced by the notion that students are members of

classroom communities" (Cobb, 1994;1050) who justify their thinking as the educator guides their establishment of concensual meanings (Cobb, 1994).

2.7 Environmental Education in the BEd programme at UCT

The environmental education course presented in the BEd programme at the University of Cape Town employs a teaching/learning approach which in the main is characterised by a constructivist approach to the acquisition of knowledge and skills. There is an emphasis on the development of critical analysis while concepts are presented and analysed in co-operative learning situations.

The course aims to help students to develop a personal environmental ethic, so that when they return to their positions as educators, they will be able to promote in schools the teaching not only about and from the environment, but also "for" the environment. The students are encouraged to explore and reflect on their environmental and educational conceptions in a co-operative manner, by being exposed to different ideas, beliefs, attitudes and values about the environment. The student population consists of educators from primary schools, secondary schools and the tertiary sectors of education, who have diverse subject specialisations.

The course content is structured around the history, content and aims of environmental education; these are presented in the context of environmental philosophies. The course also includes a discussion of environmental education as it pertains to the school curriculum. It develops the processes of environmental cognition and learning (Ballantyne, 1995), and incorporates teaching and learning strategies with a view to developing environmental attitudes and behaviour. The course thus involves the students in the process of *reflecting* on their own practices and philosophies, and on those of others in the group. As far as possible the students are exposed to a range of learning

experiences through lectures, case studies, group discussions, selected readings, videos, field experiences and practical projects, to differing arguments and ideas about environmental concerns, with the expectation that they will develop progressive attitudes, teaching practices and skills (Ballantyne, Lidstone and Packer, 1993).

The course co-ordinator attempts to create an environment in which the students may explore, debate and develop critiques of their own ideas, as well as of the ideas of others. In this way the process of cognitive conflict or dissonance is encouraged by initiating topics which are present-day concerns in a technological society. According to Raymond and Santos, students experience cognitive and emotional disequilibration when they encounter ideas which challenge their beliefs, in this instance, about learning and teaching. They contend therefore that "it is through the process of disequilibration that one may examine prior beliefs and attempt to move beyond them to another level of beliefs" (Raymond and Santos, 1995; 59).

The UCT course in environmental education endeavours to include some important characteristics of a constructivist approach to education:

- it offers student-centred instruction which is facilitated by the course co-ordinator;
- it incorporates group interaction as a learning process; and
- it introduces real-life problems for students to address and resolve.

The assessment component of the constructivist approach to the BEd course is addressed directly by the course co-ordinator, who has developed exercises such as poster design, or exercises to simulate real-world challenges. In solving these problems the students operate in a milieu in which a multiplicity of problem-solving strategies exist, and their attempts at solving these problems

provide outputs which permit their progress to be assessed in a meaningful manner.

According to Maher (1986), the coverage of facts and values, the emphasis on student-centred learning, and the incorporation of field studies in environmental education, make the assessment of students' abilities by traditional means difficult. Educators therefore need to design appropriate assessment procedures to determine "whether students can use concepts, knowledge, and skills they have learned by requiring them to perform a task or create a product" (Klein and Merritt, 1994; 16). Assessment in constructivist learning thus pairs the student and the educator as a team that examines new knowledge and habits of mind (Klein and Merritt, 1994),

Chapter 3

Methodology : the use of questionnaires

Environmental education, constructivism and its implications for environmental education have been explored, both in a general manner and by way of providing a perspective on the course in environmental education. Research on student attitudes has been carried out primarily through the administration of two questionnaires. In this chapter the research methodology is described in greater detail and the opportunity is taken to describe the framework underpinning the design of the questionnaires.

It is worth reiterating that the central question addressed by this thesis is the following:
In what ways do student conceptions of the environment shift, during the process of the BEd elective in Environmental Education?

As a means of addressing this question it is useful to try to establish what Chou and Roth (1995) refer to as the constructs underlying identified environmental concepts because it is the learners' constructs which make their personal understanding meaningful. According to Blaikie (1995), people interpret their environments with experiential, technical, cultural and value-laden means, thus constructing their individual worlds in a social manner. He continues that they may, however, "be locked into a particular spatial structure of work and residence and a linking transportation system which makes it difficult for individuals to respond to environmental demands" (Blaikie, 1995; 204). This suggests that without alternative stimuli, people may be less likely to become aware of - and therefore to respond to - environmental issues and demands.

The constructivist approach to environmental education is a way of encouraging a more dynamic interpretation of the environment, by developing in individuals the ability to be analytical and critical of the social and value-laden means which they use to construct their worlds.

3.1 The development of the questionnaire

This research attempts to gain insight into the environmental conceptions and experiences (knowledge, attitudes, values and behavioural orientations) of the students in the BEd group, and consequently, the ways in which these conceptions shift or remain stable as they engage with the course in environmental education.

3.1.1 Sources of information

As a precursor to the questionnaire, information relevant to the subject matter was assimilated from a variety of sources:

- literature reviews were carried out in the fields of
  environmental education
  constructivism
  conceptions of the environment
  survey research;
- the course co-ordinator offered guidance on the structure and intentions of the course;
- informal interviews were conducted with the students with a view to clarifying their conceptions about the environment and their goals, as teachers, in relation to the aims and claims of environmental education;
- classroom and field observation were carried out - these form an important component of qualitative assessment of the students;
- student opinion on environmental knowledge, values, attitudes and behaviour was surveyed using questionnaires.

3.1.2 Informal interviews and classroom observations

Positivist-based research aims to explain laws based on the observation of facts while postpositivist research is qualitative and aims to elicit personal understanding. Qualitative research often uses methods such as interviews in an "attempt to characterize the kinds of beliefs that people espouse" (Robertson, 1994; 24). Thompson (1992) cautions that a structured questionnaire may be problematic in that it blunts the "voice" of the respondent under the agenda of the researcher. He suggests that open-ended questions and informal interviews ensure that the researcher relaxes control over a structured questionnaire. In the case study informal interviews were conducted with a random sample of five students, during the latter stages of the course. The purpose of these interviews was to elicit views and to clarify what students thought about the environment. Likely changes in their teaching habits, as a result of having completed the course, were also discussed in these interviews. The informal nature of the interviews served the purpose of encouraging students to express themselves freely.

In addition to the interviews, field and classroom observations were carried out. These served as a further source of data on student dispositions towards the environment, and on their interactive skills in learning and teaching about the environment. The observations were also a source from which to make inferences about the students' understanding of, and ideas and beliefs about, environmental education (Brown and Borko, 1992).

It is important to be clear about the constraints within which the results of observations and interviews should be evaluated. Candy (1989), cited in Strachan (1995), suggests that methods such as observation fail to yield information about *intentions,* and furthermore, that interviews often *assume* that respondents are able to *articulate* their understandings and intentions utilising

vocabulary which they share with the interviewer. Furthermore, data from observations may be distorted through the construct system of the observer. Thus, in striving to access individual respondents' world views, it is vital to acknowledge and consider the implications of unique and multiple realities that exist in the human mind, which are used to construct varying hypotheses as individuals attempt to make sense of their experiences.

3.1.3 The constructivist approach

Constructivism has been discussed in some detail in chapter 2, so that a repetition of those details here would be redundant. It is salient, though, to recognise that the research which forms the basis of this study has been conducted using a constructivist approach, so that constructivist views will have informed the questionnaire phase of the research. The constructivist approach needs to be initiated from the assumption that certain elements of individuals' worlds are given and shared with others; thus the methods of data collection in this research should include, in this context, participant observation, open-ended interviews, as well as questionnaires comprising open-ended and closed questions. Robertson (1994) argues that because the investigator is the "primary instrument for gathering and analysing data", this approach to research is explicitly interpretive and, furthermore, "there is explicit recognition that all observations and analyses are filtered through the researcher's world view, values and perspectives. Hence, interpretive research involves the explication of something through the eyes of another; for example, the exploration of an individuals' conceptual understanding by careful analysis of his or her explanations" (Robertson, 1994; 24). Thus, the conclusions derived from this research will, to a degree, be limited by the researcher's constructions of the respondents' conceptions.

3.2 The questionnaires

Basic information about the students, as well as information about their opinions were obtained through the administration of two questionnaires. These questionnaires constituted a major source of data gathering, and served a two-fold purpose:

- to obtain information about the conceptual understandings of learners; and
- to provide insight into the students' conceptual development, and in so doing to provide opportunities for the development of innovative learning and teaching strategies.

According to Posner et al, "it is important to find out just what epistemological commitments students have, if one wants to understand what they are likely to find initially plausible or implausible and more generally, to understand their processes of conceptual change" (Posner et al, 1982; 218).

The initial questionnaire had been administered to the group in May 1995 by Kevin Winter of the Department of Environmental and Geographical Science at UCT, who was the course lecturer. This questionnaire had been designed to establish base-line student conceptions about environmental concern. "Identifying learners' prior beliefs and knowledge forms the starting point for the design of successful learning experiences according to a constructivist viewpoint" (Ballantyne, 1995; 43).

The second questionnaire was adapted from the first, and was administered towards the end of the course, in October 1995. It was designed to determine and evaluate the ways in which student conceptions had shifted as they engaged in "the process of meaning construction in which learners change, develop and build their conceptions" (Ballantyne 1995). By the end of the course, the students had been exposed to alternate learning procedures which encouraged group interaction and consequently reflection on, as well as a

reassessment of, their environmental conceptions. Such learning procedures encourage learners to reconsider their understanding of the environment and consequently, to engage in a process of reconstructing meaning.

The questionnaires include Likert-scales to order responses to certain attitudes, knowledge, values and beliefs about the environment. The closed-ended questions have the potential to indicate any statistically significant relationships between the underlying constructs, by using variables such as sex, school or involvement in environmentally related activities (Chou and Roth,1995). For example, a question in the second intervention addresses the impact of the course on

- previously held values;
- group participation;
- behaviour towards the environment;
- ability to express ideas; and
- interest level in the environment .

Each of these five attributes is assessed using a five-point scale from "strongly agree" to "strongly disagree" with a midpoint of "undecided" (Ballantyne, Lidstone and Packer, 1993). The first three may be statistically analysed using variables such as sex, or involvement in environmentally related activities, to evaluate the constructivist approach in environmental education; the last two provide information about the "tangible" impact of such an approach.

The short-answer questions are more complicated to describe and quantify, due to their partially open-ended format (Raymond and Santos, 1995). These, together with the informal interviews and classroom observations, constitute qualitative methods of investigating conceptions. For example, the respondents' written statements to the open-ended questions about what they understand environmental education to be, are examined in both questionnaires so as to

determine the ways in which their understanding evolved over the duration of the course.

A major problem associated with any research which investigates student learning is that the investigator cannot be certain about the validity of the data. The investigator has no way of measuring the honesty of the students' responses, either from the questionnaires or from the interviews. Ballantyne (1995) poses the following question: "are students reporting their own ideas or those which they feel they are expected to give"? (Ballantyne, 1995; 32). Therefore, in this research the students were informed of the value of their **personal** responses, and were also assured that their responses would remain confidential.

In summary, then, the purpose of the questionnaire phase of the research was

- to aid in the analysis of baseline conceptions which students hold of the environment and environmental education;
- to provide data which may be utilised in the analysis of initial student expectations; and
- to elicit feedback from students on such issues which may assist in evaluating the development of student environmental conceptions.

3.3 Questionnaire design and composition

The questionnaire format included open and closed-ended questions for the following reasons:

- open-ended questions would encourage students to freely express their feelings and opinions without being influenced by a structure designed by the researcher, while

- closed-ended questions were formulated to focus on specific areas in environmental education, designed to measure the development of conceptions, and to allow for quantitative analysis of trends.

3.3.1 Composition of Intervention 1

This questionnaire was administered in May of 1995 after an initial needs and expectations survey (March 1995) had been completed. The initial survey analysed responses to the questions;

- what is environmental education all about? and
- what can be expected from a course in environmental education?

The responses to the initial survey were incorporated into the responses to the first questionnaire, and this total set of responses constitutes the first intervention.

The questionnaire for Intervention 1 comprises five sections:

1. *Section A* consists of biographical questions.
2. *Section B* addresses the environmental education course policies, practices and evaluation.
3. *Section C* assesses the students' overall preparedness for the course and their confidence to use environmental education principles in their teaching.
4. *Section D* incorporates student expectations with the intention of assessing the degree to which these expectations are fulfilled by the course.
5. *Section E* assesses the level of teacher commitment to change (Ossowski, 1994).

Only the data most relevant to the present study was extracted from the first intervention. For example, the biographical data section revealed data about the number of years of teaching experience which the students had. This was not repeated in the second intervention.

The questions from the first intervention used in this research are reproduced below, together with the reasons for selecting them:

Section B, Question 2:

Relevance of Content	

(Is the subject matter relevant to what you feel Environment Education should be?)

Comment

.....

.....

This relates to the students' conceptions of environmental education at the start of the course.

Section B, Question 4:

Teacher Development: Skills	

(Do you feel satisfied with your own development in terms of skill development thus far in the course?)

Comment .....

.....

.....

A) *Have you developed any new skills in Environmental Education*?

.....

.....

This question addresses students' personal assessment of their skills development.

Section B, Questions 5 and 6:

Teacher Development: Knowledge	

(Do you feel satisfied that your knowledge towards the environment has developed?)

Comment .....

.....

Teacher Development: Attitudes	

(Do you feel satisfied with your own development in terms of your attitudes towards the environment ?)

Comment .....

.....

.....

A) *Have your attitudes towards the environment changed? Comment further.*

.....

.....

.....

The aim here was to assess knowledge about, and clarify attitudes towards, the environment.

Section C, Question 1:

Did you feel adequately prepared for doing this course?

YES	NO

*If **YES**, in what way?

.....

.....

*If **NO**, in what way?

.....

.....

This question evaluates the degree to which the student felt prepared to embark on this course of study.

Section C, Question 2:

Do you understand the course objectives?

YES	NO

Comment

.....

.....

.....

Here the students' understanding of the course objectives is explored. The question is a useful way of assessing their conceptions of the environment, as well as of *educational development* (that is, the teaching of facts against the teaching of values and attitudes).

Section C, Question 3:

Do you feel confident to use the principles of Environmental Education in your teaching?

YES	NO

*If **YES**, why?

.....

.....

*If **NO**, why?

.....

.....

This relates to the students' attitudes towards using environmental education in their teaching.

Section D

To what extent are the following needs/expectations fulfilled by the Environmental Education course?

KEY:

INADEQUATELY	1
ADEQUATELY	2
WELL	3

1. Broaden Environmental knowledge	
2. Resource development	
3. Skill development	
4. Promote an Environmental ethic	
5. E.E. concept clarification	
6. Provided an E.E. theoretical basis	
7. Develop critical and analytical skills	
8. Given confidence to promote and practise E.E. in schools	
9. Broaden teaching experience	
10. Creative teaching	

Here students' conceptions of environmental education are assessed, by considering how they describe their expectations.

A complete questionnaire is attached as Appendix 1.

3.3.2 Composition of Intervention 2

The following categories were used to guide the framework of the second intervention:

- student constructs and conceptions;
- students' conceptual knowledge about environmental education;
- student environmental awareness and behavioural orientations;
- the development and realisation of emerging attitudes;
- student conceptual change and skill development.

According to Ossowski (1994), teachers require certain conceptual and behavioural competencies to assume the roles of effective environmental educators. Furthermore, these competencies are basic to the requirements of any effective teacher education programme and are related to the above categories.

The second questionnaire was administered in October 1995 at the end of the environmental education course, and was designed to elicit such information which would assist the researcher in determining the development of, and changes in, student conceptions of the environment.

The questions constituting the questionnaire are reproduced below, and in each case are followed by pertinent comments.

Questions 1 to 3:

1. Please state the **name** and **province** of the school at which you teach.

   _____

2. a) Please indicate whether the school is in a *(✓ appropriate box)*

rural		urban		peri-urban		area.

   b) Please indicate at which level you teach *(✓ appropriate box).*

primary school		secondary school	

3. What is/are your main teaching subject/s? _____

The first three questions of the intervention request factual data which provides information about the schools at which the respondents were teaching. This data is useful in that it is likely that the responses are related to the types and locations of the schools at which the respondents teach.

Questions 8 and 9:

8. **Prior to doing this course**, which of the following activities did you participate in? *(✓as many as appropriate)*

[ ] watching environmental films, television programs
[ ] gardening with indigenous plants
[ ] conserving water (e.g. turn off dripping taps, shower rather than bath)
[ ] conserving electricity (e.g. switch geyser off when not in use)
[ ] using alternative energy sources (e.g. solar heating)
[ ] recycling (e.g. paper, tin, glass, plastic)
[ ] recycle organic matter (compost)
[ ] other, please specify

9. How often are the following environmental concerns addressed at your school? Use a scale of 1 to 5, where 1 = very often, 2 = often, 3 = seldom, 4 = not at all and 5 = don't know *(✓appropriate value)*.

1	2	3	4	5	observation of Arbor Day (i.e. tree planting)
1	2	3	4	5	recycling practices (i.e. paper, glass, tin, plastic)
1	2	3	4	5	integrating environmental concerns into subjects across the curriculum
1	2	3	4	5	through fieldwork (e.g. cleaning up rivers)
1	2	3	4	5	through litter campaigns (picking up papers)
1	2	3	4	5	emphasising the importance of saving resources (e.g. paper, water etc.)
1	2	3	4	5	other, please specify

Question 8 assesses the level of environmental awareness and behavioural orientations at the personal level, while question 9 aims to elicit information about the influence of the work environment on environmental conceptions.

Questions 10 to 13:

10. Has this course changed your attitudes to the environment with regard to the following? *(please answer all questions)*

	Yes	No
The course merely reinforced previously held views about the environment		
I pay more attention to environmental issues		
I am more aware of conserving resources		
I now realise the value of impact assessments		
Other (please specify):		

11. As a result of your involvement in this course, do you feel a greater **commitment** to the following environmental practices? *(please address all options)*

	yes	some-times	not sure	no
conserving resources				
fighting pollution				
engaging in anti-litter campaigns				
encouraging environmental awareness				

12. If this course has altered your attitudes and values about the environment, would you describe this change as being *(✓ appropriate option/s)*

1	the result of you having internalised the views of the lecturer
2	you have developed the ability to formulate new ideas about the environment
3	exposure to the ideas, attitudes and values of other students in the course
4	other, please specify:

13. If this course has **not** altered your attitudes and values about the environment, please explain why you think this is so.

The first two questions are concerned with an assessment of attitude change as a result of engaging in the BEd course, while question 12 aims to discover the reasons for this change. This is followed by a question which explores the possibility of the course not having effected any change in attitudes and values.

Questions 14 to 16:

14. Kindly describe in a few sentences how this course has changed the way you teach or intend to teach in the future.

15. Please rate each of the following on a scale of 1 to 5 where 1 = strongly agree, 2 = agree, 3 = undecided, 4 = disagree and 5 = strongly disagree *(✓ appropriate value)*.

1	2	3	4	5	This course has caused me to question previously held attitudes/values about the environment.
1	2	3	4	5	My values/attitudes towards the environment have been influenced by group participation in this course.
1	2	3	4	5	This course has affected my behaviour towards the environment.
1	2	3	4	5	This course has improved my ability to express environmental ideas and knowledge.
1	2	3	4	5	This course has encouraged me to take a greater interest in and observe what is happening in the world around me.

16. **Having done this course**, has your attitude towards environmental protection changed?

    a) If yes, how and why?

    b) If no, why not?

The final group of questions aims to evaluate the impact, or otherwise, of the course on students' perceptions and attitudes with regard to the environment. Question 14 seeks to evaluate the impact of conceptual change and skills development on actual or potential changes in the incorporation of environmental issues in their teaching, while question 15 assesses the ways in which the course impacts on conceptual development. The final question takes a global approach, asking students to comment on the overall impact of the course on their knowledge about, and attitudes towards, environmental issues.

Chapter 4

Responses to the questionnaires: presentation and analysis of results

The previous three chapters have reviewed and discussed a range of topics; these may be regarded as constituting essential background to addressing the main goal, which is that of investigating the influence of the BEd environmental education course on the development of students' conceptions of the environment. This chapter is concerned with a presentation of the results obtained through the two sets of questionnaires and with an analysis of these results. The chapter aims to

- identify shifts in attitudes by comparing the responses to the needs and expectations survey with those to the first intervention;
- assess the impact of the course on student conceptions by further comparing the responses obtained from the first intervention with those found from the second intervention;
- extract from such an analysis trends in the development of students' thinking with regard to the environment, as well as the specific factors which may influence such development.

A phenomenographical approach is adopted in this analysis; that is, the aim is to *use* the individual responses to obtain an indication of overall trends with regard to students' conceptions (of environmental matters), rather than to focus on and track individual responses. The key strategy becomes that of recording the frequency with which various conceptions emerge in the total pool of data, at the

beginning and towards the end of the course. In this way it is possible to obtain an overall description of changes in perspectives, and the reasons for such changes. Ballantyne (1995) discusses further aspects of the phenomenographical approach in the context of his investigation (Ballantyne, 1995).

The remainder of this chapter is organised as follows. Section 4.1 details the manner in which information was extracted from the questionnaires; also presented in this section are factual details, obtained from the first questionnaire, of the locations by province, and the rural-urban location, of the schools at which the students teach, as well as their subject specialisations.

Section 4.2 summarises and analyses responses to the first questionnaire, with a view to constructing patterns of student conceptions when they entered the course. Section 4.3 presents the responses from the second questionnaire and analyses the results to assess shifts in student conceptions of the environment. Lastly, Section 4.4 provides an analysis of the data by making further comparisons between the two interventions, and by extracting trends in the development of student thinking.

4.1 Preliminary data: the environments in which the students teach

The questionnaire results are of two kinds: results obtained from the responses to the closed-ended questions, that is, questions requiring that a response be selected along a scale; and qualitative results, based on the various descriptive responses.

The data contained in the responses was extracted by following a fixed set of procedures:

- each questionnaire was numerically coded to allow for identification subsequent to analysis;
- responses to closed-ended questions were coded with an ordinal scale to allow for computer-aided analysis, and the categorised responses were entered into a database;
- tabulations relating two variables in a particular category were organised;
- open-ended responses were categorised to provide a description of diverse and similar conceptions of the environment held by the students.

While the identity of individual respondents remains confidential, other demographic data about the students provides useful information which may be used to determine particular groups within the population set. For example, primary school teachers may respond differently to secondary school teachers.

The following table summarises information pertaining to the students' teaching environments.

Table 4.1 The teaching environments of the target group

Number of teachers	27
Teaching experience	Between 2 and 25 years, with an average of 13 years experience
Teaching location	56% Western Cape 15% Eastern Cape 7% Gauteng 4% Northern Cape 18% did not respond to this question
Subject specialisation	A little more than one third of the group are primary school teachers. While there is a fairly even spread of subject specialisation within the group of secondary teachers, who constitute just under two thirds of the total, the better represented subjects are Religious Education, languages and Music.
Rural-urban breakdown	21 (78%) teach in urban areas 4 (15%) teach in peri-urban areas 2 (7%) teach in rural areas

Some consideration was given to analysing the data on the basis of a rural, urban and peri-urban divide. However, the ratio of rural/urban/peri-urban in this group is 2:21:4; this degree of imbalance, coupled with the fact that two of the categories were too small for any meaningful statistical analysis, militated against a proper analysis using these categories, so that the particular locations of schools at which the students taught was subsequently not taken into account. At the same time it is fair to point out that the results of this

investigation may, not unreasonably, be interpreted as those associated with a largely urban group.

4.2 Responses to Intervention 1

The purpose of this section is, firstly, to summarise aspects of the responses obtained from the first questionnaire. These results will also be used here, to construct a picture of the governing patterns of conceptions held by the students, early on in the course. The results are discussed under the headings of key categories addressed in the questionnaire.

4.2.1 Expectations and needs

In the first intervention students were asked what they expected to gain from a course in environmental education.

Seventy percent of the group considered the acquisition of new ideas for the development of skills and teaching practice to be of prime importance. The following are a few examples of the responses to this question:

"Development in my understanding of the issues, concrete possibilities of introducing environmental education into class/school situations - not "airy fairy" notions of saving the planet at some distant point".

"I expect to learn about the interaction between the school and the environment, as well as how we can maintain and improve our environment".

"A more detailed and exciting way of conducting it or presenting it (environmental education) in my community for the goal of the whole society".

"To be more aware of my surroundings. Gaining more skills for the teaching of environment in my class".

*"To get ideas for my classroom on how to integrate mathematics and environmental education. How to make EE (*environmental education*) more relevant to my pupils. Their total association with EE is picking up papers".*

Other students expected to;

- acquire awareness (11%) of the environment:

"I want to be involved in more awareness programmes concerning environmental education".

"Is to give more awareness about the environment".

"How to teach students about their own environment, making them more aware of it in order to appreciate and enjoy".

- acquire skills (15%) in order to care for the environment, and to gain knowledge of appropriate actions that will minimise the impact on the environment:

"I expect to hear more about what the surroundings should be like and how we as human beings should behave"

"I wish to be environmentally educated myself and then wish to take this knowledge to my students - to know what specific issues are presently topical, how they are being legislated (if at all) and how communities can become involved".

- improve knowledge (4%) about the environment:

"I expect to improve my knowledge as far as the environmental education is concerned".

The range of responses with regard to expectations is summarised in Table 4.2.

Table 4.2 The distribution of expectations and needs

Expectation or need expressed	Number of responses
To acquire new ideas	19 (70%)
To become more aware	3 (11%)
To acquire behavioural skills	4 (15%)
To improve knowledge	1 (4%)

These results indicate that the group of students embarked on this course largely for the purpose of adding an environmental dimension to their teaching skills. The responses contained no explicit reference to the possibility of the course leading to a change in attitude towards the environment, so that an understanding of the role of environmental education in developing an environmental ethic appears to be absent.

4.2.2 Preparation for the course

The question "did you feel adequately prepared for doing this course?" (Question 1 in Section B) had only a 46% response (11 in a sample of 24). Of those who responded, the results showed that as many students felt inadequately prepared for the course as those who believed their preparation to be adequate. Those who believed that they were inadequately prepared gave reasons such as that they did not know what the course entailed, or that they were not prepared for the course.

Those who felt prepared attributed this position to

- prior involvement in environmental education projects at school;
- an ability to identify with the course content; and
- prior involvement in environmental education issues.

While the majority of the students (83%; n=20) indicated that they understood the course objectives (Question 2 of Section C), very few made comments to support this assertion. Those who did, understood the main objective to be that of developing environmental awareness. This could imply that at this early stage in the course, these few students realised and understood that the course entailed more than simply the teaching of facts about the environment. It should be borne in mind though, that the results from the needs survey suggested that the students entered the programme to: acquire *new ideas (70%), to achieve greater awareness (11%), to improve their knowledge (4%)* and to *develop environmental education teaching and behavioural skills (15%).*

4.2.3 Environmental literacy

Question 2 of Section B sought to understand the levels of environmental literacy. Some of the responses obtained were:

"Pupils are able to learn about their own environment and how to care for it. It is unlike what we used to do; pupils of urban areas learning about cows and kraals - things they are not familiar with."

"Yes, we are covering not just the theoretical aspect to the course, but the practical as well".

"Yes, it is much broader than the popular conception of EE as conservation of wildlife or recycling".

While 21% (n=5; sample of 24) of the group conceive of environmental education as being holistic in approach, 13% (n=3; sample of 24) felt that the course should provide guidelines for making squatter communities more environmentally aware:

"I definate(ly) find the relevance but I am battling with the implementation".

"Yes it is but some other factors concerning guidelines can be available of how someone can help a community who lives in squarters (squatter camps) can upgrade its environment".

These perceptions, along with those observed from the needs and expectations survey, also veer in the direction of the need to develop teaching skills rather than developing an approach which would equip people to deal with environmental crises, socio-political justice, or develop an environmental ethic.

4.2.4 Development of student knowledge

Virtually all of the students responding to Question 5 of Section B felt that their environmental knowledge had changed in the brief period since they had embarked on the course, with 50% (n=12) expressing a need to acquire *more* knowledge. One respondent did declare, however, that s/he had experienced very little development of her environmental knowledge, if any at all. (This particular student responded negatively to the entire first questionnaire. In constructivist terms, this is reminiscent of what is known as an anomaly; according to Posner (1982), "An anomaly exists when one is unable to assimilate something that is presumed assimilable - or (in other words), one simply cannot make sense of something" (Posner et al, 1982; 220).

Only the first intervention was used to assess the acquisition of knowledge because it is during the first half of the course (that is, during the first semester)

that the environmental knowledge component is emphasised, whereas the second half of the course treats the development of critical and analytical skills. The course co-ordinator, however, reports that the group appeared to need more time to cope with the environmental knowledge component of the course. This could be one reason why the students expressed the need to acquire *more* knowledge. Alternatively, Resnick and Collins (1994) highlight the time-consuming nature of knowledge construction, and emphasise that attempts to "get through" a syllabus are less likely to achieve significant learning. Students should be encouraged instead to develop a conception of learning which shifts from knowledge acquisition to the *active* construction of knowledge. Students, however, have to be convinced of the value of such a mode of learning. A large number of students do believe that they learn more through the acquisition of knowledge, and may therefore find the conflict-laden or dissonant nature of constructivist strategies too demanding.

4.2.5 Skills development

The results from Question 4 of Section B reveal that the students were satisfied with only certain aspects of their skills development at that stage of the course. The following table gives details of the responses to this question.

Table 4.3 Skills development (sample of 24)

Response	Number of respondents
Skills have developed but need more knowledge	4 (17%)
Have learnt to teach in a more holistic manner	1 (4%)
More resource management oriented, e.g. recycling	2 (8%)
Critical thinking, verbal and written skills have improved	5 (21%)
More aware of environmental issues and have taken ownership of more knowledge	8 (33%)
No response	4 (17%)

This table suggests that knowledge acquisition is still of prime importance to the students. However, 21% of the group acknowledged that their critical thinking and their verbal and written skills improved as a result of the course. Nevertheless the results do indicate a sense of dissatisfaction with the level of skills development, with regard to the integration of environmental education into their teaching; only 4% felt that they had learnt to teach in a more holistic manner. Also, the quest for more knowledge had not yet been satisfied.

It could be debated whether students would develop further skills once they had acquired enough knowledge, and whether these skills would cause behavioural shifts which in turn, would influence shifts in analytical skills enabling them to construct their own knowledge.

4.2.6 Attitudes towards the environment

Student attitudes and values are of particular importance in environmental education, as well as in the development of an environmental ethic in society in

general. This part of the questionnaire (Question 6 of Section B) aimed to assess students' awareness of the environment early on in the course. Later comparisons between intervention 2 and the results obtained at this early stage would indicate whether they *recognised* any significant attitudinal or behavioural changes.

The main reason offered (29%) for the change in attitude towards the environment (since the expectations and needs survey was carried out) was a *heightened awareness* . For example:

"It has changed because what I've learnt from this course made me to be environmentally aware. Yes I was before, but after learning a lot from this course I am now very much aware of the environment"

"*Yes, gradually changed because I'm too conscious about hips (heaps) of garbbage (garbage) that are damped (dumped) in our township, running water and others".*

Other reasons offered for changes in attitude included a need to preserve natural resources and the holistic approach of environmental education; on the other hand, one student expressed a need to understand the course before s/he would be in a position to assess any change in attitude.

A total of 17% of the respondents felt that they could not identify any change in their attitudes, either because their existing attitudes remained the same, or because they had in any case held positive attitudes concerning the environment, and these had merely been reinforced. For example,

"*Not changed, rather re-enforced to continue making others aware of our collective privilege to live in this environment".*

"No, I need first to understand what it all covers and be able to combine it with the knowledge I already have in nature study or environment study. They (attitudes) would change noticebly if my understanding is improved".

The responses regarding changes in attitudes are summarised in quantitative form in Table 4.4 below.

Table 4.4 Reasons offered for changes in attitude (sample of 24)

Reason given	Number of respondents
Heightened awareness	7 (29%)
Preserve resources	4 (17%)
Holistic approach of EE	5 (21%)
Need to understand EE	2 (8%)
No response	2 (8%)
Reinforced attitudes/remained the same	4 (17%)

4.2.7 Conceptual change and skills development in future teaching

The question, *"Do you feel confident to use the principles of EE in your teaching?"* (Question 3 of Section C) attempted to clarify the skills component, and to understand levels of confidence in promoting EE, as well as their experience of new learning theories.

A total of 54% (n=13; sample of 24) felt that they were confident about applying EE principles, but their comments revealed that at this stage only 25% (n=6) believed that EE principles could be incorporated across the curriculum. Additional comments included the following:

"EE is a life-long process"

"Will try to apply as many as possible"

"Will help people to become environmentally literate".

A small number (8% (n=2)) felt confident but indicated that *"school demands would leave little time".*

Comments such as these, however, give little indication of the level of students' understanding of what environmental education principles are, nor do they show any evidence of development of their conceptions of learning/teaching theories.

4.2.8 Fulfilment of needs and expectations

Section D of intervention 1 attempted to understand the extent to which students believed their needs had been fulfilled. The expectation was that the results would shed some light on their conceptions about the way they taught or intended to teach.

Table 4.5 Fulfilment of needs and expectations (sample of 24)

Response	Inadequately (%)	Adequately (%)	Well (%)
Broaden environmental knowledge	13	25	63
Skill development	21	46	33
Promote an environmental ethic	8	29	63
Develop critical and analytical skills	13	38	50
Confidence to promote and practice EE in schools	13	38	46
Broaden teaching experience	8	25	63

Table 4.5 reveals that, not only did the students' environmental knowledge and teaching experience develop, but that the development of an environmental ethic

was rated equally with knowledge development. While the development of critical and analytical skills was rated less satisfactorily, there is at this early stage in the course, evidence of some shift (in student environmental conceptions) from the acquisition of more knowledge, or the development of teaching skills, to the development of analytical skills.

The above results indicate that between the needs and expectations survey and the first intervention some shift had occurred. For example, the students appear to be more aware of developing analytical skills. At this stage it is questionable, however, whether they really are developing these skills or whether they are simply becoming familiar with the terminology used in the course. Alternatively, the results could be an indication of the students starting to engage in the processes of cognitive conflict or disequilibration (Raymond & Santos, 1995), which can result in conceptions shifting from one extreme to another before they stabilise into what the student will make his or her own.

4.3 Responses to Intervention 2

This section presents the responses obtained from the second questionnaire. These results will be used to assess whether any significant orientations or shifts in conceptions might have occurred.

4.3.1 Reasons for choosing to study environmental education

Questions 4,5,7 and 9 address the personal and social constructs which could have influenced the environmental conceptions which the students hold. Question 5 sought to elicit information about the factors which may have encouraged students to select environmental education as a course of study. The response to the survey however, was poor. The most significant result showed that 70% (n=19) of the group were exposed to environmental issues through the media. While recognising that the group will have made use of both

the printed and electronic media, this result correlates well with Question 7, which confirmed that 70% live in homes which have electricity and a television set.

According to Palmer (1995), television has become a major influence on peoples' knowledge and attitudes, and society has, as a result of the media as well as the efforts of environmental organisations, become more aware of environmental issues. However, adults may also take the content of television programmes, amongst other influences, to represent the values in which society as a whole really believes (IUCN, 1991). According to Hungerford and Volk, however, "environmental education media efforts tend to focus on the awareness level (which tends to be ineffective in changing behaviour) and often fail to reach a large audience of learners" (Hungerford and Volk, 1990; 17).

Furthermore, media coverage tends to concentrate on specific environmental issues, thus promoting these as the major form of environmental education. The media should "be enlisted as allies in promoting social change" (Hungerford and Volk, 1990) with the aid of journalists who are *environmentally educated.*

Question 4 further tried to establish the reasons why the students in the BEd programme chose to study environmental education. The most significant responses (in a sample of 27) expressed the need felt by the students to become environmentally literate (78%; n=21), to learn something new (70%; n=19), and to broaden general knowledge (67%; n=18). It therefore cannot be said that these students chose to do environmental education because of their interest in environmental concerns, or because they had "well developed and established pro-environment attitudes and behaviour" (Ballantyne & Bain, 1994; 11).

Question 4, however, did not make allowance for suggestions about how the students expected to achieve environmental literacy, or what their perceptions of environmental literacy were. The descriptive comments, however, to the question "*Is the subject matter relevant to what you believe environmental education should be?*" (Section B, Question 2 : see Section 4.2.3) revealed that students felt encouraged to learn more about the environment and so to become environmentally literate because they were exposed, through practical participation, to the relevance of the environment in their daily lives.

4.3.2 Student environmental attitudes

The second intervention (Question 10) reveals that on average *74%* (n=20; sample of 27) believed the course reinforced previously held views about the environment. The discrepancy between this response and that obtained in Intervention 1 (see Section 4.2.6 refer to 17%) may indicate either that the respondents misunderstood the question, or that the approach used in this course resulted in the students assimilating what they learnt, and taking ownership of this knowledge without fully realising that they had done so. Alternatively, they might have held these views previously, but have learnt, through the course, to access and voice their ideas by reflecting on their beliefs and gaining the confidence to declare them. Resnick and Collins (1994) refer to learners who already have large amounts of knowledge appropriate to the learning situation: such students are most likely to benefit from the educational opportunities offered.

The closed-ended responses from intervention 2 (Questions 10 and 11) also reveal that as a result of engaging in the BEd course, students' attitudes have changed because they *pay more attention* (96%; n=26) to environmental issues and are *more aware* (96%; n=26) of conserving resources. They also exhibit behavioural change by showing a greater commitment to conserving resources (89%; n=24), fighting pollution (59%; n=16), engaging in anti-litter campaigns

(56%; n=15), and encouraging environmental awareness (89%; n=24). This shows a clear shift from intervention 1 where 29% believed their attitudinal change resulted from a raised awareness.

Question 12 measures the reasons for the above attitudinal and behavioural change. The responses are summarised in Table 4.6. It is seen there that 74% of the respondents believe that their attitudes and values about the environment have undergone a change as a result of the *ability to form new ideas* about the environment, while 37% of the group attribute this attitudinal change to exposure to group interaction. While the constructivist approach advocates the use of the structured controversy approach to induce cognitive conflict, with the intention of developing personal environmental conceptions, this result offers little support for this argument. Clearly group interaction is not viewed at this stage as an important influence on attitude change. Only 15% attribute attitudinal and behavioural change to the internalisation of the lecturer's views.

Table 4.6 Reasons offered for attitudinal change (sample of 27)

Reasons given	Number of respondents
New ideas	20 (74%)
Group interaction	10 (37%)
Views of lecturer	4 (15%)

Students were asked to select all the appropriate options in this question, so that the response rate is greater than 100%.

Students generally believed that the course had effected some change in their attitudes and values, so that Question 13 ("*If this course has **not** altered your*

attitudes and values, please explain why you think this is so") elicited a very poor response (11%; n=3).

Given that only a small percentage of the students in the group actually participated in group discussion or debate, the perceived benefit from such activity is therefore not necessarily through *participation* in the activity, but may be through *observation* of the activity. For group activity to achieve full participation, the students need to have developed a requisite level of confidence in order to give voice to their views and ideas. Without full participation, the group is only exposed to the ideas and values of those students who are confident enough to speak out on various issues. From observation of group activities, it is evident that students who have had the opportunity to develop habits of language which facilitates questioning and elaboration are better able to deal with the demands of the formal learning situation (Resnick and Collins, 1994). The majority of students in this group were Black (70%) and the impression gained by the researcher was that their participation in group discussion was minimal. This may well be as a result of the school system in South Africa through which these students passed.

Education in South Africa has been segregated, with the Black educational system placed firmly at the bottom end of a hierarchy, in terms of resources and quality of education provided. Furthermore, modes of learning in South African schools generally are traditionally rigid, with teachers assuming the role of sole sources of knowledge, and leaving little opportunity for the development of group discussion as an avenue of exploration. Coverage of topics has been dictated largely by prescribed syllabi, from which teachers have seldom deviated.

It is possible that the lack of participation in group exercises is because these students have not been exposed to environmental topics or issues, or even to learning habits, to the same extent as the rest of the group. Consequently their

root beliefs or ideas about environmental education, as well as their confidence to participate in group activities, might be less developed than the rest of the group. "Group interactions should be facilitated and managed in such a way that all students feel free to participate and are not marginalised by a vocal minority" Ballantyne & Bain, 1994; 29). These considerations might also account for the large percentage of students who attribute attitudinal change to the ability to form new ideas: The dominant mode of learning appears to remain that in which the ideas propounded by the lecturer are accepted and assimilated as new ideas.

4.3.3 Student behavioural orientations

Questions 8 and 16 sought to evaluate environmental awareness, attitude development and *behavioural orientations.* A total of 56% (n=15; sample of 27) indicated that their awareness of the need for environmental protection had changed, in that they had developed a greater interest in the environment, and as a result could transfer this interest to the pupils whom they taught. No indication of how they would participate in environmental protection was offered. In this respect the findings indicate, as in Hungerford and Volk (1990), that environmental knowledge, awareness and attitudes will not necessarily influence environmental *behaviour* even when environmental attitudes and awareness are enhanced.

4.3.4 Social influences in the work environment

The social influence of the work environment was considered to be a major factor in the students' initial conceptions of the environment and environmental education. Question 9 of Intervention 2 sought to establish the nature of this influence by asking the question

How often are environmental concerns such as Arbor day, recycling practices, integrating environmental concerns across the school curriculum, fieldwork, litter campaigns and the conservation of resources addressed at your school?.

Table 4.7 Environmental concerns in the work environment

	Arbor Day	recycling	school curriculum	fieldwork	litter	saving resources
v. often	37	11	-	7	30	15
often	15	7	7	4	30	19
seldom	30	30	30	19	22	33
never	11	37	44	44	15	19
no resp.	7	15	19	26	3	14

The above table indicates that the integration of environmental concerns into subjects across the curriculum is addressed either not at all (44%; n=12), or only very seldom (30%; n=8). Also, recycling practices or fieldwork exercises receive minimal attention. This suggests that the school curriculum experienced by most of these students is still one in which teachers have to prepare their pupils, in the traditional way, to meet predefined demands through predefined curricula and texts. It appears that the only environmental concerns significantly addressed at most of the schools is involvement in anti-litter campaigns and Arbor Day. The inference is that the work environment for the majority of the students in the EE course does not positively influence their awareness of the environment.

The responses to this question do, however, highlight a need to develop an environmental ethic or approach in teaching and therefore in the schools. One means of addressing this deficiency is by developing, in the educators, *skills* to promote integration of environmental concerns across the traditional school

curriculum. Educators in environmental education need to develop analytical thinking skills in order to evaluate and implement environmental education approaches. These approaches incorporate knowledge and new ideas which may be used to solve problems in the environment. Educators may, however, be locked into a formal model of education which functions within formal educational rules, and therefore may experience some difficulty in applying "EE skills" to their subject specialisation. Also, 20 of the 27 (74%) teach at schools which serve underprivileged communities whose economic base is poor. It may not be economically feasible to integrate fieldwork exercises, for example, into the traditional curriculum. But some consideration should be given to developing an environmental approach and ethic into the school curriculum, to encourage a broader development, in general, in the schools. Therefore the need exists to develop in the educators the ability to transfer learning strategies from one context to another. "Environmental education skills need to become part of the teachers habitual repertoire and teaching methodology" (Ossowski, 1994; 69).

4.3.5 Perceived changes in teaching methods

The responses to Question 14, on perceived changes in teaching methods, do not support to any significant degree the expectation that educators have developed the ability to transfer learning strategies between contexts. The responses do indicate, though, that 59% (n=16) of the group express a commitment to cross-curriculum teaching. The following are examples of some of the responses:

"The course has strengthened my commitment to employ (a) more transactive method of teaching"

"A key challenge for me would be to try to "environmentalise" mathematics teaching. I know that this would be extremely difficult given the nature of the

subject, however, I think that an environmental approach would assist students to see the relevance of mathematics to environmental concerns..."

"Being an English teacher allows me greater scope to infuse/include environmental issues of all types into my classes"

"I intend to try (to) use the environmental issues as a medium of teaching my subject though I still have to figure how"

A smaller proportion of the group (22%; n=6) proposed that they would develop student skills, encourage group or co-operative learning, identify environmental issues, and aid pupils to become civic-minded:

"I am going to teach my pupils skills to be able to make their own decisions i.e. decision-making, problems-solving and I will try to change their attitudes towards EE. I will teach them to become more aware about the importance and implications of the environment. I will also teach them to be more responsible ..."

"I intend to attempt aiding the students to develop skills which can aid them after school to be citizen-minded. Using group learning to allow them to identify issues that are relevant to them..."

One respondent contributed the following:

"I do not teach at a primary school, in the first place, where students are still young and co-operative, in my school, which is a finishing school, comprising mostly of adults, there has been no chance of trying to reinforce what I have to accomplish in the course. My teaching has not changed as chances are a bit narrow due to the situation at my school. In other words, there is little that one can do as an initiative".

4.3.6 Factors influencing the conceptual development of students

Students were asked, in Question 15, to rate the degree to which they supported or rejected various statements relevant to their conceptual development. These statements are reproduced here, together with the breakdown of responses:

1. This course has caused me to question previously held attitudes/values about the environment (81%; n=22).
2. My values/attitudes towards the environment have been influenced by group participation(59%; n=16).
3. This course has affected my behaviour towards the environment (74%; n=20).
4. This course has improved my ability to express environmental ideas and knowledge(78%; n=21).
5. This course has encouraged a greater interest in the world around me (89%; n=24)

These responses show significant shifts in conceptions when compared with Intervention 1; this outcome will be the subject of further elaboration in Section 4.4.

4.4 Comparison and analysis of the results

This section provides an analysis of the data by presenting results from the two questionnaires. The prime purpose of the analysis is to extract, from the trends observed, information on the development of student thinking.

The needs and expectations survey revealed that 70% of the respondents wished to acquire new ideas with regard to the environment. Similarly, in the second questionnaire 70% of the respondents chose to study environmental education in order to learn something new.

Some shift in student conceptions may be detected by comparing Table 4.3 of Intervention 1 with corresponding responses to Intervention 2, the latter being summarised in Section 4.3.5. In the first intervention, 21% of the respondents acknowledged that their critical thinking and their verbal and written skills had improved early on in the course. The second intervention, however, (Section 4.3.6) shows a substantial increase in acknowledgement of an improvement in these skills, in that a total of 81% of the respondents claim that the course has caused them to question previously held attitudes and values.

Student responses to environmental literacy also show some shift between the two interventions. Intervention 1 reports that student responses demonstrate a need to develop teaching skills, with 21% of the respondents conceiving of environmental education as being integral to their daily lives, and thus holistic in structure. The second intervention shows that 78% express a wish to become environmentally literate, with the understanding that environmental concerns are relevant to their daily lives.

From the second intervention (Section 4.3.6) the researcher was able to generate from items 3, 4 and 5, together with results from the needs and expectations survey, information concerning conceptual development:

Table 4.8 Conceptual development (sample of 27)

	Pre-test (%)	Post-test (%)
Awareness	11	89
Behaviour	15	74
Knowledge	4	78

The needs survey in the first intervention revealed that 11% of the respondents expected to *acquire awareness* of the environment. By the second intervention,

89% report that the course has developed in them a greater interest in the world around them. Simultaneously, 15% wanted to acquire skills to care for the environment and knowledge of how to behave towards it (1st intervention). The second intervention registers that 74% reported that the course had affected their behaviour towards the environment. While 4% wanted in the first intervention to improve their knowledge about the environment, the second intervention shows that 78% found the course had improved their ability to express environmental ideas and knowledge. Thus it is clear that significant shifts in assessment of conceptual development have taken place during the course.

A further observation is that 59% (n=16) of the group believed their attitudes/values to have been influenced by group participation. This does not tally with the results from question 12 of Intervention 2 (refer to Section 4.3.2), which indicate that only 37% (n=10) attribute attitudinal change to their exposure to group interaction. The inference is thus that some students are still not sure whether group participation actually does contribute to their learning.

While the results indicate some shift in the students' conceptual development with reference to knowledge, behaviour and awareness, it should be pointed out that these shifts are evident in precisely those three areas in which the students indicated, in the first intervention (Section 4.2.1; responses to needs and expectations) a desire for development. These results could therefore be interpreted as an indication that students extracted from the course mainly what they felt would best suit their needs; however, it has to be acknowledged that their *conceptions* of environmental knowledge, behaviour and awareness have, to a degree, been influenced by other aspects of the course such as group interaction, which contributed to knowledge, attitudinal and behavioural changes. These changes are somewhat difficult to quantify and describe because they are not always evident, and they are also manifested in different

ways for different people. Such changes, however, could influence the ways in which people define conceptions, and in this instance, could have influenced student conceptions of environmental knowledge, behaviour and awareness development.

Shifts in conceptual development of the students are also evident from responses which show that in the first intervention, 25% were committed to cross-curricular modes of teaching. By the second intervention, 59% believed that they would attempt to implement such an approach into their teaching methods, with a further 22% reporting that they would encourage co-operative learning and that they would develop student skills.

Student conceptual and attitude development was further analysed by asking students to respond to the statement: "*Environmental education is about.....*(Intervention 1; Pre-test), and to "*Define environmental education* (Intervention 2; Question 6). Respondents were thus encouraged to identify and clarify their opinions, beliefs and values about environmental education. Both interventions provided evidence which demonstrated that the students understood environmental education to be about

- encouraging people to be aware of their surroundings;
- the role that they could play in preserving the environment; and
- teaching children to become environmentally literate and to equip them with skills in a changing world.

Two of the main conceptions to emerge from the responses to the interventions are the egocentric conception, and the guardianship conception. The *egocentric* conception is important in order to preserve individual health and safety or quality of life (Ballantyne and Bain, 1994), and is exemplified in the following responses:

"Creating broader awareness of how important the environment we live in is to our daily lives so to be able to care for it" (Intervention 1).

"Being aware of the environment and that it not only concerns conservation but other things like peace, development, and social justice... " (Intervention 2).

"Environmental education is more than making people aware of environmental problems but giving the opportunity to think critically about them and giving them skills to go about solving them so as to improve the quality of their everyday life ..." (Intervention 2).

The *guardianship* conception "focuses on the need to protect the environment for the future of our children and the survival of the planet" (Ballantyne, 1995; 34); examples of responses in this category are:

"How to appreciate, look after your environment in order for future generations to enjoy and appreciate it" (Intervention 1).

"Making students aware of the environment as an integral part of their living space and how they can be part of its conservation" (Intervention !).

"...we must conserve our resources for the purpose of future use" (Int. 2).

"Environmental education is concerned with our future as well as future generations, to conserve and protect natural resources" (Intervention 2).

There is also the *ecocentric* conception which views people and the environment as interdependent, and in terms of which the environment is acknowledged to have inherent worth independent of its necessity for supporting human life (Ballantyne and Bain, 1994):

"Educating people about the relationship between environment and their life" (Intervention 1).

"Environmental education is an approach to learning/teaching which attempts to clarify issues concerning the interrelatedness between humans and their environment. Objectives are environmental awareness, literacy and responsible environmental behaviour" (Intervention 2).

"EE is an approach to education intended to develop understanding, skills, knowledge and attitudes about environmental matters with a view to creating a positive harmonious human-environment relationship" (Intervention 2)

The following table summarises the breakdown of responses in these three categories, for each of the two interventions.

Table 4.9 Shifts in conceptions of the environment (sample of 27) (Adapted from Ballantyne, 1995; 38)

Conception	1st intervention (%)	2nd intervention (%)
egocentric	19	7
guardianship	52	30
ecocentric	7	59
Not applicable	22	4

Table 4.9 indicates quite a significant shift in the ecocentric conceptions. An explanation may be that the students' heightened environmental awareness -

the prime reason offered for the change in attitude towards the environment - may have contributed to this conceptual shift. The students who hold an ecocentric conception of the environment stress the interdependence and interaction between people and the environment, as opposed to those who perceive the environment as something to be used. Consequently, it would appear that the course in environmental education *enhanced* student **conceptions** of environmental awareness, thus causing shifts away from the egocentric and guardianship conceptions, and towards an ecocentric conception.

This result shows that through the course in environmental education the students are able to *reconstruct* what Khan (1992) describes as their inter-relatedness with the environment. The process of reconstruction, and its outcomes, are dependent on the context in which the course is taught, and it is therefore necessary that environmental educators be aware of this dependence, when designing curricula. For example, it may be desirable that reconstruction of the inter-relatedness between the students and their environment takes place within a context which gives due prominence to the unique features of an African ethic, while at the same time broad ideas from elsewhere are taken on. Such an approach would be consistent with the ideas of Bak (1995), who warns against favouring traditional Western methods of environmental education, which would inhibit the development of an African ethic for environmental education in South Africa.

The results summarised in Table 4.9 may be contrasted with those of Ballantyne (1995) who reports on similar research conducted at the Queensland University of Technology. He reports that the guardianship conception was the most prevalent, and indicates that although he found no evidence of a shift from one conception to another, it appeared that the course in environmental teacher

education did enhance student "understanding of and commitment to their originally held environmental viewpoint" (Ballantyne, 1995; 39).

Chapter 5

Conclusions and recommendations

The aim of this research has been to establish whether a group of students enrolled for the Bachelor of Education degree, and who elected to take a course in Environmental Education as part of the requirements of that degree, underwent any change in their conceptions of the environment as a result of having completed this course. Consequently student attitudes, values and behaviour towards the environment were assessed by obtaining information on student conceptual understandings through the administration of two questionnaires. By making use of a phenomenological method of analysis a clearer understanding of the experiences of students was gained, and the researcher was able to describe trends in the development of the affective, cognitive and psychomotor domains.

The results of the questionnaires were presented in Chapter 4 and revealed some significant trends in the conceptual development of the students in the group. For example,

- the students displayed a strong shift in their environmental awareness. By the end of the course the majority declared that they took a greater interest in the world around them. They also showed a greater concern for conserving resources.
- the students indicated a willingness to behave in a more environmentally friendly manner.

- their environmental knowledge and communicative skills improved, thereby providing a foundation for promoting environmental education in the schools at which they teach.
- they expressed a greater desire to promote environmental education in the schools in an integrated manner, thereby indicating an increase in their knowledge and understanding of the integrative nature of environmental education.
- they showed a marked improvement in their critical and analytical skills, with many reporting that as a result of having completed the course they questioned their previous attitudes and values about the environment.
- a substantial number of the students by the end of the course subscribed to an ecocentric view of the environment, thus showing a growth in interdependence and inter-connectedness with the environment.
- a smaller number believed that group interaction influenced their cognitive development; this number increased significantly by the end of the course.
- a large percentage of the group, however, reported that there had been no change in their previously held positive attitudes towards the environment, and that their attitudes had merely been reinforced by the course in environmental education.

While the results of the qualitative and quantitative data collected in this research indicate that the environmental education elective in the BEd programme was instrumental in effecting changes in students' conceptions of the environment, the development may not be described as linear in nature. Instead it appears that through the constructivist approach employed in this course, the students were encouraged to reconstruct their environmental conceptions in order to develop both *new* and *existing* conceptions about the environment. This is important because changes in student conceptions may also be attributed to factors outside of the formal curriculum. For example, Mahlios and Maxson (1995) point out that conceptions may change as a result of

programme design or as a result of maturation, and as a result of experience gained through interaction with others. This interaction with others also encourages them to develop the confidence to communicate what they learn, and to alert them to any misconceptions which they may hold. In this way they are able to clarify their thinking and experience personal growth (Clacherty, 1992).

The environmental education course did not, however, significantly alter the conceptions of all the students in the group. Those who failed to be convinced by the proposed strategies experienced less of a shift in their attitudes and beliefs about the environment, while others who already held strong views argued that the course simply reinforced their existing conceptions. Other students again might believe that they acquired greater knowledge about the environment, and modified their existing schema to accommodate new ideas. A uniform outcome was therefore not observed, nor would it be expected.

The constructivist approach is one way of facilitating a modification in existing schema, by introducing learning experiences which create intellectual controversy within the learner. This approach was adopted in the presentation of the environmental education course, and this research study provided a concrete opportunity to assess the merits of the constructivist approach.

Ballantyne (1994) claims that constructivist learning experiences enable students to become aware of inconsistencies, inadequacies and the consequences of their own environmental knowledge and conceptions. They also become aware of the relevance and relative merits of alternatives. Their environmental knowledge and conceptions are, however, influenced by the dominant environmental attitudes, values and beliefs which they hold and which are socially constructed. Constructivist learning principles enable students to explore these socially constructed attitudes, values and beliefs and challenges

students to reassess them. In this manner the students in the group are empowered to take control of their own learning and to become critical about how and what they learn.

Constructivism places significant importance on individual constructions, yet not all constructions, according to Candy (cited in Strachan 1995), are equally useful. He maintains that a function of education is to allow an opportunity for reconstruction. Consequently, a major limitation of the constructivist approach is that individuals are encouraged, through this approach, to believe that they are in control, but they remain influenced by society, its ideology and its authority. Nevertheless, as a learning and teaching approach it does alert learners to the restriction of accepting the structure of a set environment, and educators to their obligation to *guide* learners into the intellectual practices of their society (Strachan, 1995). It thus involves a shift from the positivist tradition, which still influences both learning and teaching in our society, to a notion of learning in which learners are not viewed as passive recipients of knowledge but are actively engaged in the construction of knowledge. It is hoped that through participation of this kind, learners involved in the environmental education elective will acquire the skills necessary to transfer the rules and habits of learning from any one particular setting to other new settings (Resnick and Collins, 1994).

However, within the South African context many barriers exist which hinder the progress of the constructivist approach in education generally. Some of the factors which militate against the effective implementation of a constructivist approach have been highlighted in this research, for example, the language issue, minimal group participation, the history of Black teachers' experience, and the rigid approach to teaching in schools. In environmental education courses the need exists to overcome such barriers, so that the constructivist approach may take hold at a tertiary level, and in this way hopefully filter into the schools.

Within the BEd course, the lecturer is largely confronted by a group of students who subscribe to positivist ideals, for example, that knowledge can be given to them by the lecturer. The task of the lecturer is therefore twofold: s/he has to provide what the students believe they want and need, namely knowledge, but s/he also has to try to instil in them a constructivist perspective, so that they might be encouraged to think critically and analytically. Presently, this course achieves these aims only partially because of time constraints, the needs and wants of the students, and the barriers referred to earlier.

Recommendations

While the course in environmental education appears to have facilitated the development of student conceptions of the environment, it remains to be seen whether the changes in conceptions were significant enough, and sufficiently durable, to be sustained and implemented in the schools in which these students teach. These new conceptions are vulnerable, in that they are liable to be suppressed as the students/teachers attempt to cope with the socialisation pressures generated by the need to complete formal syllabi, the frustrations accompanying teaching in poorly equipped schools, or the constraints of rigid, subject-dominated timetables.

Many of the students participating in this elective in environmental education have had to acquire some command of the discipline through a medium of instruction whose nuances might not have been readily appreciated at all times. The need to engage in a new learning structure and alternative education practices will also have presented considerable challenges. Environmental educators, therefore, need to identify learners' prior beliefs and knowledge with as great a measure of precision as might realistically be expected, in order that learning experiences with a good prospect of success may be designed. The extent to which interaction with the dominant concepts incorporated into

environmental education programmes is positive, will depend very directly on these considerations.

Furthermore, by acknowledging the relationships between students' beliefs and the concepts utilised in the course, educators are in a position to enable students to reflect upon *their* beliefs in relation to the core concepts. Students should be informed of the educator's interpretation or understanding of their prior beliefs, and these should be assessed in relation to the dominant concepts in the course design. Mahlios and Maxson (1995) believe that by providing students with information about possible areas of disagreement between their ideas and those of the course elements "greater congruence and accommodation may be obtained and more optimal outcomes obtained" (Mahlios and Maxson, 1995;198). Moore (1995) argues further that "educators need to divide their curricular attention roughly equally between the selection of the networks of important ideas (i.e. content), and consideration of the ability of learners to engage with those ideas" (Moore, 1995; 83). The educator may therefore have to compromise between concepts deemed central to a discipline, and those concepts which encourage learner-centredness. The curriculum should allow ideas to be thoroughly explored, either through assignments which are both integrated with the course aims and which help students to focus on the course as it is intended, or through learning experiences such as group interaction which challenge individuals to reflect on their conceptions of the environment. In this way thought and discussion about the environment are stimulated, with a consequently beneficial outcome in respect of behaviour towards the environment. Moore (1995) argues that the more the ideas are explored and the more integrated the learning is, the greater the likelihood that learners will make connections across different contexts, "and thus achieve some measure of "transfer" (Moore, 1995; 83).

A curriculum also needs to recognise the fact that for many of the second and third language students, nuances are likely to be lost. This has implications not only for lectures conducted in English, but also for other course material such as prescribed and recommended reading material, much of which may be Eurocentric in nature.

Finally, the educator may be unaware that s/he is promoting a particular environmental viewpoint, and students need to be immunised against being influenced unduly about the superiority of one set of views over another. For example, students who express a desire to acquire more knowledge may attribute great importance to a particular view favoured by an educator. The educator therefore needs not merely to present information, but also simultaneously to confront students to reflect upon how *they* feel about the particular concept.

Future research

- The students from this group could be re-assessed through postal questionnaires to assess whether there is actual evidence of their altered environmental conceptions in their teaching, or in their environmental behaviour or involvement in green issues.
- The pupils whom they teach could be surveyed to ascertain whether they are more environmentally aware or literate as a result of the teaching they have received.
- Another group in a subsequent year of study at UCT, which may be differently composed with regard to race, class and other social yardsticks, may be surveyed in the same manner, so that the results of that research may be juxtaposed against the present set of results in a comparative manner.

References

ANDRADE, C S and STRAUSS, C. 1992. Human motives and cultural models. Cambridge University Press, New York.

ASHLEY, M. 1995. "Why the moralistic approach to environmental education will never work". *Environmental Education*, **50**:16.

ASTON, P. 1991. Guidelines for the development of environmental teacher education in South Africa: a conceptual and contextual analysis. MA in Environmental and Geographical Science, University of Cape Town, South Africa.

BAK, N. 1995. "Green doesn't always mean "go": possible tensions in the desirability and implementation of environmental education". *Environmental Education Research*, **1**(3):345-352.

BALLANTYNE, R R and Bain, J. 1994. "Enhancing environmental conceptions: an evaluation of cognitive conflict and structured controversy learning". In review: *Studies in Higher Education*.

BALLANTYNE, R R and Packer, J M. 1994. "Teaching and learning in environmental education: developing environmental conceptions". In Press: *Journal of Environmental Education*.

BALLANTYNE, R R and Tooth-Aston, P. 1989. "Environmental education teacher training: a participatory research model". *Southern African Journal of Environmental Education*, **9**:3-4.

BALLANTYNE, R R, Lidstone, J and Packer, J. 1993. "A critically reflective pre-service geography teacher education course: attitude and practise changes among graduates". *Geographic and Environmental Education*, **2(1)**:41-50.

BALLANTYNE, R R. 1986. Change in secondary school geography education: teacher attitudes and practise. PhD thesis, University of Cape Town.

BALLANTYNE, R R. 1994. "Environmental teacher education: constraints, approaches and course design". In review: *International Journal of Environmental Education and Information*.

BALLANTYNE, R R. 1995. "Evaluating the impact of teaching/learning experiences during an environmental teacher education course". *International Research in Geographical and Environmental Education*, **4(1)**:29-46.

BARRATT, R S. n/d. "Why bother about environmental issues". *Environmental management newsletter.* McGraw Hill Publishers.

BLAIKIE, P. 1995. "Changing environments or changing views"? *Geography*, 80(3):203-214.

BLIGNAUT, J B. 1991. An analysis of the prevailing awareness among senior educationalists in the Cape education department of the nature of environmental education and attitudes towards its implementation in schools. MSc in Environmental Studies, University of Cape Town, South Africa.

BROWN, C A and BORKO, H. 1992. "Becoming a mathematics teacher". In D A Grouws (ed.), Handbook of research on mathematics teaching and learning, MacMillan Publishing Co., New York, 209-239.

CANDY, P C. 1981. Mirrors of the mind: personal construct theory in the training of adult educators. Manchester Monographs No. 16, Department of Adult and Higher Education, University of Manchester, United Kingdom.

CANDY, P C. 1991. Self-direction for lifelong learning. Jossey-Bass Publishers, San Francisco.

CHOU, J and Roth, R E. 1995. "Exploring the underlying constructs of basic concepts in environmental education". *Journal of Environmental Education*, **26(2)**:36-43.

CLACHERTY, A J. 1988. Towards an environmental education programme for the training of primary school teachers. MSc thesis, University of Cape Town.

CLACHERTY, A J. 1992. "Environmental literacy: implications for environmental and teacher training". *South African Journal of Education*, **12**(1):25-30.

COBB, P. 1994. "Constructivism and learning". In Husen, T and Postlethwaite, T N (eds). The International Encyclopaedia of Education, Vol. 2 (2nd edition), Pergamon Press, Oxford.

COMBER, M. 1996. "A response to the Toyne Report on "Greening the Colleges" - a case study". *Environmental Education,* **51**:26-27.

DIXON, A. 1995. "Environmental education: the second generation". *Environmental Education*, **49**:21.

DUIT, R. 1994. "Preconceptions and misconceptions". In Husen, T and Postlethwaite, T N (eds). The International Encyclopaedia of Education, Volume 8, (2nd edition), Pergamon Press, Oxford.

EISENHART, M A. 1988. "The ethnographic research tradition and mathematics research". *Journal for Research and Mathematics Education*, **19**(2):99-114.

FENSHAM, P J and Northfield, J R. 1993. "Pre-service science teacher education: an obvious but difficult arena for research". *Studies in Science Education*, **22**:67-84.

FINK, A and Kosecoff, J. 1985. How to conduct surveys: a step-by-step guide. Sage Publications, Newbury Park, California.

FUGGLE, R F. 1982. "Towards definitions and aims for environmental education". Paper presented at the International Conference on Environmental Education, Treverton College, Mooi River.

GAYFORD, C. 1987. "Environmental indoctrination or environmental education"? *Environmental Education*, **27**:8-9.

GIGLIOTTI, L M. 1992. "Environmental attitudes: 20 years of change". *Journal of Environmental Education*, **24**(1):15-25.

GREENALL, A. 1986. "Searching for a meaning: what is Environmental Education"? *Geographical Education*, **5**(2):9-12.

GROUWS, D A. (ed.). 1992. Handbook of research on mathematics teaching and learning. MacMillan Publishing Company, New York.

HUCKLE, J. (ed.). 1983. Geographical education: reflection and action. Oxford University Press. Oxford.

HUCKLE, J. 1983. "Environmental Education". In Huckle, J. (ed.). Geographical education: reflection and action. Oxford University Press, Oxford.

HUNGERFORD, H R and Volk, T L. 1990. "Changing learner behaviour through environmental education". *Journal of Environmental Education*, **21**(3):8-21.

HUYSAMEN, G K. 1994. Methodology for the social and behavioural sciences. Southern Book Publishers, Halfway House, Midrand.

INGLETON, R. 1995. "The role of environmental education in schools". *Environmental Education*, **50**:30-31.

IRVING, J. 1994. The practise of environmental education at the Caltex Refinery (CALREF), Cape Town. Honours Dissertation in Environmental and Geographical Science, University of Cape Town, South Africa.

IRWIN, P. 1990a. "The concept of environmental education and the development of environmental education in South Africa". *Southern African Journal of Environmental Education*, **11**:3-7.

IRWIN, P. 1990b. "What is environmental education"? *Conserva*, **5**(2):4-5/10.

IUCN/UNEP/WWF. 1991. Caring for the earth. A strategy for sustainable living. Gland, Switzerland.

JANSE VAN RENSBURG, E. n/d. Environmental education a new course, new directions. Earthyear Edition **11**:62-63.

JANSE VAN RENSBURG, E. 1994. "Research priorities for environmental education in southern Africa: preliminary results". *Southern African Journal of Environmental Education*, **14**:3-9.

KAHN, F. 1989. "The role of history in understanding current South African attitudes to conservation". *Southern African Journal of Environmental Education*, No. 10.

KAHN, F. 1990. Contemporary South African environmental response: an historical and socio-political evaluation, with particular reference to blacks. MA, University of Cape Town, South Africa.

KAHN, F. 1992. Black environmental history as a facet of current South African environmental perceptions. Department of Environmental and Geographical Science, University of Cape Town, South Africa.

KIDDIE, C. 1995. "No problem ... "? *Environmental Education*, **48**:10-12.

KLEIN, E S and Merritt, E. 1994. "Environmental education as a model for constructivist teaching". *Journal of Environmental Education*, **25**(3):14-21.

LAYDER, D. 1993. New strategies in social research: an introduction and guide. Polity Press, Cambridge.

LEMONS, J. 1989. "The need to integrate values into environmental curricula". *Environmental Management*, **13**(2):133-147.

LUTZ, C. 1992. "Motivated models". In Andrade, C S and Strauss, C. (eds.), Human motives and cultural models. Cambridge University Press, New York.

MAHER, M. 1986. "Environmental education: what are we fighting for"? *Geographical Education*, **5**(2):21-25.

MAHLIOS, M and Maxson, M. 1995. "Capturing preservice teachers' beliefs about schooling, life and childhood". *Journal of Teacher Education*, **46**(3):192-199.

McB CARSON, S. 1995. "Introducing environmental education to the secondary school". *Environmental Education*, **50**:25.

MILLER, R. 1989. "Conceptual issues in theorising and cognition". *South African Journal of Higher Education*, **3**(1);154-159.

MOORE, R S. 1995. The role of student writing in learning in Zoology. MEd (English Second Language), Rhodes University, South Africa.

MORPHET, T. 1992. "Introduction to the problems in adult learning". In Hutton, B(ed.). Adult basic education in South Africa, Oxford University Press, Cape Town.

NDUNA, J N. 1994. Using the topic "water management in Umtata" to provide the use of an environmental approach in the teaching of geography. MEd, Rhodes University, South Africa.

O'DONOGHUE, R. 1993. "Clarifying environmental education: a search for clear action in southern Africa". *Southern African Journal of Environmental Education*, **13**:28-38.

O'DONOGHUE, R. 1986. "Environmental education and evaluation; an eleventh hour reconciliation". *Southern African Journal of Environmental Education*, **3**:18-21.

OPIE, F W J. 1987a. "All things wise and wonderful ...". *Veld and Flora*, 73(4):138-141.

OPIE, F W J. 1987b. "Seeds of hope". *Veld and Flora*, 73(1):36-40.

OPIE, F. 1992. Good morning, world! Awakening earth love in the young and young at heart. Council for the environment, Pretoria.

OSSOWSKI, K. 1994. Teacher development in the practise of environmental education. Honours dissertation in Environmental and Geographical Science, University of Cape Town.

PALMER, J. 1995. "How research is informing practice in environmental education". *Environmental Education*, **50**:33-34.

PARK, C. 1995. "Environmental issues". *Progress in Physical Geography*, **19**(3):379-390.

PHILLIPS, J. 1995. "Can geography deliver environmental education in the secondary school"? *Environmental Education*, **49**:27.

POSCH, P. 1993. "Research issues in environmental education". *Studies in Science Education*, **21**:21-48.

POSNER, G J, Strike, K A, Hewson, P W and Gertzog, W A. 1982. "Accommodation of a scientific conception: toward a theory of conceptual change." *Science Education*, **66**(2):211-227.

RAYMOND, A M and Santos, V. 1995. "Preservice elementary teachers and self-reflection: how innovation in mathematics teacher preparation challenges mathematics beliefs". *Journal of Teacher Education*, **46**(1):58-70.

RESNICK, L B and Collins, A. 1994. "Cognition and learning". In Husen, T and Postlethwaite, T N. (eds). The International Encyclopaedia of Education, Vol. 2 (2nd edition), Pergamon Press, Oxford.

ROBERTSON, A. 1994. "Toward constructivist research in environmental education". *Journal of Environmental Education*, **25**(2):21-31.

ROGERS, J. 1986. Teaching adults. Open University Press, Milton Keynes, United Kingdom.

SCHREUDER, D. 1995. "Delusions of progress: a case for reconceptualising environmental education". *Southern African Journal of Environmental Education, **15**:18-25.*

SHAW, G and Wheeler, D. 1985. Statistical techniques in geographical analysis. John Wiley and Sons, Chichester.

SLATER, F. 1994. "Education through geography: knowledge, understanding, values and culture". *Geography*, **79**:147-163.

STILES, K and Milton, B. 1995. "Environmental education and the school governor". *Environmental Education*, **48**:5.

STRACHEN, J. 1995. "Since our way of constructing the world is shaped by our experiences, and no two people have exactly the same experiences, then no two people construe the world identically. What are the implications of this

for Adult Education"? Term paper submitted to the Department of Adult Education, University of Cape Town.

THOMPSON, A G. 1992. "Teachers' beliefs and conceptions: a synthesis of research". In Grouws. D A. (ed.). Handbook of research on mathematics teaching and learning. MacMillan Publishing Company, New York.

TURLEY, J. 1995. "Environmental education in further and higher education". *Environmental Education*, **49**:24.

UNEP. 1992. Caring for the Earth: a learner's guide to sustainable living.

VAN DER SCHEE, J. 1993. "Geography teaching and environmental education - a Dutch perspective". *International Research in Geographical and Environmental Education*, **2**(2):113-115.

VAN WIJK, E. 1995. "Full marks for Environmental Education". *Conserva*, **10**(4):10-11.

VEITCH, R and Arkkelin, D. 1995. Environmental Psychology, Prentice-Hall, Englewood Cliffs.

VILJOEN, H. 1990. "White paper - symbol of concern". *Conserva*, **5**(2):6-7.

VON GLASERSFELD, E. 1984. "An introduction to radical constructivism". In P Watzlawik (ed.) The invented reality. W W Norton & Co., New York.

VON SCHIRNDING, Y. 1995. "Environment and health: an introduction". *Enviro Teach*, **2**:48.

WHATMORE, S and Boucher, S. 1993. "Bargaining with nature". *Transactions of the Institute of British Geographers,* **18**:166-178.

YELD, J. 1993. Caring for the earth. South Africa: a strategy for sustainable living. The South African Nature Foundation, Stellenbosch, South Africa.

APPENDIX A

BACHELOR OF EDUCATION
STUDENT EXPECTATIONS SURVEY
COURSE ENVIRONMENTAL EDUCATION

SECTION A

AREA OF SCHOOL (RURAL OR URBAN)	
TEACHING EXPERIENCE IN YEARS	
SUBJECT SPECIALISATION	

SECTION B

Indicate your general level of satisfaction with the following items by writing an appropriate number in each box. You may provide comments in the lines provided.

IMPRESSED	1
SATISFIED	2
DISAPPOINTED	3

1. COURSE CURRICULUM [ ]

(Can you see structure and logic in the course curriculum?)

Comment

.....

.....

2. RELEVANCE OF CONTENT [ ]

(Is the subject matter relevant to what you feel Environment Education should be?)

Comment

.....

.....

3. ACADEMIC LEVEL [ ]

(Do you feel the course, thus far, has been pitched at the right academic level?)

Comment

.....

.....

4. TEACHER DEVELOPMENT: SKILLS [ ]

(Do you feel satisfied with your own development in terms of skill development thus far in the course?)

Comment .....

.....

.....

A) Have you developed any new skills in Environmental Education?

.....

.....

5. TEACHER DEVELOPMENT: KNOWLEDGE [ ]

(Do you feel satisfied that your knowledge towards the environment has developed?)

Comment .....

.....

6. TEACHER DEVELOPMENT: ATTITUDES [ ]

(Do you feel satisfied with your own development in terms of your attitudes towards the environment ?)

Comment .....

.....

.....

A) Have your attitudes towards the environment changed? Comment further.

.....

.....

.....

SECTION C

1. Did you feel adequately prepared for doing this course?

YES	NO

*If **YES**, in what way?

.....

.....

*If **NO**, in what way?

.....

.....

2. Do you understand the course objectives?

YES	NO

Comment

.....

.....

.....

3. Do you feel confident to use the principles of Environmental Education in your teaching?

YES	NO

*If **YES**, why?

.....

.....

*If **NO**, why?

.....

.....

SECTION D

To what extent are the following needs/expectations fulfilled by the Environmental Education course?

KEY:

INADEQUATELY	**1**
ADEQUATELY	**2**
WELL	**3**

1.	Broaden Environmental knowledge	
2.	Resource development	
3.	Skill development	
4.	Promote an Environmental ethic	
5.	E.E. concept clarification	
6.	Provided an E.E. theoretical basis	
7.	Develop critical and analytical skills	
8.	Given confidence to promote and practise E.E. in schools	
9.	Broaden teaching experience	
10.	Creative teaching	

SECTION E

Please read each item carefully and indicate whether you agree or disagree with the statement

KEY:

1. = Stongly disagree
2.= Disagree
3.= Undecided
4.= Agree
5.= Strongly agree

1.	The course has clear objectives	
2.	The course gives me a clear understanding of the concepts and principles of the field	
3.	I have put a good deal of work into this course	
4.	The subject matter is stimulating and challenging	

THANK YOU FOR YOUR TIME AND INPUT, THE RESULTS OF WHICH WILL BE BENEFICIAL TO FUTURE PARTICIPANTS OF THIS COURSE!

APPENDIX B

Environmental Conceptions
University of Cape Town, BEd Environmental Education Class, 1995

This survey aims to evaluate the conceptions of the environment held by students in this class both, prior to doing the course and again at the end of the course.

Background:

Name: _____

Sex:

Male		Female	

1. Please state the **name** and **province** of the school at which you teach.

   _____

2. a) Please indicate whether the school is in a *(✓ appropriate box)*

rural		urban		peri-urban		area.

   b) Please indicate at which level you teach *(✓ appropriate box).*

primary school		secondary school	

3. What is/are your main teaching subject/s?

   _____

4. Why did you choose to do Environmental Education? Use a scale of 1 to 5, where 1 = very important, 2 = important, 3 = neutral, 4 = unimportant and 5 = of no concern *(✓ the appropriate value)*.

1	2	3	4	5	to learn something new
1	2	3	4	5	I presently teach environmental education and wanted to broaden my teaching experience
1	2	3	4	5	to become environmentally literate
1	2	3	4	5	to broaden my general knowledge
1	2	3	4	5	I had a timetable clash and had to choose Environmental Education
1	2	3	4	5	this course was recommended by a colleague/fellow student

5. Which aspects of your social/cultural background would you say influenced your decision to study Environmental Education? *(✓ as many as appropriate)*

   [ ] I grew up in a rural area.
   [ ] I grew up in a home in which environmental issues were often discussed.
   [ ] exposure to environmental issues through the media
   [ ] religious beliefs
   [ ] membership of a society which influenced your environmental ideas, values or attitudes
   [ ] other, please explain

6. I know it is difficult to define Environmental Education, but please write a short sentence to show your understanding of Environmental Education.

7. Do you have the following in your home? *(✓as many as appropriate)*

   [ ] electricity
   [ ] a garden
   [ ] access to running water
   [ ] a television

8. **Prior to doing this course**, which of the following activities did you participate in? *(✓as many as appropriate)*

   [ ] watching environmental films, television programs
   [ ] gardening with indigenous plants
   [ ] conserving water (eg. turn off dripping taps, shower rather than bath)
   [ ] conserving electricity (eg. switch geyser off when not in use)
   [ ] using alternative energy sources (eg. solar heating)
   [ ] recycling (eg. paper, tin, glass, plastic)
   [ ] recycle organic matter (compost)
   [ ] other, please specify

9. How often are the following environmental concerns addressed at your school? Use a scale of 1 to 5, where 1 = very often, 2 = often, 3 = seldom, 4 = not at all and 5 = don't know *(✓appropriate value)*.

1	2	3	4	5	observation of Arbor Day (i.e. tree planting)
1	2	3	4	5	recycling practices (i.e. paper, glass, tin, plastic)
1	2	3	4	5	integrating environmental concerns into subjects across the curriculum
1	2	3	4	5	through fieldwork (eg. cleaning up rivers)
1	2	3	4	5	through litter campaigns (picking up papers)
1	2	3	4	5	emphasising the importance of saving resources (eg. paper, water etc.)
1	2	3	4	5	other, please specify

Course evaluation:

10. Has this course changed your attitudes to the environment with regard to the following? *(please answer all questions)*

	Yes	No
The course merely reinforced previously held views about the environment		
I pay more attention to environmental issues		
I am more aware of conserving resources		
I now realise the value of impact assessments		
Other (please specify):		

11. As a result of your involvement in this course, do you feel a greater **commitment** to the following environmental practices? *(please address all options)*

	yes	some-times	not sure	no
conserving resources				
fighting pollution				
engaging in anti-litter campaigns				
encouraging environmental awareness				

12. If this course has altered your attitudes and values about the environment, would you describe this change as being *(✓ appropriate option/s)*

1	the result of you having internalised the views of the lecturer
2	you have developed the ability to formulate new ideas about the environment
3	exposure to the ideas, attitudes and values of other students in the course
4	other, please specify:

13. If this course has **not** altered your attitudes and values about the environment, please explain why you think this is so.

14. Kindly describe in a few sentences how this course has changed the way you teach or intend to teach in the future.

15. Please rate each of the following on a scale of 1 to 5 where 1 = strongly agree, 2 = agree, 3 = undecided, 4 = disagree and 5 = strongly disagree *(✓appropriate value).*

1	2	3	4	5	This course has caused me to question previously held attitudes/values about the environment.
1	2	3	4	5	My values/attitudes towards the environment have been influenced by group participation in this course.
1	2	3	4	5	This course has affected my behaviour towards the environment.
1	2	3	4	5	This course has improved my ability to express environmental ideas and knowledge.
1	2	3	4	5	This course has encouraged me to take a greater interest in and observe what is happening in the world around me.

16. **Having done this course**, has your attitude towards environmental protection changed?

a) If yes, how and why?

b) If no, why not?

Thank you for your participation!