

**PROFESSIONAL DEVELOPMENT OF TEACHERS FOR EFFECTIVE
ENVIRONMENTAL EDUCATION**

by

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DECLARATION

I declare that **PROFESSIONAL DEVELOPMENT OF TEACHERS FOR EFFECTIVE ENVIRONMENTAL EDUCATION** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

SIGNED: -----

Johannah Bopape

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AT UNISA

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ABSTRACT

Studies have shown that most teachers in South Africa have no background in Environmental Education (EE), have not received pre-service training in EE and very little teacher education has taken place in EE. The Revised National Curriculum Statements emphasise the infusion of EE in all learning areas. There is, however, a problem whether there is a need for professional development of teachers for effective EE. The main aim of this study is to enable teachers to acquire knowledge and skills to infuse EE in all learning areas. The study gathered data through literature review from primary and secondary sources. The questionnaire was developed as a research tool and was sampled to 216 Tshwane North District Office teachers. The collected data are analysed by using the frequency tables indicating percentage of respondents in each category. The study recommends the professional development of teachers for effective implementation of EE in schools.

Key words:

Environment; Environmental Education; pre-service training; in-service training; professional training; professional development; Outcomes-Based Education, teacher education; teacher development; teacher training.

TABLE OF CONTENTS

Declaration	i
Acknowledgements	ii
Abstract and keywords	iii

CHAPTER 1

ORIENTATION

1.1 INTRODUCTION	1
1.2 PROFESSIONAL DEVELOPMENT AND ENVIRONMENTAL EDUCATION	3
1.3 PROBLEM STATEMENT	7
1.4 SIGNIFICANCE OF THE STUDY	9
1.5 AIMS OF THE STUDY	10
1.6 RESEARCH STRATEGIES AND METHODS	10
1.7 DEFINITIONS OF THE TERMINOLOGY USED IN THIS CHAPTER	12
1.8 CHAPTER DIVISION	13

CHAPTER 2

THE CONCEPTUAL FRAMEWORK OF ENVIRONMENTAL EDUCATION AND ENVIRONMENTAL EDUCATION

2.1 INTRODUCTION	16
2.2 THE CONCEPTUAL FRAMEWORK OF ENVIRONMENTAL EDUCATION	16
2.2.1 The concept “environment”	17
2.2.2 The concept “education”	18
2.2.3 The concept “environmental education”	19
2.3 HISTORICAL BACKGROUND OF ENVIRONMENTAL EDUCATION	21
2.4 AIMS, GOALS, OBJECTIVES AND PRINCIPLES OF ENVIRONMENTAL EDUCATION	24
2.4.1 Aims of Environmental Education	24
2.4.2 Goals of Environmental Education	25
2.4.3 Categories of Environmental Education objectives	25
2.4.4 Guiding principles of Environmental Education	26
2.5 PROFESSIONAL DEVELOPMENT OF TEACHERS	27
2.5.1 The term “professional”	28
2.5.2 The term “development”	28
2.5.3 The term “professional development”	29
2.6 OUTCOMES-BASED EDUCATION	30
2.6.1 Outcomes-Based Education in relation to Environmental Education	31

CHAPTER 3

**THE EFFECTIVE PROFESSIONAL DEVELOPMENT OF ENVIRONMENTAL
EDUCATION TEACHERS**

3.1 INTRODUCTION	34
3.2 APPROACHES APPROPRIATE TO THE PROFESSIONAL DEVELOPMENT OF TEACHERS IN ENVIRONMENTAL EDUCATION	35
3.2.1 Environmental Education approach to professional development	35
3.2.2 Research-Based approach to professional development	37
3.3 PROFESSIONAL DEVELOPMENT MODELS APPROPRIATE TO ENVIRONMENTAL EDUCATION TEACHERS	39
3.3.1 A professional development model for teacher change	40
3.3.2 The NEEP's active learning model	41
3.3.3. The Amoeba model	43
3.3.4 The Cascade model	43
3.3.5 The issue investigation and action-training model	44
3.3.6 The Spiral model	46
3.3.7 The NEEP-GET learning tree model	47
3.3.8 The training model	49
3.3.9 The deficit model	49
3.3.10 The action research model	50
3.4 SYNTHESIS	51
3.5 TEACHING METHODS APPROPRIATE TO ENVIRONMENTAL EDUCATION	51
3.6 SYNTHESIS	53
3.7 RESOURCES APPROPRIATE TO SUPPORTING THE PROFESSIONAL DEVELOPMENT OF TEACHERS IN ENVIRONMENTAL EDUCATION	54
3.8 IMPORTANT CONCEPTS IN ENVIRONMENTAL EDUCATION AND PROFESSIONAL DEVELOPMENT	56
3.9 BARRIERS TO THE IMPLEMENTATION OF ENVIRONMENTAL EDUCATION	58
3.9.1 External barriers	58
3.9.2 Internal barriers	60
3.9.3 How to overcome these barriers	61
3.10 CONCLUSION	62

CHAPTER 4

RESEARCH METHODS AND DATA COLLECTION TECHNIQUES

4.1 INTRODUCTION	64
4.2 RESEARCH DESIGN	64
4.2.1 Quantitative approach	65
4.2.2 Qualitative approach	65
4.2.3 The questionnaire as a research instrument	66
4.2.4 Types of questions used in the questionnaire	68
4.2.4.1 Closed questions	68
4.2.4.2 Open-ended questions	68
4.2.5 Reasons for selecting the questionnaire	69
4.3 SELECTION OF THE POPULATION TO BE SURVEYED	69
4.3.1 Sampling	70
4.4 DATA COLLECTION PROCEDURES	72
4.5 CONTENT VALIDATION OF THE QUESTIONNAIRE	74
4.6 PROCEDURE FOR DATA ANALYSIS AND PRESENTATION	77
4.7 PILOT-TESTING THE QUESTIONNAIRE	77
4.8 CONCLUSION	78

CHAPTER 5

REPORTING AND ANALYSIS OF SURVEY DATA

5.1 INTRODUCTION	79
5.2 PROCEDURE OF DATA CAPTURE	79
5.3 PRESENTATION AND DISCUSSION OF RESULTS	80
5.3.1 Biographical data of the respondents	81
5.3.1.1 Discussion of results	83
5.3.2 In-service training in Outcomes-Based and Environmental Education	85
5.3.2.1 Discussion of results	86
5.3.3 Environmental Education in the school curriculum	89
5.3.3.1 Discussion of results	90
5.3.4 Knowledge and understanding of basic environmental concepts and attitudes toward environmental issues	91
5.3.4.1 Discussion of results	92
5.3.5 Teaching methods	93
5.3.5.1 Discussion of results	94
5.3.6 Study tours/excursions	95
5.3.6.1 Discussion of results	96
5.5 CONCLUSION	96

CHAPTER 6

6.1 INTRODUCTION	98
6.2 AIMS OF THE STUDY	98
6.3 BRIEF DISCUSSION OF THE FINDINGS	99
6.3.1 The main findings of the literature study	99
6.3.1.1 Environmental education and teacher professional development	99
6.3.1.2 Environmental Education and the curriculum	100
6.3.1.3 Aims, goals, objectives and principles of Environmental Education	101
6.3.1.4 Teaching methods and resources	102
6.3.1.5 Professional development models appropriate to EE teachers	102
6.3.2 The main findings of the survey	103
6.3.2.1 Pre-service and in-service training in Environmental Education	103
6.3.2.2 Knowledge and understanding of basic environmental concepts and attitudes toward the environment	104
6.3.2.3 Environmental Education in the school curriculum	105
6.3.2.4 Teachers' levels of environmental literacy and EE practice	106
6.3.2.5 Professional development models for teachers	106
6.4 TESTING THE PROBLEM STATEMENT	107
6.5 LIMITATIONS OF THE STUDY	107
6.6 RECOMMENDATIONS	108
6.7 RECOMMENDATIONS RELATED TO THE RESEARCH PROBLEM	108
6.8 CONCLUSION	110
7. REFERENCE LIST	112
8. APPENDICES	
APPENDIX A: Random table of numbers by Borg & Gall	125
APPENDIX B: Letter to the District Manager and the Senior Manager, Strategic Policy Research & Development, requesting permission to do research in schools	127
APPENDIX C: Approval from the Senior Manager, Strategic Policy Research & Development, granting permission to conduct research in Tshwane North District Schools	129
APPENDIX D: Questionnaire (Pilot instrument)	131
APPENDIX E: Questionnaire (Main instrument)	141
APPENDIX F: Letter to respondents explaining the purpose of the study	147

CHAPTER 1

ORIENTATION

1.1 INTRODUCTION

In the past, prospective teachers acquired their pre-service training (PRESET) at a college of education or university after the completion of their academic training. The latter refers to scholarly education of an abstract and theoretical kind, usually demanding a high level of academic ability (Page & Thomas, 1977: 8). Teachers undergo academic training related to the subjects that they will teach. Their professional training addresses teaching. Currently, academic training provides access to the Postgraduate Certificate in Education (PGCE) as a ‘capping’ qualification (Department of Education, 2000: 24). Alternatively, PRESET can be done as part of a degree containing both academic and professional training that includes both subject and phase specialisation, e.g. Bachelor of Education (B.Ed) (Department of Education, 2000: 29). Qualified teachers who study further to ‘cap’ an initial or general teaching qualification are accredited with an Advanced Certificate in Education (ACE) (Department of Education, 2000: 24).

The teaching profession is one that requires lengthy training, involves theory as background to practice, has its own code of behaviour, and has a high degree of

autonomy (Dean, 1991: 5). A professional is a person qualified within a profession, therefore teachers should be judged as professionals according to these criteria.

For the most part, tertiary education prepares a young person for a profession and, according to Holy and McLoughlin (1989: 34), concern for his/her welfare abruptly ceases once he or she is placed in their first year of teaching. Under these circumstances, the teacher's PRESET may become inadequate or outdated, as requirements change. Although the signs of inadequacy are evident in the first years of teaching, teachers in service are also affected by changes in education with regard to curriculum, outcomes, methodology, content, assessment and approaches (Lotz, Tselane & Wagiet, 1998: 4-5).

In the South African context, teachers, both pre-service and in-service, are challenged by the changes in the curriculum, i.e. the replacement of content-based education by outcomes-based education (OBE), Curriculum 2005 (C2005) and the Revised National Curriculum Statements (RNCS). The implementation of C2005 has taken place in an environment characterised by enormous infrastructural backlogs, resource limitations, inadequate supply of quality learning materials, and the absence of common national standards of learning and assessment (Choma, 2003: 15). When Professor Kader Asmal became the Minister of Education in 1999, C2005 was in its second year of implementation, and was accompanied by frustration with its design and implementation (Choma, 2003: 15). On the other hand, the teacher development framework was not yet in place, and the policy guiding the professional development and conduct of teachers was being revised (Janse van Rensburg & Lotz-Sisitka, 2000: 3).

The C2005 Review Committee presented its report on 31 May 2002, and confirmed the limitations of C2005 (Choma, 2003: 15). The RNCS made some changes and reduced the features of C2005 to three, viz: critical and developmental outcomes, learning outcomes, and assessment standards (Department of Education, 2001: 3). The committee also recommended that C2005 be streamlined and strengthened to emphasise environmental education (EE) (Lotz-Sisitka & Raven, 2001: 9), and that EE should receive “special attention” in the revised curriculum (Lotz-Sisitka & Raven, 2001: 67). In light of this, there is a need for the development of teachers (both pre-service and in-service) for effective EE, since the task of EE had usually been assigned to academics because most environmental educators did not have the academic training to do so (Loubser, 1992: 90). Basic concepts of EE have been partially addressed by South African authors (Loubser, 1992: 90). On the other hand, very little teacher development has taken place, and teachers have to learn new jargon related to both OBE and EE (Le Grange & Reddy, 1997: 15-16).

1.2 PROFESSIONAL DEVELOPMENT AND ENVIRONMENTAL EDUCATION

In order to determine the professional development of teachers for EE, a description of both concepts would seem to be appropriate, in order to best identify how the two could be integrated. According to Craft (1996: 6):

“Professional development refers to all types of professional learning beyond the point of initial learning. In a broad sense, professional development is seen as

covering all forms of learning undertaken by experienced teachers, from course to private reading to job shadowing but it is sometimes used in a narrow sense of professional courses. The term is sometimes used to describe moving teachers forward in knowledge and skills”.

Professional development could mean different things to different people, depending on their perception of its purpose. This is why some authors refer to professional development as continuing education (Noge, 1993; Tyson, 1994: 10), in-service education and training, or staff development (Le Roux & Loubser, 2000: 99; Dean, 1991: 4), educator development (Department of Education, 1996) and teacher development (Guskey & Hubberman, 1995: 13). According to the Department of Education (1996), the term “educator development” refers to ongoing education and training as a continuum, including both PRESET and INSET. Guskey and Hubberman (1995: 13) maintain that teacher development is about knowledge and skills development, and can be packaged in course materials, workshops and training programmes. They are also of the opinion that today’s practitioners in education are doing an inadequate job, and they see the demand for an increase in INSET as an indication of deficiencies in the knowledge and skills of educators, and therefore efforts must be made to correct these inadequacies if educational institutions are to meet the demands of our increasingly complex society (Guskey and Hubberman, 1995: 13).

An instrument for developmental appraisal defines professional development as the extent to which a teacher acquires new skills and expertise in not, only his/her own

learning area, but more particularly in educational thinking, administration, management, vocational and/or technical areas (Department of Education, 1998). Dean (1991: 5) maintains that professional development is a growing process, a continuous developmental activity, and an increase in some form of professionalism. Professional development includes, inter alia, becoming a self-regulated, flexible and reflective practitioner who can monitor his/her own learning in accordance with the demands of the teaching profession (Du Toit, 2001: 327).

As an infused “theme”, EE is concerned with learning about, in and through the environment, and also learning for the environment (Bornman, 1997: 60). With regard to EE, professional development needs to address the critical thinking and reflection of practitioners so that they can identify how to better achieve the goals of EE (Heck, 1994: 26), which are, as stipulated by the Tbilisi conference, to:

“...provide every person with opportunities to acquire knowledge, values, attitudes, commitment and skills needed to protect and improve the environment”.

Although much attention has been given in official documents to both initial or pre-service training as well as continuing education, the current status of EE in teacher education remains at an unsatisfactory level (Fien & Rawling, 1996: 12). Camino and Calcagno (1995: 61-63) maintain that teachers in some countries have little professional preparation to tackle interdisciplinary themes, and are usually reluctant to introduce environmental issues at school. They believe that certain activities and reflections that

stimulate the interest and participation of teachers when carried out during initial training are often received with scepticism and distrust when proposed to practicing teachers (1996: 12). Fien and Rawling (1996: 12) further quote Wilke, Peyton and Hungerford who state the following:

“Few if any, teacher training programmes adequately prepare teachers to effectively achieve the goal of environmental education in their classroom”.

In addition, many teachers have received their education and pre-service training long before the availability of interdisciplinary courses in environmental studies and the development of critical approaches to teacher education, which have the potential to empower teachers to work for constructive social change (Fien & Rawling, 1996: 13).

In the South African context, it should be noted that South Africa is part of the world and should comply with international standards by adopting EE in its education system. The World Summit on Sustainable Development (WSSD) was held in Johannesburg in 2002. In a speech made at the WSSD, President Mbeki acknowledge the agreements made in Stockholm in 1972 and Rio de Janeiro in 1992, regarding the need for humankind to act together to protect the global environment (United Nations, 2002: 159). In order to protect the global environment in South Africa, teachers, as agents of change, need to be effective environmentally educated teachers. Effective environmentally educated teachers possess basic competencies in professional education, EE content (ecological foundations, conceptual awareness, investigation and evaluation) and environmental

action skills (Oulton & Scott, 1995: 229-231). In South Africa, the Committee on Teacher Education Policy (COTEP) (COTEP, 1996: 6-48) regards EE as an important part of teacher education, as it provides various forms of knowledge, skills and attitudes that can be incorporated as part of a teacher's value system.

1.3 PROBLEM STATEMENT

Based on the above discussion of professional development and EE, the following question needs to be answered regarding EE and professional development:

- **Is there a need for the professional development of teachers for effective environmental education?**

In 1994, South Africa became a democratic state, and underwent drastic changes in terms of the Reconstruction and Development Programme (RDP, 1994). The new constitution of South Africa was adopted, and the Bill of Rights was implemented, which “guaranteed the right of every citizen to an environment that is not harmful to their health or well-being; have the environment protected, for the benefit of present and future generations” (Constitution of South Africa, 1996: 11). Through the Environmental Education Policy Initiative (EEPI), EE was included as a key concept in the White Paper of Education's Training Policy (Department of Education, 1995: 22), which states ...

“Environmental Education, involving inter-disciplinary, integrated and active approach to learning, must be a vital element at all levels and programmes of the education and training system, in order to create environmentally literate and

active citizens and ensure that all South Africans, present and future, enjoy a decent quality of life through the sustainable use of resources”.

The EEPI was formed to ensure that EE became part of the formal education programme. When the EEPI disbanded, the Environmental Education Curriculum Initiative (EECI) was established to ensure that environmental concerns formed part of OBE in South Africa (Le Grange, & Reddy, 1997: 12). For this reason, a phase organiser “the learner in the environment” was included (Department of Education, 1997: 27). This phase organiser was later dropped in the Revised National Curriculum Statements (RNCS) (Lotz-Sisitka & Raven, 2001: 9). The RNCS has been EE-infused in every learning area, because OBE builds on the vision and values of the Constitution and C2005 (Department of Education, 2002: 10).

From the above, it can be deduced that every teacher, irrespective of his/her area of specialisation, has to be able to infuse EE themes in his/her learning area, and that this should form part of their professional development. It appears that professional development programmes should help teachers to gain a deeper knowledge of learning areas, to understand and implement associated pedagogical processes, and to understand and interpret those EE processes (content and skills) that are integral to particular learning areas (Janse van Rensburg & Lotz.-Sisitka, 2000: 89). In this way, teachers will be more able to infuse EE themes across learning areas. Professional development in EE is a national need, because most teachers in South Africa have not received pre-service

training in EE (Chacko, 2000: 7), and many have no background in EE (Janse van Rensburg & Lotz-Sisitka, 2000: 1).

A further problem appears to be the following:

- **If there is a need for the professional development of teachers for effective EE, what kind of professional development in EE do teachers need, and what processes should be followed?**

1.4 SIGNIFICANCE OF THE STUDY

This study is of particular significance to the professional development of : practitioners working with teachers, environmental educators, COTEP, school management teams, development appraisal teams, whole school evaluators, subject advisors, curriculum planners, personnel engaged in professional development activities, prospective teachers, learners in this area of specialization, staff development teams, and teacher education providers. This study will enable the abovementioned professionals to be informed about approaches, models, methods, resources and concepts that are essential to EE.

It will also help curriculum designers to design a curriculum for teacher education. On the other hand, it will also be significant to education specialists (subject advisors) in terms of providing INSET programmes to teachers.

1.5 AIMS OF THE STUDY

This study aims to:

- Elucidate the concepts “professional development” and “environmental education” in order to provide a balance between the theoretical and practical implementation of EE, by providing teachers with the language and the concepts to do so.
- Consider which PRESET and INSET programmes may most effectively be used to promote EE within schools, and through them, the wider community.
- Determine the barriers and challenges that distort the professional development of teachers in EE, and to identify the barriers that teachers encounter in implementing EE in their schools.
- Decide on approaches, models, teaching methods and resources that are appropriate to the teaching and learning of EE.
- Establish the contributions of resource materials to the teaching and learning of EE in schools.

By exploring the research problem, guided by the aims, goals, objectives and principles of EE, it is hoped that important information will be gathered to provide relevant answers for the study.

1.6 RESEARCH STRATEGIES AND METHODS

Literature review have been undertaken in the following areas, in order to gain as wide a perspective as possible of the research context: environmental education; professional development; professional training; training, teacher training or education, or teacher development; pre-service and in-service training; environmental education and teacher education; and environmental education in South Africa and other countries.

Based on the aims previously outlined, it will therefore be appropriate that the approach in this study is quantitative and descriptive in nature. A survey will be used because it is used for descriptive, relationship and exploratory purposes (McMillan & Schumacher, 2001: 309). There will be a clear description of the population, sample and procedures for sampling. The survey describes the frequency of the population and this makes this survey to be descriptive (McMillan & Schumacher, 2001: 296). Information collected by surveys is quantitative.

The study intends to gather data about professional development for effective EE via: a literature review of primary and secondary sources, a content analysis of relevant literature in terms of circulars, guidelines or handouts from the Departments of Education, Environmental Affairs and Tourism, and Water Affairs and Forestry, and questionnaires. These will provide an overview of the literature relevant to this study.

1.7 DEFINITIONS OF TERMINOLOGY USED

- “Assessment standards”: describes the level at which learners should demonstrate their achievement of the learning outcomes and ways to demonstrate their achievement.
- “Critical and developmental outcomes”: lists of outcomes derived from the constitution and contained in the South African Qualification Authority (SAQA).
- “Critical outcomes”: refers to broad, generic, cross-curricular outcomes which underpin the constitution and are adopted by SAQA.
- “Curriculum”: a philosophical framework which sets out guidelines for teaching and learning. It includes all aspects of teaching and learning.
- “Democratic state”: refers to a sovereign state which was chosen by the people and is against autocratic rule.
- “Environment”: can be human or non-human, and consists of all those factors (natural, spatial, man-made, socio-political, etc) that affect the growth and development of a species.
- “Environmental Education”: an interdisciplinary, integrated process concerned with the resolution of value conflicts related to the man-environment relationship, through the development of a citizenry with an awareness and understanding of the environment, both natural and man-made.
- “Environmental literacy”: refers to the basic understanding that an individual should possess in order to make intelligent decisions about managing the environment.

- “In-service training”: refers to the training of experienced teachers to help them move forward in terms of the knowledge and skills of their profession.
- “Interdisciplinary”: refers to holistic, integrative and cross-curricular approaches to teaching.
- “Learning Area”: a field of knowledge, skills and values which has unique features as well as connections with other fields of knowledge. It is a vehicle used to facilitate learning.
- “Learning Outcomes”: refers to what learners should know, demonstrate and be able to achieve by the end of the GET band.
- “Outcomes”: learning results that are clearly demonstrated during or after a learning experience. They are forms of learning that we can see learners do and that we can directly assess. They are contextually demonstrated end-products of the learning process.
- “Outcomes Based Education”: an integrated and holistic approach to teaching and learning. It is a participatory, learner-centred and activity-based education system based on outcomes and assessment standards.
- “Pre-service training”: refers to the initial training of teachers for their profession.

1.8 CHAPTER DIVISION

CHAPTER 1: ORIENTATION

The focus of this chapter is on the introduction of the research topic, the aims and significance of the study, and the research strategies and methods. It also provides definitions of the terminology used in the study.

CHAPTER 2: The conceptual framework of Environmental Education and professional development

In chapter 2, an attempt is made to explore the conceptual framework of the terms “environmental education” and “professional development”. This chapter discusses the historical background of EE. The definitions, aims, goals, objectives and principles of EE are explained. The OBE system in relation to EE is also discussed.

CHAPTER 3: Effective professional development of Environmental Education and barriers on professional development of EE teachers

In chapter 3, the focus is on what can be regarded as the effective professional development of EE teachers, and the profile of an environmentally literate teacher. The focus is also on approaches, models, teaching methods and learning resources appropriate to the professional development of teachers in EE. In this chapter, the focus is also on the barriers or impediments that hinder the professional development of teachers in EE, and how these barriers may be overcome.

CHAPTER 4: Research methods and strategies

In this chapter, the focus is on the data gathering process, and on the research methodologies and techniques employed in the study.

CHAPTER 5: Report and analysis of data

In this chapter, data is reported and analysed. The results are then discussed in relation to the research question as stated in 1.2.

CHAPTER 6

The last chapter provides conclusions and recommendations of this research investigation. These aim at encouraging teachers and other interested parties in EE to continue with further research on this topic.

CHAPTER 2

THE CONCEPTUAL FRAMEWORK OF ENVIRONMENTAL EDUCATION AND PROFESSIONAL DEVELOPMENT

2.1 INTRODUCTION

This chapter aims to explore the conceptual framework of the terms *environmental education* and *professional development*, as stated in the previous chapter. According to the New Oxford Dictionary (1999: 380), the word *conceptual* is derived from the word *concept* which means an idea or thought corresponding to some distinct entity, or which determines the application of a term. Concepts are understood as having a logical core which is surrounded by an associative framework (Loubser, Swanepoel & Chacko, 2001: 319). According to the Dictionary of Education (1973:124), *conceptual framework* refers to the main ideas arranged in such a way as to create a scope for an area of study. *Environmental education* and *professional development* are the concepts that will be given attention in this study.

2.2 THE CONCEPTUAL FRAMEWORK OF ENVIRONMENTAL EDUCATION

In environmental education (EE), the starting point is inevitably the “environment” (Lotz & Robottom, 1998: 24). The concept “environmental education” is made up of the following words: “environment” and “education”. Attention should be given to a clear conceptual framework of the term “environmental education”, as the central

concept of this study. In this regard, the origins and historical background of EE and how it came to South Africa is of the utmost importance. To better understand the concept of EE, it would be appropriate to explain the concepts “environment”, “education” and “environmental education”.

2.2.1 THE CONCEPT “ENVIRONMENT”

The New Oxford Dictionary (1999: 617) describes the environment “as the surroundings or conditions in which a person, animal or plant lives; the natural world as a whole or a particular geographical area especially as affected by human activity”. Chadwick (2000: 6) quotes Shnack (1996) stating that “nature is not environment; it only becomes environment when linked to human interest”.

The Department of Environmental Affairs and Tourism (1999: 2) defines the word “environment” as places where people and other organisms such as plants, animals and insects live; that the environment consists of renewable and non-renewable resources such as air, water, land and all forms of life; and natural ecosystems, habitats and spaces that are made by people or changed by them in some way. According to Lotz-Sisitka and Raven (2001: 29), the “environment” is a living world made up of communities of humans, other living things and life-support systems. All of these interact, shaping our surroundings in diverse ways, so that the biophysical, social, economic and political are all interacting dimensions of our environment (Lotz-Sisitka & Raven, 2001: 29).

According to Tselane and Mosidi (1998: 11), the term “environment” includes everything around people, including people themselves, where they live, shop, relax, play, work, enjoy nature, and where history occurred (e.g. monuments and cemeteries). The environment consists of interacting social, economic and political dimensions, resting upon a base of biophysical life-support systems and their interrelationships, influencing sustainable development (Chacko, 2000: 18). This perspective thus expands the scope of EE to include conservation, development, peace and democracy (Chacko, 2000: 18). Neluvhalani (2000: 12) maintains that the meaning of the concept “environment” is constructed from a personal point of view influenced by different contexts, viz: political, economic, social, scientific and technological.

From the above definitions, it appears that the environment is everything around us. It seems that people are placed at the centre of all environmental concerns, with an emphasis on the biophysical, social, economic and political factors as part of the environment. It should be further noted that the concept “environment” is protected in Section 24 of the Constitution (1996), which is found in the Bill of Rights chapter. This means that the government is obliged to make environmental rights a reality by managing the environment (Department of Environmental Affairs and Tourism, 1999: 78).

2.2.2 THE CONCEPT “EDUCATION”

Education means different things to different people, depending on their perspective regarding what its purpose is. Wilke (1997: 24-26) maintains that education is more

than preparation for life - it is a mechanism, a tool for improving the quality of the human environment. According to Tselane and Mosidi (1998: 11), “education is a lifelong process in which knowledge is imparted, and correct skills, attitudes and behaviour are developed, embracing both teaching and learning”.

For the purpose of this study, education implies a purposeful practice or process among individuals, where philosophies of life are shared and transferred according to the needs of the society. Every society is obliged to bring up their children in such a way that they will become the kind of people who will protect the environment in which they live. This is in the hands of the pre-literate society at home, specialist teachers in schools, universities and technikons, and informal teachers in workplaces. These people pass on environmental skills, knowledge, attitudes and values needed for sustainable living.

2.2.3 THE CONCEPT “ENVIRONMENTAL EDUCATION”

Attention can now be turned to the definition of the concept “environmental education”, as the central concept of this study. Disinger, in Hungerford (2002a: 5-6), and Simmons, in Hungerford (2002b: 6) acknowledge the fact that there is confusion when defining EE. Maila’s view on the definition of EE is that “the acceptability of any definition will depend on its capacity to define the environmental situation or context clearly, relevant and comprehensively with those who are in that situation” (2001: 15). The first known definition of EE in the school curriculum was drawn up at the conference of the International Union for the Conservation of Nature (IUCN), and is the most commonly used and most widely accepted and acknowledged definition

among most authors (Leketi, 1992: 3; Irwin, 1993: 58; Schulze, 1994: 165; Lotz and Robottom, 1998: 24; Clacherty, 1988: 8; Bornman, 1997: 58; Gough, 1993: 5). It reads as follows:

“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 entails practice in decision-making and self-formulation of code of behaviour about issues concerning environmental quality”.

Bornman (1997: 60) quotes Agenda 21 (1992) and Tilbury (1994), stating that EE, as a cross-curricular “theme”, is concerned with learning *about* the environment, learning *in* and *through* the environment, and also learning *for* the environment. Learning *about* the environment aids in the acquisition of knowledge and understanding, helping in the development of sensitivity for and awareness of the environment on a local, national and global level; learning *through* and *in* the environment leads to the development of skills which help in problem-solving and decision-making; learning *for* the environment deals with the development of attitudes and values which promote responsibility for the environment, and encourage a direct involvement in environmental action (Bornman, 1997: 60).

There are many definitions of EE. Plant (1995: 34) acknowledges the fact that EE is an inherently complex field of study which draws on diverse political, sociological, philosophical, pedagogical and environmental strands, in an attempt to give meaning to the ecological crisis and environmental change. Hungerford (1994: 141) states that

“EE is that aspect of education that develops individuals who are environmentally knowledgeable and, above all, skilled and dedicated to working individually or collectively, towards achieving and or maintaining a dynamic equilibrium between the quality of life and the quality of the environment”. Chacko (2000: 96), on the other hand, succinctly defines EE as a tool used for developing environmental literacy, whereas Knapp (2000: 33) refers to EE as education for the environment and sustainability. Educating for sustainability became a term used more or less synonymously with EE and education for sustainable development (Irwin, 2000: 32).

Since there is confusion in defining the concept of EE, for the purpose of this study, EE implies a field of study and an integrated, holistic approach to education directed towards conserving planet earth and its inhabitants in order for present and future generations to survive on its sustainable resources.

2.3 HISTORICAL BACKGROUND OF ENVIRONMENTAL EDUCATION

Having discussed and defined EE in the preceding paragraphs, it is also important to discuss the origins of EE both internationally and in South Africa. The historical background also forms the conceptual framework of EE in this study.

The earliest origins of EE can be traced back to Ancient Egypt, Greece, India and China. The modern concept has its roots in the Industrial Revolution, initially in Britain, Europe and North America, and subsequently globally (Irwin, 1993: 20-21). The most important date in the development of EE was the 1972 IUCN conference which led to the establishment of the United Nations Environmental Programme

(UNEP) (UNEP, 1975), which, together with the United Nations Educational, Scientific and Cultural Organisation (UNESCO), organised the first intergovernmental conference on EE at Tbilisi in the USSR in 1977 (UNESCO-UNEP, 1978) and the Belgrade Charter, a global framework for EE, was launched in 1975 (Schulze, 1994: 58). Other important international developments related to EE are the Global 2000 Report (1982), the World Commission on Environment and Development (1987) (Leketi, 1992: 6), the World Conservation Strategy (1989), the Rio Summit (1992), the Rio+ 5 Summit (1997) (Maila, 2001: 19-20), and the Rio+ 10 Summit in Johannesburg (WSSD, 2002).

The milestone in the development of EE in Southern Africa was the first international conference on EE in South Africa in 1982, on the initiative of the Treverton College in Mooi River, Natal, which led to the formation of the Environmental Education Association of Southern Africa (EEASA) (Janse van Rensburg & Jenkin, 1999: 7). EE first came to South Africa in the mid 1970's, as prior to that time, efforts had been largely concentrated on soil erosion and what was termed until the late seventies "Conservation Education" – concentrating on conservation as the wise use of (mainly) natural resources and basic ecology, and South Africa seldom concerned itself with the political, social or even the built environment (Irwin, 1993: 21). Irwin (1993: 6) further maintains that in South Africa, EE teacher education was pioneered in Bophuthatswana and at all five colleges of education in that region. Several tertiary institutions have become involved in EE, such as University of South Africa (UNISA), Rhodes University, University of Stellenbosch, and Cape Town Teachers' College, by incorporating EE in their training curricula (Loubser & Ferreira, 1992: 33).

In the 1990's, EE adopted a more defined stance, and addressed education for long-term sustainability (Bornman, 1997: 59). At the 1992 Earth Summit, a key recommendation to educators was that EE and Development Education should be incorporated as an essential part of learning in formal and non-formal education (Bornman, 1997: 59). In South Africa, the Environmental Education Policy Initiative (EEPI) took the lead in discussing curriculum matters regarding the integration of EE into formal education (Bornman, 1997: 62). Besides the broad reflection on EE (concepts, aims, goals, objectives and learning strategies), the EEPI also provided guidelines for the integration of EE at specific levels within ten different subjects areas of the national core syllabus (Bornman, 1997: 62). In 1996, the Environmental Education Curriculum Initiative (EECI), a continuation of the EEPI, was created in order to conduct a project on community development for EE in new learning areas (Bornman, 1997: 62). Today, EE is emphasised and infused in every learning area by the National Environmental Education Programme (NEEP) (Department of Education, 2002: 10; Lotz-Sisitka & Raven, 2001: 9). The NEEP-GET pilot project recommended orientation for including the environment in the National Curriculum Statement (Lotz-Sistka & Raven, 2001: 100).

Environmental concerns have been emphasised in many policy documents in South Africa, viz: the White Paper on Environmental Education (1989); the Reconstruction and Development Programme (RDP) (1994); the White Paper on Education and Training (1995); the Constitution of the Republic of South Africa (1996); the Environmental Management Bill (1998); the White Paper on Environmental Management Policy (1999); and the RNCS (2002).

2.4 AIMS, GOALS, OBJECTIVES AND PRINCIPLES OF ENVIRONMENTAL EDUCATION

Aims are general statements of what might be gained in the long-term by studying an issue (Hodgson, 1993:20). A goal is an actual “destination” of learning in general terms (Curzon, 1985: 89). Objectives are statements designed to identify, as clearly as possible, what learners should do in order to demonstrate that they have learned something (Hodgson, 1993: 20). Loubser (1992: 92) quotes Cawood (1986), in stating that principles can be regarded as prerequisites. Aims, goals, objectives and principles of EE will be discussed in this study, as they provide a clear direction for the research, and contribute towards determining whether or not there is a need for the professional development of teachers in EE.

2.4.1 AIMS OF ENVIRONMENTAL EDUCATION

The UNESCO-UNEP (1977: 25) conference in EE recommended and endorsed the following aims of EE:

To succeed in making individuals and communities understand the complex nature of the natural and built environments resulting from the interaction of their biological, physical, social, economic and cultural aspects; to acquire the knowledge, values, attitudes and skills to participate in a responsible and effective way in anticipating and solving environmental problems; and to manage the quality of the environment.

2.4.2 GOALS OF ENVIRONMENTAL EDUCATION

The commonly expressed goal of EE is to encourage environmentally responsible behaviour (Simmons, 1991: 16; Fien 1993: 13). Simmons (1991: 16) quotes Hungerford, Peyton and Wilke, in stating that the superordinate goal of EE is “to aid citizens in becoming environmentally knowledgeable and, above all, skilled and dedicated citizens who are willing to work, individually and collectively, toward achieving and/or maintaining a dynamic equilibrium between quality of life and quality of the environment”. The ultimate goal of EE is to create informed and skilled citizens who are willing and able to take action to resolve environmental issues (Lane, Wilke, Champeau, Sivek, 1995: 33). The fundamental goal of EE is to equip students with skills needed to make more thoughtful decisions about environmental issues (Arvai, Campbell, Baird & Rivers, 2004: 33). The goals outlined above suggest that encouraging environmentally sound behaviour is a desired outcome of EE, as well as involvement in environmental activities (Simmons, 1991: 16).

2.4.3 CATEGORIES OF ENVIRONMENTAL EDUCATION OBJECTIVES

The translation of aims of EE to objectives is necessary for effective implementation of EE at all levels of education. A comprehensive set of objectives was drawn up by UNESCO at the Belgrade workshop (1975), and endorsed by the Tbilisi conference. These objectives are summarised as follows (Chacko, 2000: 29):

- To foster a clear awareness of and concern about economic, social, political and ecological interdependence in urban and rural areas;

- To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment; and
- To create new patterns of behaviour in individuals, groups and society as a whole, towards the environment.

2.4.4 GUIDING PRINCIPLES OF ENVIRONMENTAL EDUCATION

Guiding principles of effective EE were accepted at Tbilisi, in order to accomplish the aims and objectives of EE. The guiding principles for effective EE offer a broad and neutral approach to environmental issues (Chacko, 2000: 36). The UNESCO-UNEP conference (1977: 27) endorsed the following principles of EE, which can be summed up as follows: totality, continuity, interdisciplinarity, participation (in problem-solving), critical thinking, diversity and holism.

From the above discussion, it becomes apparent that the aims, goals, objectives and principles of EE provide guidelines for educators and learners on how to care for the environment. Therefore, it is appropriate to state that all human activities are founded on these underlying aims, goals, objectives (outcomes) and principles, and that teaching and learning in EE is impossible without them. Teaching activities need to be directed by these aims and principles in order to attain the goals, objectives or outcomes. In order to help learners to achieve the aims, goals, objectives and outcomes of EE, a teaching workforce that is knowledgeable and skilled in teaching toward this end, is required.

2.5 PROFESSIONAL DEVELOPMENT OF TEACHERS

In order to attempt to analyse the professional development of teachers, a description of the term “professional development” would seem to be necessary for identifying how best it can be integrated. This study presents a perspective on professional development and the conditions under which it takes place. For the sake of this study, the discussion concentrates on teachers – both prospective and current teachers. This means that teachers’ professional development takes place both through pre-service training (PRESET) and in-service training (INSET). The definitions of professional development will be discussed, as well as the concepts related to professional development. The paradigm shifts and the relationships between professional development, EE and outcomes-based education (OBE) will also be discussed. The aim is to equip teachers, individually and collectively, as members of a wider professional community (doctors, nurses, social workers, lawyers etc), to act as shapers, promoters and well-informed critics of reforms. In order to face the challenges of reform, teachers have to acquire skills and knowledge through professional development.

It is generally accepted that professional development is essential for improvement in education (Guskey, 2002: 381). Although most teachers are generally required to take part in professional development by certification or contractual agreement, most report that they engage in these activities because they want to become better teachers (Guskey, 2002: 382).

To better understand the term *professional development*, it would be most appropriate to first explain the concepts *professional* and *development*, since professional development is a key concept in this study.

2.5.1 THE TERM “PROFESSIONAL”

According to the Large Print Oxford Dictionary (1999: 637), the word *professional* is derived from the word *profess*, which means to be skilled. *Profession* (noun) means a paid occupation, especially one that involves prolonged training, and *professional* (noun) refers to a person qualified in a profession. The Concise Dictionary of Correct English (1979: 111) defines a *professional* as one who earns a living in a particular occupation. The term has, however, lost its original meaning as a result of overuse, as soldiers, criminals and footballers call themselves professionals. In this study, a teacher is referred to as a professional because of his/her prolonged training in the skills of teaching.

2.5.2 THE TERM “DEVELOPMENT”

The Large Print Oxford Dictionary (1999: 220) refers to *development* as the process of developing or being developed, a special state of growth or advancement. *Development* emanates from the word *develop*, which means to grow and become more mature, advanced or elaborate. The Dictionary of Education (1973: 175) defines *development* as growth or change in structure, function or organisation, constituting an advance in size. For the purpose of this study, when teachers grow further in their

profession, there is development. This development can be achieved through INSET and further studying.

2.5.3 THE TERM “PROFESSIONAL DEVELOPMENT”

Kathrada (1989: 6) maintains that there are many misconceptions surrounding the term ‘professional development’, in the way it is defined and interpreted by researchers. Researchers use the terms “staff development”, “in-service education”, and “continuing education” interchangeably. Kathrada (1989: 6) further maintains that professional development is geared towards making teachers lifelong learners rather than recruits of education. Guskey (2002: 388) refers to professional development as learning to be proficient in something new, and finding meaning in a new way of doing things.

Concoran (1995: 1) maintains that educators are being asked to master new skills and responsibilities and to change their practices, and in order to meet these expectations, teachers need to deepen their content knowledge and learn new methods of teaching. All these activities fall under the heading of professional development (Concoran, 1995: 1). Professional development is a more holistic view of the development of a teacher from a novice to an advanced practitioner (Eric Clearinghouse, 2000:1). If today’s teachers are to be adequately prepared to meet the new challenges they face, they need to understand the importance of professional development in relation to their practice (Eric Clearinghouse, 2000: 1). Professional development plays an important role in successful education reform - it serves as a bridge between where prospective and experienced educators are now and where they will need to be in

order to meet the challenge of guiding all students in achieving higher standards of learning and development (U.S Department of Education, 1996: 1).

From the above discussion, it can be deduced that the term *professional development* is defined differently by different authors. Some authors refer to professional development as continuing education (Noge, 1993; Tyson, 1994: 10); INSET (Bagwandeen, 1991: 57-59; Le Roux & Loubser, 2000: 99; Dean, 1991, 4); educator development (Department of Education, 2000); staff development (Dean, 1991: 4); and teacher development (Guskey & Hubberman, 1995: 13). These terms are used interchangeably with professional development. For the purpose of this study, the definition of teacher professional development provided by Maila (2003: 19) will be used, which states that:

“Teacher-educator professional development refers to institutional or non-institutional professional and academic programmes aimed at improving the curriculum development skills of teachers and educators and their professional growth and professional development in an on-going process”.

2.6 OUTCOMES-BASED EDUCATION

An outcomes-based education (OBE) system is based on the principle that decisions about learning programmes for learners should be driven by outcomes (outputs) that the learners should demonstrate by the end of their learning experiences, as opposed to the inputs of the traditional, syllabus-driven education and training system (Conradie, 1997: 8). OBE is an integrated and holistic approach to teaching and learning (Unisa, 2003: 11). Both the process and content of education are emphasised

by spelling out the outcomes (critical, developmental and learning outcomes) derived from the constitution and which are contained in the South African Qualifications Act (Department of Education, 2002: 11).

2.6.1 OUTCOMES-BASED EDUCATION IN RELATION TO ENVIRONMENTAL EDUCATION

One of the strategies of the Manifesto on Values, Education and Democracy which promotes EE in OBE is “promoting ethics and the environment” (Department of Education, 2002: 8). The kind of learner envisaged in the OBE curriculum is a lifelong learner who is confident and independent, literate, numerate and multi-skilled, compassionate, with respect for the environment, and has the ability to participate in society as a critical and active citizen (Department of Education, 2002: 8). The critical outcomes envisage learners who will be able to use science and technology effectively and critically, showing a responsibility towards the environment, and demonstrating an understanding of the world as a set of related systems, by recognising that problem-solving contexts do not exist in isolation (Department of Education, 2002: 8). The developmental outcomes also envisage learners who are able to be culturally and aesthetically sensitive across a range of social contexts (Department of Education, 2002: 8).

In OBE, the relationship between human rights, a healthy environment and social justice, is addressed in each learning area, whereby the latter provides guidelines in terms of the requirements and expectations in the General Education and Training band (Department of Education, 2002: 10). The RNCS has tried to ensure that all

learning area statements reflect the principle of social justice, respect for the environment and human rights, as defined by the constitution (Department of Education, 2002: 10). Kader Asmal, the previous Minister of Education, stated that “this curriculum encapsulates our vision of teachers and learners who are knowledgeable and multifaced, sensitive to environmental issues and able to respond to and act upon many challenges that will still confront South Africa in this twenty first century” (Department of Education, 2002: 1).

The principle of integrated learning is integral to OBE, since learners experience that learning areas are linked and interrelated across the curriculum (Department of Education, 2002: 13). EE is cross-curricular and integrative in nature (Bornman, 1997: 65; Loubser, 1997a: 20; Loubser, 1997b: 25). EE also emphasises social contexts, problem-solving, lifelong learning, respect for the environment, participation and critical thinking, as in the Manifesto, and critical and developmental outcomes.

2.7 CONCLUSION

In this chapter, an attempt has been made to describe the conceptual framework of both EE and professional development. It was shown how both terms are related to the training of teachers, both PRESET and INSET. The origins of EE were also discussed because they provide a framework for the developments of EE as a field of study, both globally and locally. The aims, goals, objectives and principles of EE were mentioned, because they provide a clear direction in terms of the content and methods of teaching EE. In order to be able to solve today’s environmental problems,

communities need to possess skills and knowledge to actively participate in resolving any environmental crises. It appears that both EE and professional development are related to OBE and EE should therefore be a field of study in teacher education.

Chapter 3 will discuss the approaches, models, teaching methods and teaching and learning resources that are appropriate to teaching and learning in EE. The barriers to the implementation of EE and how to overcome them will also be discussed. This aims at developing the character of an environmentally literate teacher in teacher education.

CHAPTER 3

THE EFFECTIVE PROFESSIONAL DEVELOPMENT OF ENVIRONMENTAL EDUCATION TEACHERS

3.1 INTRODUCTION

In this chapter, the focus will be on the approaches, models, teaching methods and environmental learning resources that guide the creation of more effective professional development programmes in environmental education. Schulze (1994: 167) maintains that the two keys to outstanding teaching are *effectiveness* (are the results worthwhile?) and *efficiency* (are the methods used the best in terms of time and cost?). Effective professional development programmes are made possible by an effective educator who has acquired skills in, and knowledge of, EE through professional development during pre-service training (PRESET) or initial and in-service training (INSET), to enable him or her to use approaches, models, teaching methods and environmental learning resources appropriate to the teaching and learning of EE. It would be appropriate, in this chapter, to also focus on the most important concepts in environmental literacy and EE, the barriers to the implementation of EE, and the characteristics of an environmentally educated teacher, in order to promote effective professional development in EE.

3.2 APPROACHES RELEVANT TO THE PROFESSIONAL DEVELOPMENT OF TEACHERS IN ENVIRONMENTAL EDUCATION

The Dictionary of Education (1959: 34-35) defines an approach as a method based upon some theory of how it should be learned. Approaches in education are about decisions made by curriculum development agencies (Rampedi, 2001: 28). Approaches decided upon should be in line with curriculum grounding features, which are yardsticks to evaluate a curriculum in practice (Rampedi, 2001: 28). An approach can thus be defined as a means adopted when tackling a problem. The area of teachers' professional development is of growing interest internationally (Kennedy, 2005: 278). This study proposes two categories under which approaches to professional development of EE teachers can be grouped: environmental education and research-based approaches.

3.2.1 ENVIRONMENTAL EDUCATION APPROACH TO PROFESSIONAL DEVELOPMENT

In many countries of the world, EE has emerged as an educational approach and a process with goals related to the integration of subject matter; systems thinking; problem solving; critical thinking and decision-making; and lifelong learning (Bornman, 1997: 65). These are the characteristics of EE as a field of study. An EE approach develops learners into critical thinkers, social enquirers and problem solvers or active participants in environmental and political (or educational) decision-making (Leketi, 1992: 6).

Leketi (1992:5) quotes Zoller (1986/7), who states that the EE approach should expose learners to actual environmental problems in their immediate environment, promote learning by self-experience via the enquiry method, and direct interaction between learners' cognitive systems which, in turn, entails change in teachers' roles and in the traditionally accepted role of subject matter. The EE approach also suggests that teaching should not end with classroom activities, but should be extended to the community through surveys of problems, projection of possible solutions, and conducting of awareness programmes for parents (Leketi, 1992: 6). Bornman (1997: 59) also emphasises the fact that EE should be regarded as an approach to education which permeates all subjects in some way, due to its holistic, integrative and interdisciplinary nature.

The EE approach is given different names by different authors, since it is similar to the infusion approach, inclusion approach, holistic approach, interdisciplinary approach, learner-centered approach, outcomes-based education and integrative approaches. These approaches share the same features with the EE approach because they focus on including and inserting EE components in existing teacher courses, rather than forcing demands on college curricula which are already crowded. In South Africa, the OBE approach has applied the infusion approach (Janse van Rensburg, 2000: 71). The OBE approach is guided by outcomes that emphasise skills, knowledge, values and attitudes that citizens of SA will be expected to have (Squazzin & du Toit, 2000: 10). OBE is learner-centred and constructivist education, because it is based on a shift from the traditional aims and objectives approach to an approach based on the learners achieving

the outcomes (Squazzin & du Toit, 2000: 10). This calls for the inclusion of EE training in the curriculum. In order for EE to be successful, it must be integrated in all subjects or learning areas (Knapp, 2000: 33), as well as in teacher training courses.

3.2.2 RESEARCH-BASED APPROACH TO PROFESSIONAL DEVELOPMENT

The South African government has taken major initiatives to improve the quality of education of its citizens, with the aim of achieving higher standards for all learners. These changes not only concern changes in standards, assessment, school management and teaching methods, but also changes in the curriculum and teaching approaches (OBE). Workshops are increasingly being used as a forum for engaging participation in research processes (Lotz & Robottom, 1998: 25). The one-day workshops do not provide a firm foundation for EE and its teaching strategies (Paul & Volk, 2002: 11). Paul and Volk (2002: 11) quote Spiegel (1996), who acknowledges the fact that teachers find themselves unable to learn new teaching skills, and maintain that part of the problem lies within the schools' choice of delivery for in-service training. Workshops are used to present an open, reflective research process during professional development. The National Environmental Education Programme (NEEP) runs in-service workshops for EE teachers in South Africa (Nyembe, 2000: 12).

Environmental issues are complex, related to science and society, so teachers must draw knowledge and skills from a variety of subjects, since EE requires an interdisciplinary approach (Paul & Volk, 2002: 11). Brief, one-shot workshops without any follow-ups are

offered, with the intention of ‘telling’ teachers what they are obliged to change, and with the intention of having an immediate benefit for the whole school, but these activities have hardly been effective (Ponte, 2005: 274). By developing case studies and research-based professional development processes, ways of enabling participants to enhance their understanding of the complexity of EE as a field of study, are explored (Lotz & Robottom, 1998: 25).

Teachers should engage in research because it is a systematic and intentional inquiry carried out by them in their own schools and classrooms (Ponte, 2005: 377). Teachers can develop themselves professionally by learning in and from their practice through the inquiry-based activities of the research approach. In research, teachers are able to reflect on their own practice (not external experts, but teachers themselves), understand their practice in the situation in which it is carried out, and analyse data about their practice in view of understanding and improving it (Ponte, 2005: 277-283). Teachers should see the research-based approach as a tool to improve their practice and the situation in which it is carried out. The relationship between the professional development of teachers and the improvement of their practice is most evident in the research-based approach, because teachers initiate the research, engage in dialogue, and cooperate and collaborate with whoever is part of the situation that needs to be changed (Ponte, 2005: 290-292). Teacher training courses should include the research based approach to enable teachers to carry out researches in their own schools and classrooms for effective EE teaching.

Based on the above discussion of approaches, it appears that no single approach can adequately inform an EE curriculum, because EE is holistic, inclusive, infusive, learner-centred and integrative in nature. A combination of both approaches is appropriate to the professional development of teachers in EE. Therefore, a collaborative, participatory, (Rampedi, 2001: 30) learner-centred and infusive approach is a prerequisite for professional development in EE.

3.3 PROFESSIONAL DEVELOPMENT MODELS APPROPRIATE TO ENVIRONMENTAL EDUCATION TEACHERS

Lebeloane (1998: 141) defines a model as a design which is tailored to produce a desired shape that can be imitated. The International Dictionary of Education (1978: 223) defines a model as a representation of a concept, principle, idea or system in a two- or three-dimensional diagram, or as a means of transferring a process from its actual setting to one which can be more conveniently studied. Based on the approaches to EE, an EE professional development model should consider approaches that use EE and research-based strategies. This study proposes ten models for facilitating professional development, namely: a development model for teacher change; the NEEP's Active Learning model; the Amoeba model; the Cascade model; the issue investigation and action-training model; the spiral model; the NEEP-GET learning tree model; the training model, the deficit model and the action research model. This study considers the circumstances in which each of the ten models of professional development can be

adopted, and explores the forms of knowledge that can be developed through any particular model.

3.3.1 A PROFESSIONAL DEVELOPMENT MODEL FOR TEACHER CHANGE

Figure 1: Adapted from Guskey (2002: 383)

According to Guskey (2002: 353), this model suggests a different sequence of the three major outcomes of professional development programmes, viz: change in classroom practices of teachers, change in their attitudes and beliefs, and change in the learning outcomes of learners. According to this model, significant change in teachers' attitudes and beliefs primarily occurs after they see evidence of improvements in student learning (Guskey, 2002: 383). Guskey (2002: 383) acknowledges the fact that change is a gradual and difficult process for teachers. In order to achieve this change, teachers should ensure that they receive regular feedback on the learners' learning process, and that they are provided with continuous follow-up and support.

This model is appropriate to the professional development of teachers in EE, because change is needed urgently due to the implementation of the Revised National Curriculum

Statements (RNCS) and the OBE approach. The RNCS and OBE go against the traditionally driven syllabus, instead focusing on change to infuse EE in all learning areas. This model provides a perspective on professional development as a means of providing educational change. This model could arguably be categorised as a transformative model of professional development. In practice, many stakeholders in education are involved, (teachers, government, curriculum developers, teacher education providers, researchers etc.), in order to move from content-based and teacher-centred models of professional development so as to support educational transformation.

3.3.2 THE NEEP' S ACTIVE LEARNING MODEL

Figure 2: Adapted from Lotz-Sisitka & Raven (2001: 3)

The NEEP published this model to support active learning through OBE, which enables teachers and schools to plan active learning processes (Lotz-Sisitka & Raven, 2001: 4). This model does not regard EE as something 'there' to be used as an instrument, but sees it as involving 'processes' that can be realised through the use of the active environment (Maila, 2001a: 33). In practice, teachers are taught that, during the lesson process, they assist the learners with information sources, ask simple, probing questions that encourage cooperative environmental learning and the sharing of information, and then the learners and teachers report to other teachers in the school (Maila, 2001a: 34).

This model has already been used by the Department of Environmental Affairs and Tourism's "Working for Water" programme in the novel "Hack Attack Pack" (Lotz-Sisitka, 2000: 4). This model was used to support material development for the C2005 and RNCS pilot projects, and other potential projects that fell under the umbrella of the NEEP (Lotz-Sisitka, 2000: 4). This model is implemented by an expert who trains teachers on how they can improve the teaching and learning of EE, by effectively targeting the skills and knowledge that teachers require.

3.3.3 THE AMOEBA MODEL

Figure 3: Adapted from Lebeloane (1998: 156)

The Amoeba model by Lebeloane (1998: 156) takes on the structure, shape and movement of a unicellular organism, the amoeba. This model suggests that EE can use elements from a variety of paradigms (constructivism, social critical theory and positivism) and teaching methods, in order to teach a topic in an environmentally directed way (Lebeloane, 1998: 157). This model is also applied by an expert who demonstrates to teachers how to use it in a teaching and learning situation.

3.3.4 THE CASCADE MODEL

The Cascade model is dominant in teacher development in South Africa today, and the committee for the review of C2005 reports that a Cascade model of training was “the primary means of preparing the majority of educators for C2005 implementation” (Janse van Rensburg & Lotz-Sisitka, 2000: 44). The Cascade model involves individual teachers

attending ‘training events’ and then cascading or disseminating the information to colleagues (Kennedy, 2005: 240). For implementing environmental literacy in teachers, the National Department of Education (DoE) can commission a non-governmental organisation to train a core of 20 officials from each province, who in turn ‘cascade’ the knowledge and understanding they gained to district officials, who then ‘workshop’ classroom teachers and other educators with the knowledge and understanding they have managed to gain (Janse van Rensburg & Lotz-Sisitka, 2000: 44). This model is cost-effective (Janse van Rensburg & Lotz-Sisitka, 2000: 40) and is commonly employed in situations where resources are limited (Kennedy, 2005: 240).

3.3.5 THE ISSUE INVESTIGATION AND ACTION - TRAINING MODEL

The issue investigation and action training model was developed by Hungerford, Litherland, Peyton, Ramsey and Volk (Winter et al, 2002: 28). This model addresses commonly accepted goals of EE: ecological foundations, conceptual awareness, issue investigation and evaluation, and citizenship action (Winter et al, 2002: 28). Professional training in these goals is appropriate to teachers of EE, and teachers should be trained in how to implement this model. It has been found to promote beliefs, knowledge and skills, as well as learners’ confidence in their ability to make a difference (Lane, Wilke, Champeau and Sivek, 1995: 37). The effective professional development of teachers should provide these opportunities to learners.

In this model, teachers are trained to encourage learners to choose an issue of personal interest, investigate that issue in depth, and then develop issue-resolution action plans that are subsequently evaluated and, if desired, implemented (Ballantyne and Parker, 1996: 31). Winter (2002: 32) and his colleagues' research on this model indicates that some teachers use more group work, peer teaching and learner leadership, and they have continued to develop and elaborate cognitive frameworks that allow them to have more flexibility and power in their classrooms. In this case, teachers are encouraged to use this learner-centred model that also highlights groupwork participation. On the other hand, the "paradigm shift" towards OBE has led to learner-centred, activity-based, constructivist education (Janse van Rensburg & Lotz Sisitka, 2000: 5).

3.3.6 THE SPIRAL MODEL

Figure 4: Adapted from Janse van Rensburg & Lotz-Sisitka (2000: 42)

The Spiral model was a response to the shortcomings of the Cascade model with regard to INSET (Maila, 2003: 125). The Spiral model is based on extended cluster-based training and close interaction between classroom practice and reflection-on-practice in regular professional development sessions (Janse van Rensburg & Lotz-Sisitka, 2000: 46). The Spiral model moves outwards in broadening circles, is recursive, and allows for

the building of increasing levels of sophistication and complexity of understanding in learning (Maila, 2003: 124), in order to represent progress over time. Although the Spiral model has a fixed starting point, there is no definite end-point. This highlights the lifelong learning and continuous professional development encouraged by the OBE system.

The key focus of this model is to enable subject advisors and teachers to work together, and through reflective tasks to develop applied competencies that will support environmental learning processes in schools (Maila, 2003: 125). The NEEP for General Education Training (GET) project does not only spiral in its subject advisors' and teachers' professional development, but it also cascades (Maila, 2003: 125).

In practice, the Spiral model represents a process of cluster-based approaches that provide subject advisors and teachers with opportunities to develop professionally over an extended period of time, as opposed to once-off workshops (Maila, 2003: 125). The NEEP-GET project staff train subject advisors and teachers, who are clustered into a group or groups for environmental learning. The provincial and district offices select subject advisors and teachers, and cluster them according to their proximity for long-term cluster-based workshops (Maila, 2003: 124).

3.3.7 THE NEEP-GET LEARNING TREE MODEL

The learning tree framework in the NEEP-GET is a vital tool that gives direction to the professional development of subject advisors, curriculum support (CS) staff and teachers (Maila, 2003: 119). Two professional development learning frameworks are used - one is the learning tree framework for subject advisors and CS staff, and the other one is for teachers (Maila, 2003: 119).

The learning tree framework for subject advisors and CS staff's INSET comprises of the South African Qualifications Authority's critical outcomes. EE professional development is represented by the trunk, with four branches, viz: environment in the curriculum (environment in context, environmental concepts, environment in learning areas and learning support materials); learning processes (learning environment, adult learning, approaches and methods, assessment and learning theories); policy (learner support material policy, curriculum policy, environmental policy and school policy); and management of professional development (networking, cluster management, research-based implementation, models for professional development, relationships and roles) (Maila, 2003: 119-120).

The teacher professional development tree has eight main branches, viz: learning area knowledge and skills, environment and context, OBE curriculum framework and implementation, national policy and transformation, learning theory and methodological change, action reflection and evaluation practice, and assessment and learning support material (Maila, 2003: 120). The learning tree branches also have twigs which mainly indicate policy, implementation guidelines, methods and activities.

It appears that the learning tree model is more advanced, because it incorporates the cascade and spiral models through its branches and twigs. In addition, it professionally develops both CS staff and teachers with regard to environmental teaching and learning.

3.3.8 THE TRAINING MODEL

This model features in other previously mentioned models, namely: the NEEP's active learning model, the Amoeba model, the Cascade model, the issue investigation and action-training model, the Spiral model, and the NEEP-GET learning tree model. This training model has, in recent years, been arguably the dominant form of professional development for teachers (Kennedy, 2005: 236). It is generally delivered to the teacher by an 'expert', with the agenda determined by the deliverer, and the participant placed in a passive role (Kennedy, 2005: 237). In order to deliver new environmental knowledge to teachers, this model provides them with skills and knowledge of EE as a field of study.

3.3.9 THE DEFICIT MODEL

Professional development can be specifically designed to address deficits in teacher performance, so as to raise standards, effectiveness and accountability, and also to attempt to remedy perceived weaknesses in teacher performance (Kennedy, 2005: 239). The deficiency in the Cascade model led to the Spiral model. The deficiency in the Spiral model led to the NEEP-GET learning tree model. Studies in South Africa have proved

that most teachers did not receive pre-service training in EE (Chacko, 2000: 7), and this is the deficit that this model could overcome.

3.3.10 THE ACTION RESEARCH MODEL

Ponte (2005: 274) defines action research as an enquiry-based professional development tool. He further quotes Carr & Kemmis (1997), who give a more elaborate definition of action research as a “form of self-reflective enquiry undertaken by participants in social situations in order to improve the rationality and justice of their own social or educational practices, their understanding of these practices, and the situations in which these practices are carried out”. They call action research ‘self-reflective’ to emphasise that it is not external experts, but teachers themselves, who gather and analyse data about their practice (Ponte, 2005: 280).

The effect of large-scale reform on learner performance is based on the development of those who ultimately have to deliver, namely the teachers (Kennedy, 2005: 278). Brief, once-off workshops without any follow-up, which tell teachers what they are obliged to change, have hardly been effective (Kennedy, 2005: 278). As an alternative to these workshops, approaches are often proposed which allow teachers to learn from their own practice through self-directed, inquiry-based activities that are bundled together as action research (Kennedy, 2005: 278). Since action research is research conducted by or with teachers, teachers will be able to reflect on their performance with regard to skills and knowledge of EE, and then improve them. Teachers can develop professionally by

learning in and from their practice through the enquiry-based activities of action research (Ponte, 2005: 278).

3.4 SYNTHESIS

Based on the discussion of models appropriate to EE, it appears that no one model can adequately develop teachers professionally to implement EE. For the cost-effective professional development of teachers, the Cascade model can be combined with the issue investigation and action-training model, NEEP's active learning model, the teacher change model, and the Amoeba model. The Spiral model and the learning tree model seem to be effective models for EE, but they are not cost-effective. They are commonly employed in situations where resources are unlimited. The success of these professional development models is based on award-bearing, standards-based (maintaining standards), coaching, mentoring, and community-based practices that take place regularly. To improve practice in EE, teachers should see action research as a tool for professional development, to investigate and improve their own practice in the classroom and at school level. Hence, action research is schoolwork research and classroom research (Ponte, 2005: 287).

3.5 TEACHING METHODS APPROPRIATE TO ENVIRONMENTAL EDUCATION

Lebeloane (1998: 106) quotes Elser and Sciortino (1991: 5), who state that “teaching methods are patterns of practices which account for effectiveness in teaching”. It would appear that teaching methods are the means by which knowledge can be imparted to learners during teaching, and by which learners can acquire knowledge and skills, and change their attitudes in the process of both learning and teaching (Lebeloane, 1998: 106). Methods feature within approaches and models - they are a way of actually doing something.

Lebeloane (1998: 107-108) identifies the following teaching methods as being appropriate to EE: narrative, textbook, cooperative learning, demonstration, discovery, discussion, drill, experimental, free-activity, problem-solving, project, and question-and-answer. Leketi (1992: 6) quotes Wolsk (1977), who recommends the following methods and techniques for EE: field trips, mapping, development of outdoor areas such as gardens, development of mini-plots and mini-environments, simulations, role-play, game methods and conscientisation. The Council for the Environment (1993: 22) suggests the following methods for the teaching of EE: discovery, adventure (finding out), communication and understanding, creativity, sensory, and valuing commitment. Schulze (1994: 166) identifies the following teaching methods as being more appropriate to the teaching and learning of EE: experimentation, case studies, out-of-classroom activities and field trips, projects, problem-solving, survey work, role-play and simulated situations, debates and discussions, buzz activity, brainstorming sessions and action research. Du Toit, Squazzin & Hansen (2000: 39-43) recommend the following methods:

groupwork, story-telling, role-play, drama, interviewing, sketching, field trips, games, poster-making and research.

3.6 SYNTHESIS

In order to be truly effective, teachers must be skilled in the methods they use to pass on their knowledge, skills, attitudes and action capabilities to their learners (Lane et al, 1995: 37). Teacher preparation (PRESET) is needed to provide teachers with EE instructional competencies (Lane et al, 1995: 37). PRESET initially provides training for teachers in different subjects with regard to the majority of the abovementioned teaching methods. That is, most teachers are skilled in how to use and apply these methods because they form the core of teacher training courses. These methods are only meaningful to EE when applied to a problem associated with the environment (Schulze, 1994:166). Not only should teachers learn about diverse methods which are most effective for developing EE competencies, they should also be required to apply these methods in the teaching situation, and evaluate their effectiveness in terms of the objectives and guidelines for EE (Schulze, 1994: 166).

Teachers need to be educated regarding the methodology that will help them and their learners to acquire environmental skills. All methods are appropriate to EE, but some are more appropriate than others. The method selected will depend on the topic and context within which it is taught. A variety of teaching methods can be used simultaneously or can supplement each other, when presenting an EE topic.

3.7 RESOURCES APPROPRIATE TO SUPPORTING THE PROFESSIONAL DEVELOPMENT OF TEACHERS IN ENVIRONMENTAL EDUCATION

Teaching and learning resources in EE can be human, places or material. The use of resource materials is important in any educational or teaching situation, and therefore it is important in the implementation programme of EE (De Jager, 2003: 66). The effectiveness of teaching in the classroom is influenced by the teacher's ability to find, use and develop resources and teaching aids in EE. The NEEP-GET project (2003: 67) identifies the following resources that support EE teaching and learning:

- Human resources: INSET is a vital human resource strategy discharged by the DoE (De Jager, 2003: 65). This human resource can be utilised in terms of EE specialists and environmental educators in INSET workshops. Professionals such as environmental impact assessors, nature conservation officers and environmental health officers are also useful human resources. Environmental groups such as recyclers, waste management officials and NGOs, provide environmental services to schools and teachers. Government departments such as the DoE, the Department of Water Affairs and Forestry (DWAF), and the Department of Environmental Affairs and Tourism (DEAT), have officers specifically assigned to providing educational services to schools and teachers. Through INSET and PRESET, teachers are trained in how to find out who the relevant people are, and how to ask them to assist them and their learners with some of their lessons and lesson plans.

Old community members often have a wealth of knowledge and can tell learners how the environment has changed over time and how it and local resources were managed in the past.

Teachers cannot teach and facilitate learning in EE without going outdoors. Outdoor teaching and learning integrates EE in method courses (Powers, 2004: 5):

- **Places:** Teachers should use outdoor activities such as a visit to local rivers, building sites, EE centres, school grounds, factories and other environmental places in their planning. It is necessary to take learners to places such as nature reserves, parks, forests, the coast etc, in order to explore the diversity of life and be exposed to a range of environmental issues and risks. The environment is the best resource for environmental learning.
- **Publications:** Magazines, books and journals are learning support materials that help the teacher to integrate an environmental focus in his/her learning areas. These publications are teacher books that have been developed on key environmental themes. The DoE, DWAF and the DEAT also provide a number of teaching and learning resources. Discover the City (DEAT) and Share-Net (Wildlife and Environment Society of South Africa) also have numerous teaching resources that teachers can use for further development in the field of EE. These teaching resources include water audit kits, sanitation education materials, hands-on field-work booklets, etc.

3.8 IMPORTANT CONCEPTS IN ENVIRONMENTAL EDUCATION AND PROFESSIONAL DEVELOPMENT

The fact that most teachers currently lack proper training and experience in EE and also in infusing EE into their teaching, could impede their involvement in local EE issues in schools, communities and at a national level. A healthy environment is dependent on the environmental literacy of the population (Loubser, Swanepoel & Chacko, 2001: 317). Schulze (1994: 165) quotes Sterling, who points out that “the key to environmental education lies with teachers”. The effectiveness of teaching in the classroom is influenced by the background knowledge of the teacher, and teachers are the ones who select the ways in which the EE goals and objectives are met (Loubser et al, 2001: 318). Teachers cannot assist their learners to become environmentally literate if they themselves lack environmental literacy (Loubser et. al, 2001: 318). Therefore, teachers must be trained to be knowledgeable about the most important environmental concepts for the effective teaching of EE. These concepts empower teachers with regard to environmental knowledge, skills and content, and can be imparted to teachers by setting up a more specialised professional development programme for them. Professional development in EE, which will facilitate EE projects and the whole school’s approach to EE, can serve as a point of departure or action plan (Neluvhalani, 2000: 115).

The most important concepts in EE are in line with the definitions, aims, objectives and guiding principles of EE (Swanepoel, Loubser & Chacko, 2002: 282). Loubser et al

(2001: 321), and Swanepoel et al (2002: 282), identified the most important concepts in EE that should be included in courses designed to improve environmental literacy and EE, viz: -

1. Basic understanding of the biosphere (air, water and land).
2. Understanding of the ecological perspective of nature and human beings.
3. Awareness of human interaction with the environment, and interrelationships within the ecosystem.
4. Knowledge of environmental changes brought about by industrialisation and urbanisation.
5. Understanding of activities to meet basic human needs.
6. Awareness of renewable and non-renewable resources.
7. Knowledge of how to maintain environmental quality and quality of life.
8. An understanding about the ability to make choices.
9. Knowledge of decision-making on environmental issues in scientific, economic, legal, social and political contexts.
10. Knowledge of environmental ethics as a way of life.

The concepts of environmental literacy are not only important to professional development in EE because they emanate from the aims, goals and objectives of EE, but they also provide the content and theory to the practice of this field of study. Teachers need to acquire knowledge and skills in EE so that they are able to integrate these into different learning areas when facilitating learning.

3.9 BARRIERS TO THE IMPLEMENTATION OF ENVIRONMENTAL EDUCATION

Barriers are impediments or inhibitors that distort the implementation of EE in institutions of learning (Gould League of NSW, 1993: 35). Barriers can also imply constraints or problems arising when undertaking initiatives in EE, as well as those factors or obstacles that seem to discourage implementers of EE from becoming involved in EE (Chacko, 2000: 7). These barriers may arise from external factors (outside forces e.g. government, administrative directorates, financial emergencies and immediate wishes of the community) or internal factors (school-based) (Maila, 2003: 50). Barriers will differ from school to school, country to country, and even between classes (Chadwick, 2000: 7).

In order to ensure the effective implementation of EE in schools, barriers need to be identified and resolved beforehand. Implementers of EE should be made aware of these barriers, and in turn, they should take action to get rid of them for the effective implementation of EE. The removal of these barriers also creates a good support base for teachers. To incorporate effective EE in EE content, theory, teaching methods, approaches, strategies and classroom practice, it is critical to overcome the barriers hampering its effectiveness.

3.9.1 EXTERNAL BARRIERS

External barriers emanate from forces outside the school. Le Grange and Reddy (2000: 24) argue that, expecting poorly qualified teachers who have been systematically deskilled for many years, to cope with larger classes, poor educational resources, new school governance structures and a sophisticated OBE system, is a tall order. Teachers have to learn new jargon related to both OBE and EE, that is too complex, confusing and contradictory (Le Grange & Reddy, 1997: 16). Hit-and-run workshops on OBE conducted by departmental officials appear to hold little promise for contributing to transformation in South African classrooms (Le Grange & Reddy, 2000: 25). A lack of pre-service teacher education in EE, a lack of state and local support of EE, and the absence of the infusion approach championed by most environmental educators for incorporating EE in the curriculum (Hungerford, 2002: 6), can also be construed as barriers.

The teacher-learner ratios imposed by the DoE are threatening many jobs in the teaching fraternity (Le Grange & Reddy, 2000: 21-22). The post-provisioning norm for primary schools is 1: 40, and for secondary schools is 1: 35, and teachers feel that environmental learning will add an extra load to their already overloaded work (Maila, 2003: 154). There is no coordination between districts, schools and partner support, viz: DoE, DEAT and the DWAF (Maila, 2003: 154). In China, Wu (2002: 21) maintains that the constraints are caused by the low sustainability of EE in schools, and the limitations of Green schools' criteria.

In the South African context, the core business of CS staff includes, among other things, running daily errands for schools. However, there is a lack of resources in schools, and the CS staff do not consider the development of resource material as part of their core business (Maila, 2003: 50). Maila ((2003: 154) further asserts that CS staff seem to be busy with other job-related tasks.

3.9.2 INTERNAL BARRIERS

Internal barriers are school-based. These barriers emanate from the fact that EE is a non-examinable school subject, and head teachers feel that EE may be a waste of time (Nyembe, 2000: 12). Teachers perceived some head teachers as unenthusiastic about EE (Maila, 2003: 153). The Gould League of NSW (1993: 35) identifies the following internal barriers: lack of time for teaching and preparation; lack of funding; lack of background to and training in EE; lack of confidence to teach EE; teachers perceiving EE as a scientific area or that it can only be done outdoors; lack of leadership; teachers being afraid to involve the community; EE considered to be politically biased and therefore inappropriate for classroom teaching; and difficulty in consistency. Some barriers emanate from single-discipline-trained teachers who are not used to a new educational approach involving interdisciplinary co-operation (Chadwick, 2000: 8).

Bornman (1997: 57) identifies the following internal barriers: misconceptions about EE; lack of knowledge and understanding of the field of study; an inherent resistance to change; and the unwillingness of teachers to commit themselves to the teaching of EE in

the midst of overcrowded courses and curricula. Le Grange & Reddy (2000: 23) identify low teacher morale, which may be one of the reasons why only half of the schools in the area of their research involved themselves in the research project. Maila (2003: 50) highlights the danger of putting an emphasis on learners passing examinations at the end of the year as evidence of the immediate effect of learning, and not on the overall outcome of lifelong learning, as intended by OBE. Schools claim that they have limited resources and that the learner support materials supplied by the DoE are either unsuitable, outdated, or the process of acquiring them is questioned (Maila, 2003: 154).

For the effective professional development of teachers in EE, barriers need to be removed inside and outside the school situation, so as to enable teachers to implement and focus on the idea of effective EE teaching and learning. The removal of barriers also creates a good support base for both employer and school for effective professional development.

3.9.3 HOW TO OVERCOME THESE BARRIERS

The removal of all these barriers is very important, because they prevent the implementation of an effective EE programme. The challenge is for schools, education departments, environmental educators, curriculum planners and researchers, to find ways of removing these obstacles. Participants of the UNESCO Inter-Regional workshop decided that the training of trainers is of the utmost importance (Knapp, 2000: 35). If teachers are duly motivated and have the proper training, they will be able to find ways to introduce EE of a higher standard, and at the same time overcome existing obstacles, in

order to bring about significant changes to the existing tradition (Papadimitriou, 1995: 89). The training of teachers is essential to overcoming some barriers in this field of study. Some schools in China began to set up self-training bases of EE inside schools, so that EE teachers could train other teachers (Wu, 2002: 4).

Wu (2002: 22) argues that this can be accomplished by infusing EE into existing curricula, extra-curricular activities, activities of youth organisations, class meetings, examinations, and integrating environmental protection publicity within the school (special displays in the library). The school principal should be encouraged to integrate EE in the school administration, establish an EE committee that includes teachers and learners, and get the committee to create an EE plan that identifies themes and directs teachers and learners in terms of developing EE activities (Wu, 2002: 21).

Papadimitriou (1995: 90) supports an action research approach, and regards it as a proper model for the inquiry-based professional development of teachers in EE. Environmental educators should consult institutions that offer courses to farmers, business people and staff of the education department, viz:- Umgeni Valley Project; Potberg Environmental Education Centre; Thomas Baines Environmental Education Centre; and the National Parks Boards (Loubser & Ferreira, 1992: 34), to name but a few.

3.10 CONCLUSION

If the character of an environmentally educated teacher can be developed during PRESET and INSET through appropriate EE approaches and models, accompanied by the ability of the teacher to use the appropriate teaching methods and resources that support environmental teaching and learning, then barriers that prevent the effective implementation of EE in South Africa could be limited. Professional development implies that, with resources and information, a teacher can make creative, unique, relevant and contextualised use of ideas and approaches (May & Flack, 2002: 6). In this regard, the goals of EE will be attained, and the quality of life and of the environment will be promoted. The future of this generation and generations to come could then be guaranteed to some extent. In Chapter 4, the research design and data collection techniques will be discussed.

CHAPTER 4

RESEARCH METHODS AND DATA COLLECTION TECHNIQUES

4.1 INTRODUCTION

This chapter focuses on the research design and data collection for this study. The collective outcome of the three preceding chapters necessitated an empirical investigation. This empirical investigation is important to the study, because it intends to report on the reactions and responses of teachers to questions regarding the professional development of teachers in the field of environmental education (EE). In this chapter, both qualitative and quantitative research will be discussed, as will the procedure for conducting the research. In a subsequent chapter, the data analysis and interpretation will be given, as well as the findings of the research.

4.2 RESEARCH DESIGN

Research design refers to the process of creating an empirical test to support or refute a claim (Borg & Gall, 1989: 324). This section focuses on the research instrument, the selection of respondents, and data gathering for the study. Both ‘qualitative’ and ‘quantitative’ approaches to research have been identified. These could refer to distinctions regarding the nature of knowledge with respect to how one understands a

situation, the ultimate purpose of research and how data will be collected and analysed, and the type of generalisations and representations derived from the data (McMillan & Schumacher, 2001: 15).

4.2.1 QUANTITATIVE APPROACH

A quantitative study is an inquiry into a social or human problem, based on testing a theory composed of variables, measured with numbers, and analysed with statistical procedures, in order to determine if the predictive generalisations of the theory hold true (Creswell, 1994: 2). In quantitative studies, questions, objectives and hypotheses represent specific restatements of the purpose of the study (Creswell, 1994: 72). A quantitative method consists of two types, namely experiments and surveys (Creswell, 1994: 11). In survey projects, these restatements typically take the form of research questions and objectives, whereas in experiments, they are hypotheses because they represent the traditional, classical form of raising questions (Creswell, 1994: 72).

4.2.2 QUALITATIVE APPROACH

The qualitative approach is defined as an inquiry process of understanding a social or human problem, based on building a complex, holistic picture formed with words, reporting the detailed views of informants, and conducted in a natural setting (Creswell, 1994: 1-2). The data that would be obtained offers the researcher with rich information that leads to theories that explain the phenomenon. The qualitative research method

allows for the inductive use of literature to direct the questions asked by the researcher (Creswell, 1994: 7). The major reason for conducting a qualitative study is that it is exploratory, i.e. the researcher reads material that informs him/her, and builds a picture by using ideas (Creswell, 1994: 5).

4.2.3 THE QUESTIONNAIRE AS A RESEARCH INSTRUMENT

The questionnaire is a tool or instrument for collecting data, in which the subjects respond to questions asked to elicit their reactions, beliefs and attitudes (McMillan & Schumacher, 2001: 40). The researcher chooses or constructs a set of appropriate questions and asks the subjects to answer them, usually in a form that asks them to tick their response (McMillan & Schumacher, 2001: 40). In a nutshell, the questionnaire is a written set of questions to which the subjects respond in writing (Mulusa, 1990: 120).

The information collected by survey instruments is assumed to be quantifiable. In the case of multiple-choice questionnaire items, the information is qualified at the time it is collected. If open-ended questions are used, the 'open-ended' information obtained must be codified so that it can be analysed and reported quantitatively.

The major steps that must be taken to carry out successful questionnaire surveys are: defining the objectives; selecting the sample; designing the questionnaire format; writing items; constructing the questionnaire; pre-testing; preparing a letter of

transmittal; sending out the questionnaire and follow-ups; and analysing the questionnaire data (Gall, Borg & Gall, 1996: 293; Borg & Gall, 1989: 418-423).

Questionnaires ask the same questions of all individuals in the sample, and respondents record a written response to each item. All the respondents are given the same questionnaire, which they can complete at their convenience, and because of the uniformity, the results will be reliable. In this case, 216 questionnaires were sent to schools. Reliability refers to the consistency of measurement – the extent to which the results are similar over different forms of the same instrument of data collecting (McMillan & Schumacher, 2001: 239). Internal consistency is the most common type of reliability since it can be estimated from giving one form of a test once (McMillan & Schumacher, 2001: 239). The Cronbach-Alpha type of internal consistency was used in this study because it is generally the most appropriate type of reliability for survey research and other questionnaires in which there is a range of possible answers for each item (McMillan & Schumacher, 2001: 242).

The questionnaire is reliable, encourages honesty, is personal, self-administered, and avoids the problem of interviews, where the choice of words or body language may unintentionally affect responses (Maila, 2001: 124). Even though questionnaires are difficult to construct and administer, and rely on respondents completing them, they are reliable, and timeously returned questionnaires have numerous advantages.

The disadvantage of the questionnaire is encountered when the return rate is very low, and therefore not representative of the target population. In cases where respondents leave questionnaire items blank, the researcher will not know whether the items were considered to be difficult, irrelevant or unacceptable to the respondents. The questionnaire assumes that the target community has a high rate of literacy, a deep understanding of the subject of study, and a high proficiency in the language in which the questionnaire is written. The researcher has no way of observing the respondents' attitude to the topic under investigation, or to specific items in the questionnaire.

4.2.4 TYPES OF QUESTIONS USED IN THE QUESTIONNAIRE

4.2.4.1 Closed questions

Closed or structured questions are those in which the respondents choose between predetermined responses or options. Closed items are typically used to collect data, and this data can be easily coded (McMillan & Schumacher, 2001: 261). It is much easier to score a closed item. It is best to use closed form questionnaires if many respondents are involved, or if large numbers of items are to be covered in the study.

4.2.4.2 Open-ended questions

Open-ended or unstructured questions are those in which respondents can comment on their opinions, feelings or beliefs regarding the questions asked. The subjects can write

any response that they want (McMillan & Schumacher, 2001: 260). In this study, the researcher decided to use closed questions because they would enhance the validity of the questionnaire which had 216 respondents.

4.2.5 REASONS FOR SELECTING THE QUESTIONNAIRE

The questionnaire was the instrument selected for this study. It was the only practical and suitable instrument for this study, because it allows for the use of a large sample (Noge, 1993: 112). Due to the size of the sample (216 respondents), it would be time-consuming for the researcher to travel and visit widespread primary schools in the demarcated area, namely the Tshwane North District Office (TNDO). An advantage of the questionnaire is that a large number of respondents, in this case, teachers, could be reached. The researcher also decided to use the questionnaire because it is economical.

4.3. SELECTION OF THE POPULATION TO BE SURVEYED

A survey is normally carried out to gather information through questionnaires, opinion sheets or personal interviews, and to elicit opinions, feelings and attitudes of individuals on environmental issues or problems (UNESCO-UNEP, 1988: 98). The survey design provides a quantitative or numerical description of some fraction of the population – the sample – through the data collection process of asking questions of people (Creswell, 1994: 117). This data collection, in turn, enables the researcher to generalise the findings from a sample of responses to a population (Creswell, 1994: 117). Sampling

means selecting a given number of subjects from a defined population as being representative of that population (Borg & Gall 1989: 216). The usual purpose of educational research is to learn something about a larger group of people by studying a much smaller group (Borg & Gall, 1989: 213). The larger group that we wish to learn about is called a population, whereas the smaller group that we actually study is called a sample (Borg & Gall, 1989: 213).

The list of all schools was requested from the Tshwane North District Office (TNDO). Details, including registration numbers, postal addresses, telephone numbers, principals' names and their locations, were obtained. The list of schools was arranged in an alphabetical order. The TNDO consists of 102 primary schools (including public primary farm schools). The research is confined to this area (TNDO) because it is where the researcher lives.

4.3.1 SAMPLING

Random sampling was used in this research to determine which schools out of the 102 would participate in this study. Random sampling implies that each member of the population has an equal chance of being selected (University of South Africa, 1999: 7). The random sampling procedure is very rigorous, enabling one to generalise the finding of a study to the entire population (Creswell, 1994: 120). Random sampling was done in the following way:

The schools were assigned numbers within their alphabetical order. The random table of numbers by Borg and Gall (1989: 910-920) was used (see Appendix A). The researcher decided to move from the top to the bottom, selecting 18 intermediate phase schools. A school that corresponded with the number selected was included in the study. Because there were 102 schools, the last three digits of the random numbers were used in each five-digit number. If more numbers were needed, the researcher proceeded to the next column until sufficient numbers had been selected to make up the desired sample size. The researcher selected Row 1 Column 5 (see Appendix A) as the starting point. From the TNDO area, 18 schools were selected, namely: school number 9, 21, 59, 34, 72, 14, 25, 55, 54, 99, 26, 19, 80, 81, 42, 11, 78 and 15.

The target population consisted of twelve intermediate phase educators from each selected school. The target population included all the members of a real or hypothetical set of people to whom the researcher wished to generalise the results of the study (Gall, Borg & Gall, 1996: 220). The researcher selected intermediate phase educators as the target group to be surveyed, because the researcher was an intermediate educator at the time of this investigation.

Stratified random sampling was used to select educators for the study. Stratified random sampling involves selecting a sample so that certain sub-groups or characteristics of the population are adequately represented by the sample (Gall, Borg & Gall, 1996: 226; Creswell, 1994: 120). In this study, educators were classified according to gender, i.e. 6 males and 6 females. In every school, a list of educators was

alphabetically arranged according to gender and surnames. Each educator was assigned a number. The numbers were randomly sampled by using the random table of numbers. In the case where schools had only either male or female educators, 12 male or female educators were selected for the study. Twelve educators at 18 schools resulted in 216 participants, as illustrated by Table 4.1.

TABLE 4.1

Total number of schools in the district	Number of schools in the sample	Number of teachers per school	Total number of teachers participating
102	18	12	$18 \times 12 = 216$

4.4 DATA COLLECTION PROCEDURES

After selecting a sample for the study, the questionnaire was administered as follows:

- The researcher asked for the permission of the TNDO manager and the Gauteng Provincial Department of Education to distribute the questionnaires to the educators at the schools selected for the study (see Appendix B).
- After consent was given (see Appendix C), the researcher was given a right of introduction to the schools.

- The researcher visited the selected schools to introduce herself to them, and requested an appointment to administer the questionnaires to the educators. The researcher avoided posting the questionnaires, to make sure that the selected sample received their questionnaires. The researcher went personally to the schools to deliver them.
- At some schools, both the researcher and the principal appointed a contact teacher from whom the researcher later collected the completed questionnaires. In some schools, the researcher administered the questionnaires, waited and collected them as soon as the educators had completed them. In other cases, two weeks were given for the completion of questionnaires, after which they were collected.
- The questionnaire (see Appendix E), when administered, was accompanied by a letter addressed to the respondents (see Appendix F), explaining the purpose and objectives of the study, and the reasons that prompted the researcher to undertake the study. The intention was to relieve the respondents of any fears or misunderstandings.
- The researcher agreed with respondents on the time-frame for the completion and collection of the questionnaires.

4.5 CONTENT VALIDATION OF THE QUESTIONNAIRE

Content validation asks the following questions: What are the content areas addressed in the survey? Do the items in the questionnaire measure the content they are intended to

measure? (Creswell, 1994: 121). The professional development of educators for effective environmental education (EE) is addressed if the following holds true:

- Conceptualisation of the term ‘environmental education’: To check whether educators understand the concept “environmental education”; to check whether educators were made aware of EE during teacher or in-service training, through courses offered by the Department of Education or non-governmental organisations; and to check whether there are educators in the TNDO who are enrolled in an EE course in further teacher training or development.
- Environmental literacy: The aim is to check whether educators are environmentally literate, irrespective of pre-service or in-service training. Environmental literacy means to be aware of one’s environment. It enriches one with the knowledge of the imbalances and threats that the environment faces, and enables one to form positive attitudes towards the environment, with the aim of developing skills to resolve and prevent environmental problems, and to protect and improve the environment for present and future generations, through active participation (Swanepoel, Loubser & Chacko, 2002: 282). It should be noted that all school subjects are vehicles for the implementation of EE to foster environmental literacy (Chacko, 2000: 117). On the other hand, it is impossible for teachers who are not environmentally literate to develop environmental literacy in their students. Therefore, it can be said that environmental literacy is in line with the five categories of the objectives (awareness, knowledge,

attitudes, skills and participation) of environmental education and its guiding principles (Loubser, Swanepoel & Chacho, 2001: 318).

- Teaching methods appropriate to environmental education: The aim is to check whether educators are skilled in using methods appropriate to the teaching and learning of EE, e.g. problem-solving, experimentation, case studies, field trips, projects, survey work, role-playing, debates, action research, groupwork, etc; to establish whether these methods enhance the goals and objectives of EE, as well as their understanding, for the teaching of environmental issues which form the content of EE.
- Outdoor activities: To check whether teachers use outdoor activities, since these activities can enhance the utilisation of environmental resources and teaching aids. The aim is to check whether or not educators take learners out to visit different places such as museums, factories, theatres, local authorities, places of work, exhibitions, and nature reserves, or whether or not they participate in environmental days such as Spring Day, Heritage Day, Arbor Day, etc.
- School environmental education policy: To ascertain whether or not schools have developed environmental education policies which indicate how resources are to be sustainably utilised; and to determine whether or not there is an environmental education policy in the schools which comes from the Department of Education (DoE).
- Environmental issues: To determine whether or not educators are aware of environmental issues, since these are infused in every learning area of the intermediate phase.

Content validity was carried out before the research instrument was presented to the educators. The questionnaire was submitted to the supervisor, who has several years of experience in the field of EE. The questionnaire was also submitted to a fellow colleague (Mathews Moeng) who has a Masters' degree in the field of EE. During the pilot study in 4.7 (Appendix D) the questionnaire was given to educators in the intermediate phase, who have been generated from the population that is similar to the subjects in the study. These people were requested to comment on the content validity of the questionnaire. The supervisor helped the researcher to select or identify questions that were relevant and should be included in the questionnaire, in terms of assessing the professional development of teachers in EE. Parts of the questionnaire were designed with reference to topics taught in the intermediate phase in the following learning areas: Mathematics, Natural Sciences, Technology, Languages, Social Sciences, Economic and Management Sciences, Arts and Culture, and Life Orientation.

The content validity of items in the questionnaire would also measure the educators' pre-service and in-service training with regard to its impact on the effective teaching and learning of EE, sustainability, sustainable development and sustainable earth, and to improving the quality of the environment and maintaining sustainable resources, both renewable and non-renewable.

4.6 PROCEDURE FOR DATA ANALYSIS AND PRESENTATION

Data analysis and presentation states the statistical techniques to be used in analysing data, and specifies how the data will be presented (Mcmillan & Schumacher, 2001: 275). The data collected in this study is quantitative. Descriptive statistics of items in the study will be presented. Data that can be counted and quantified will be used to work out percentages.

Information will also be presented about the number of returns and non-returns of the survey questionnaire. This information will be presented in a table form, with special attention given to the number of respondents and non-respondents (Creswell, 1994: 121). The response bias will then be discussed – this refers to the effect of non-responses on survey estimates.

4.7 PILOT-TESTING THE QUESTIONNAIRE

Pilot-testing was done to establish the face validity of the questionnaire, and to improve the questions, format and scales. The researcher administered the pilot study questionnaire (Appendix D) to twenty-five intermediate phase teachers in the Brits Area Project Office, because they are similar to the target population. The pilot test was conducted prior to the main survey. The purpose of pre-testing the questionnaire was to assess its clarity, the validity and reliability of each of the items in the instrument, and the suitability of the items used. Any blank spaces, inaccurate responses, inconsistencies

or other weaknesses noted during the pre-testing indicate that there is a need to review the suitability of the questionnaire. The respondents were given space in the questionnaire to comment on their understanding of each question. After the pilot study, the researcher was advised by the supervisor to reduce certain items from the questionnaire and to leave out Section C of the open-ended questions, since many respondents were involved and too many items were covered in the questionnaire.

4.8 CONCLUSION

The abovementioned information informed the researcher with respect to the sampling, administration and presentation of data. The use of different statistical techniques will help the researcher to analyse data and to test the problem statement given in Chapter 1. Percentages will be checked to see whether or not they had an influence on a particular behaviour of the respondents.

CHAPTER 5

REPORTING AND ANALYSIS OF SURVEY DATA

5.1. INTRODUCTION

In the previous chapter, the research design was explained. In this chapter, the reporting and analysis of data is undertaken. The purpose of the analysis of data is to answer the research question, as indicated in Chapter one, namely, whether or not there is a need for the professional development of teachers for effective environmental education. The findings are analysed in terms of the research question. Data such as the frequency (f) of the number of returns and non-returns of survey questionnaires is reported in table form. The percentage of respondents in each category, with respect to each question, is calculated. This will help the researcher to make valid generalisations of statistical results obtained from the sample to a much larger population. The results of the empirical investigation are clearly outlined in the tables below. The information in these tables is followed by a brief interpretation of the analysed results.

5.2. PROCEDURE OF DATA CAPTURE

The questionnaires were submitted to the Department of Computer Services at the University of South Africa, where the data was captured and verified with a guaranteed

error rate of less than 0.3%. The researcher worked out the frequency of the scores in order to test them against the research question.

5.3. PRESENTATION AND DISCUSSION OF RESULTS

The questionnaires were distributed, completed and collected between 5 September and 10 October 2005. All selected schools participated, but some schools were too small to accommodate the target population of twelve intermediate phase educators. Of the 216 questionnaires distributed to the 18 schools, a total of 163 were returned, which gives a return rate of 75.5%, and a non-return rate of 24.5%, as illustrated in Table 5.1.

TABLE 5.1: Sample description and response rate

Total surveys (n)	Total surveys returned (n)	Return rate percentage (%)	Total surveys not returned (n)	Non-return rate percentage (%)
216	163	75,5 %	53	24.5 %

(n) = number

5.3.1 BIOGRAPHICAL DATA OF RESPONDENTS

Biographical data was obtained in order to gain insight into the demography, age group, gender, etc of the sample, in relation to pre-service training (PRESET) in environmental education (EE) and qualifications in EE.

Table 5.2 Section A Question 1: Biographical data of respondents

(n =163)

Variable and number	Category	Number (n)	Percentage (%)
V4	Gender: Male	40	24,5
	Female	123	75,5
V5	Age group: 20-30	11	6,7
	31-40	77	47,2
	41-50	56	34,4
	50 +	19	11,7
V6	School location:		
	Informal settlement	39	23,9
	Rural area	0	0
	Peri-urban area	44	27
	Urban area	80	49,1
Farm	0	0	
V7	Years of experience:		
	Less than 5 years	13	8,1
	5-10 years	35	21,7
	11-20 years	74	46
More than 20 years	39	24,2	
V8	Position held:		
	Educator PL1	129	79,1
	Head of Dept PL2	22	13,5
	Deputy/Principal PL3	8	4,9
	Principal PL4	2	1,2
Other	2	1,2	
V9	Professional training:		
	PTC	6	3,9
	PTD/STD	59	38,8
	UED	14	9,2
	SED/HED	59	38,8
Other	14	9,2	
V10	Academic qualifications:		
	Matric/Std10	44	28,2
	3 year degree	70	44,9
	Honours	26	16,7
	Masters	1	0,6
	Other	15	9,6
V11	Pre-service in EE:		
	Yes	89	54,6
No	74	45,4	
V12	Qualification in EE:		
	Yes	29	17,8
No	134	82,2	

Missing number =20

5.3.1.1 Discussion of results

Question 1 in table 5.2 (the biographical data questions) served to identify the personal profiles of intermediate phase educators in the Tshwane North district. Table 5.2 contains the biographical data of respondents with reference to gender, age group, location of school, years of experience, position held, professional training, academic qualifications, pre-service training in Environmental Education (EE), and qualifications in EE. Table 5.2 indicates that 123 (75.5%) of the respondents were female, and 40 (24.5%) of the respondents were male. Due to the random selection of respondents, it can be deduced that more females than males are teaching at intermediate phase primary schools.

Table 5.2 indicates that 77 (47.2%) of the respondents who participated in the survey ranged from 31-40 years, followed by those 56 (34.4%) respondents between 41-50 years and then those 9 (11.7%) who are above 50 years. Only 11 (6.7%) of the respondents were aged between 20-30 years. This table also indicates that, according to the respondents, the majority of the schools 80 (49.1%) are situated in urban areas, followed by 44 (27%) schools in peri-urban areas, and 39 (23,9) schools in informal settlements. No respondents indicated that their schools were situated on farms or in rural areas. This implies that the study only covered urban, peri-urban and informal settlement schools. The results of this study can therefore not be generalised to schools situated on farms or in rural areas.

Table 5.2 further indicates that 129 (79.1%) of the respondents held post-level one posts, 22 (13.5%) held post-level two posts, 8 (4.9%) held post-level three posts, 2 (1.2%) held post-level 4 posts, and only 2 (1.2%) held other posts. This implies that mainly post-level one teachers participated in the research. With regard to professional training, 59 (38.8%) of the respondents had a Secondary Teachers' Diploma (STD) or a Primary Teachers' Diploma (PTD). A further 59 (38.8%) had a Secondary Education Diploma (SED) or a Higher Education Diploma (HED). Fourteen respondents (9.2%) had a University Education Diploma (UED), and another 14 (9.2%) respondents had other qualifications. Only 6 (3.9%) respondents had a Primary Teachers' Certificate (PTC). This implies that all teachers in the survey are professionally qualified teachers who hold either a teacher's certificate or a teacher's diploma.

Table 5.2 also indicates that, as far as academic training is concerned, 70 (44.9%) of the respondents had a three year degree, 44 (28.2%) had a matric certificate, 26 (16.7%) had an honours degree, 15 (9.6 %) had other qualifications, and only one (0.6%) respondent had a master's degree. Of the respondents, 89 (54.6%) reported that they had been made aware of environmental education (EE) while training as teachers, and 74 (45.4%) reported that they were not made aware of EE during their training as teachers. Only 29 (17.8%) of the respondents reported that they possessed a qualification in EE, with the majority 134 (82.2%) of the respondents without any qualification in EE. This suggests that most teachers are not qualified to teach EE.

5.3.2 IN-SERVICE TRAINING IN OUTCOMES-BASED AND ENVIRONMENTAL EDUCATION

Data on in-service training (INSET) in Outcomes-Based Education (OBE) and EE was collected, in order to gain insight into whether or not there was any INSET offered within these approaches, and if so, how it was offered. The teachers' point of view was needed regarding how the professional development of teachers in OBE and EE should be offered, and by whom. The teachers' opinions on the relevance of EE and the learning areas were obtained.

TABLE 5.3 SECTION B: QUESTION 2.1: In-service training in Outcomes-Based and Environmental Education

(n =163)

V	Statement	(n)	%
V13	Have you attended any courses or training in Environmental Education this year?		
	Yes	24	14,7
	No	139	85,3
V14	Have you attended any courses or training in Outcomes-Based Education this year?		
	Yes	107	65,6
	No	59	34,4
V15	How were the courses in 1 and 2 presented?		
	Formal manner initiated by the Department of Education	90	78,9
	Circulars/readings provided by the Department of Education	17	14,9
	Private study	3	2,6
	Private sector or NGOs	1	0,9
	By principal, deputy or head of department	3	2,6
V16	How does your school assist you as a teacher in your professional development? (mark as many variables as necessary)		
	Send you to courses or workshops	122	74,8
	Motivate you to read and study further	19	11,7
	Informal and individual discussions with teachers	14	8,6
	Working sessions during meetings	8	4,9
V17	Which institution/sector, in your opinion, should take the responsibility for the training of teachers in Environmental Education?		
	Colleges of Education	25	15,3
	In-service centres/teacher centres	36	22,1
	Private sector/NGOs	11	6,7
	Universities	21	12,9

	Department of Education	70	42,9
V18	Doing a course that prepares a teacher to be professionally competent in Environmental Education should be regarded as:		
	Knowledge expansion	69	42,3
	Continuing education	39	23,9
	Becoming a better teacher/further study	53	31,9
	Unnecessary	3	1,8
V19	In which learning area do you think Environmental Education is most relevant?		
	Mathematics	2	1,2
	Natural Sciences and Technology	76	46,6
	Languages	10	6,1
	Human Sciences, Economic and Management Sciences	28	17,2
	Arts, Culture and Life Orientation	47	28,8
V20	How important do you consider Environmental Education to be in the school curriculum?		
	Very important	117	71,8
	Important	42	25,8
	Not important	4	2,4
V21	Do you think that there is a need for you to receive training in Environmental Education?		
	Yes	130	79,8
	No	33	20,2
V22	If you were given a chance to attend a professional development course or training in Environmental Education, what would be your area of need?		
	Knowledge about relevant content	18	11
	Skills needed for teaching Environmental Education	16	9,8
	Both of the above	114	70
	I have no need for further development	15	9,2

Missing number = 51

5.3.2.1 Discussion of results

Table 5.3 indicates that the majority 139 (85.3%) of the respondents did not attend any INSET course in EE in 2005. Only 24 (14.7%) of the respondents indicated that they attended an INSET course in EE in 2005. On the other hand, 107 (65.6%) the majority of respondents did attend an OBE course, and 59 (34.4%) did not attend this course in 2005, although OBE had already been implemented in schools. The majority 90 (78.9%) of the respondents indicated that the courses they attended were conducted in a formal manner, initiated by the Department of Education (DoE). Second were those 17

(14.9%) who indicated that the courses they attended were conducted by means of circulars or readings provided by the DoE. Third were two (2.6%) respondents who reported that the courses they attended were provided by way of private study and also provided by the principal, deputy and head of department. Lastly, only one (0.9%) of the respondents indicated that the courses they attended were provided by the private sector. This may imply that very little INSET of teachers in EE has taken place. INSET of teachers is more concerned with the educational content of OBE than with environmental content. The professional development of teachers in EE is therefore an important issue that needs to be addressed.

The majority 122 (74.8%) of the respondents indicated that their schools provided professional development by sending them on courses or workshops, followed by 19 (11.7%) who indicated that their schools motivated them to read further as a form of professional development. Of the respondents, 14 (8.6%) indicated that they developed themselves professionally by engaging in informal discussions with other teachers, and 8 (4.9%) of the respondents indicated that engaging in working sessions during meetings developed them professionally. Most respondents 69 (42.3%) consider being professionally developed in environmental education as knowledge expansion, 53 (31.9%) regard it as becoming a better teacher, 39 (23.9%) regard it as continuing education, and a few 3 (1.8%) of the respondents indicated that they regarded professional development in EE as unnecessary. This implies that most teachers regard professional development in EE as important to their profession. This suggests that teachers need training in order to become competent practitioners of EE.

The majority of teachers 76 (46.6%) indicated that EE is most relevant in Natural Sciences and Technology, followed by 47 (28.8%) of the respondents in Arts, Culture and Life Orientation, Human Sciences, Economic and Management Sciences with 28 (17.2%) respondents, Languages with 10 (6.1%) respondents, and the least in Mathematics with 2 (1.2%) respondents. This suggests that most teachers are not aware that most of the outcomes of the Revised National Curriculum Statements (RNCS) which are relevant to EE, emanate from the Human Sciences, Economic and Management Sciences learning area. This also implies that teachers need to adapt to new conditions in which EE is infused in every learning area of the RNCS. With regard to the importance of EE in the school curriculum, it is most interesting to note that an overwhelming majority 117 (71.8%) of the respondents indicated that EE is “very important”, and 42 (25.8%) indicated that EE is “important”. Only 4 (2.4%) of respondents indicated that EE is “not important” in the school curriculum. This suggests that the majority of teachers are interested in EE as a field of study. The majority of 130 (79,9%) of the respondents think that there is a need for them to receive training in EE and only 33 (20,2%) of the respondents think that there in no need for them to receive training in EE. The majority 114 (70%) of the respondents strongly indicated that if they were given a chance to attend a professional development course in EE, their area of need would be both the content and the skills for teaching EE. Eighteen (11%) respondents indicated that they needed knowledge of the relevant content, and 16 (9.8%) respondents indicated that they required skills to teach EE. Only 15 (9.2%) of the respondents indicated that they had no need for further development in EE. This

suggests that teachers can identify the areas in which they need PRESET and INSET in EE, i.e. environmental skills, content, and knowledge, and that there is a need for professional development in both the content and skills for teaching EE.

5.3.3 ENVIRONMENTAL EDUCATION IN THE SCHOOL CURRICULUM

Table 5.4 below presents data on whether or not schools have EE policies that they use to implement EE; how teachers view EE in the curriculum with reference to EE implementation, and their general awareness of international summits.

TABLE 5.4 QUESTION 2.2: Environmental Education in the school curriculum

(n = 163)

V	Statement	Yes		No		Unsure	
		n	%	n	%	n	%
V2 3	Does your school have an Environmental Education policy?	54	33,3	41	25,3	67	41,4
V2 4	Do you think that Environmental Education deserves to be a learning area on its own?	88	54	64	39,3	11	6,7
V2 5	Are you involved in implementing Environmental Education in your school and class?	101	62	55	33,7	7	4,3
V2 6	Do you think that outcomes in the Revised National Curriculum Statement are relevant to Environmental Education?	118	72,8	9	5,6	35	21,6
V2 7	Have you heard or read about the World Summit on Sustainable Development?	117	71,8	42	25,8	4	2,4

Missing number = 2

5.3.3.1 Discussion of the results

Table 5.4 shows that the majority 67 (41.4%) of the respondents are unsure about whether or not their schools have any EE policy. Approximately 54 (33,3%) of the respondents think that their schools have an EE policy. Lastly, 41 (25.3%) of the respondents indicated that their schools do not have such a policy. This may mean that teachers in all learning areas should bear a responsibility for EE. Most 88 (54%) respondents indicated that EE deserves to be a learning area on its own, whereas 64 (39.3%) did not think so. Only 11 (6.7%) of the respondents indicated that they are unsure. This implies that most teachers are unaware that EE is an interdisciplinary field of study and not a learning area per se, and that almost every learning area can relate to it. The majority 101 (62%) of the respondents indicated that they are involved in implementing EE in their schools and classes, and 55 (33.7%) indicated that they are not. Only 7 (4.3%) indicated that they are unsure. The majority 118 (72.8%) of the respondents indicated that the outcomes in the Revised National Curriculum Statements are relevant to environmental education, 35 (21.6%) indicated that they are unsure, and only 9 (5.6%) indicated that the outcomes are not relevant to EE. This suggests that INSET in OBE for certain teachers was inadequate. The majority 117 (71.8%) of the respondents indicated that they have read or heard about the World Summit on Sustainable Development, 42 (25.8 %) of respondents indicated that they have never read or heard about this Summit, and only 4 (2.4 %) of the respondents indicated that they are unsure about this Summit. Of special concern were the number of “never” and “unsure” responses from teachers about this Summit, since it was held in South Africa.

This indicates that some teachers are unaware or ignorant of important environmental events in their country.

5.3.4 KNOWLEDGE AND UNDERSTANDING OF BASIC ENVIRONMENTAL CONCEPTS AND ATTITUDES TOWARD ENVIRONMENTAL ISSUES

In Table 5.5 below, the number of responses to “strongly agree” and “agree” are grouped together as positive responses, and the number of responses to “strongly disagree” and “disagree” are grouped together as negative responses. These statements helped the researcher to gain insight into the environmental attitudes and literacy of the teachers.

TABLE 5.5 QUESTION 3: Knowledge and understanding of basic Environmental Education concepts and attitudes toward environmental issues

(n = 163)

V	Statement	Agree (n)	%	Undecided (n)	%	Disagree (n)	%
V28	All living things depend on air, water, food and land to survive	153	94,4	1	0,6	8	5
V29	Plants, minerals, soil, water and animals need to be conserved	154	95,7	2	1,2	5	3,1
V30	Burning of coal releases gases into the atmosphere which affects the survival of living things and cause air pollution	154	95,1	4	2,5	4	2,5
V31	People must live in harmony with nature in order to survive	151	93,8	7	4,3	3	1,9
V32	I am willing to be involved in a project to develop a school garden	129	80,1	19	11,8	13	8,1
V33	Tree-planting days will increase public awareness of the necessity of trees	150	93,2	6	3,7	5	5,6
V34	Family planning is important to avoid overpopulation	141	87,6	11	6,8	9	5,6
V35	Conservation is a responsibility to be						

	shared by individuals, industries, social groups, all levels of government and education	146	90,7	12	7,5	3	1,9
V36	It is important to repair leaking taps	154	95,1	5	3,1	3	1,9
V37	When shopping, I avoid buying products known to be harmful to the environment	128	80	19	11,9	13	8,1
V38	I normally leave the water running when I brush my teeth	39	24,1	4	2,5	119	73,5
V39	I take a shower instead of a bath to save water	62	38,3	12	7,4	8	54,3
V40	Only science teachers should know how the environment works	10	6,2	4	2,5	148	93,4
V41	Use of unleaded petrol reduces air pollution	99	61,5	33	20,5	29	18
V42	I don't think it is my responsibility to teach environmental issues in the normal classroom situation	14	8,6	12	7,4	136	84
V43	I encourage people to start using electricity for cooking, so that smoke pollution from homes can be reduced	123	76,4	16	10	22	137
V44	I always switch off lights when I don't need them anymore	147	90,7	2	1,2	13	8
V45	I encourage my learners to write on both sides of the paper	145	89	4	2,4	14	8,6
V46	I encourage my learners to pick up tins, bottles and papers at school	151	92,6	1	0,6	11	6,7
V47	It is my wish to point out to others not to smoke	142	87,1	3	1,8	18	11

Missing number = 27

5.3.4.1 Discussion of results

The number of “undecided” responses in table 5.5 is of special concern. These responses indicate that teachers are unsure about positive behaviour or attitudes towards the environment. The fact that they answered, “disagree” to positive statements or attitudes towards the environment, indicates that some teachers are ignorant regarding environmental issues. From this overview, the researcher deduced that certain aspects of environmental information and literacy require some INSET. For example, 9 (11.8%) of

respondents were “undecided” as to whether or not they were willing to be involved in a project to develop a school garden (V32), 9 (11.9%) were “undecided” as to whether or not to avoid buying products that are harmful to the environment (V37), and 33 (20.5%) were also “undecided” about whether or not unleaded petrol reduces air pollution (V41). It can be assumed therefore that the level of basic environmental understanding of some teachers is inadequate.

Despite such conceptual limitations, teachers came out strongly in favour of positive environmental attitudes and behaviours (between 123 (76.4%) and 154 (95.7%). Teachers responded strongly against negative environmental attitudes and behaviour 119 (73.5%), 148 (93.4%) and 136 (84%) in relation to V38, V40 and V42 respectively).

5.3.5 TEACHING METHODS

Questions pertaining to teaching methods were asked to gain insight into whether or not teachers are skilled in teaching methods appropriate to the teaching and learning of EE.

Teaching methods feature within approaches and models of teaching.

TABLE 5.6 QUESTION 4.1: Teaching Methods

(n =163)

V	Teaching method	Very often (n)	%	Sometimes (n)	%	Never (n)	%	No response
V48	1. Lectures	72	44,2	84	51,5	7	4,3	0
V49	2. Discussions	87	53,4	74	45,4	2	1,2	0
V50	3. Dramatisation	26	16	97	59,9	39	24,1	1
V51	4. Experimentation	6	16	99	60,7	38	23,3	0
V52	5. Fieldwork	24	14,8	98	60,5	40	24,7	1
V53	6. Case studies	37	22,8	104	64,2	21	13	1

V54	7. Demonstration	31	19,4	99	61,9	30	18,7	3
V55	8. Debates	35	21,6	91	56,2	36	22,2	1
V56	9. Brainstorming	64	39,5	83	51,2	15	9,3	1
Y57	10. Projects	60	37	90	55,6	12	7,4	1
V58	11. Action research	57	35	84	51,5	22	13,5	0
V59	12. Groupwork	83	51,2	70	43,2	9	5,6	1

Missing number = 10

5.3.5.1 Discussion of results

Table 5.6 indicates that each of the following methods was cited by 64 (39.5%) to 87 (53.4%) of respondents, as methods they very often use in teaching at their respective schools: discussions 87 (53.4%), groupwork 83 (51.2%), lectures 72 (44.2%), and brainstorming 64 (39.5%). Each of the following teaching methods was cited by 51.2% to 64.2% of respondents, as methods they sometimes use in teaching at their respective schools: case studies 104 (64.2%), demonstration 99 (61.9%), experimentation 99 (60.7%), fieldwork 98 (60.5%), dramatisation 97 (59.9%), debates 91 (56.2%), projects 90 (55.6%), action research and lecturing 84 (51.5%), and brainstorming 83 (51.2%). Each of the following methods of teaching was cited by above 20% of respondents as teaching methods they never used at their respective schools: fieldwork 40 (24.7%), dramatisation 39 (24.1%), experimentation 38 (23.3%) and debates 36 (22.2%). Of special concern are the “sometimes” and “never” responses to teaching methods appropriate to teaching and learning in environmental education. This suggests that teachers do not use some methods appropriate to the teaching and learning of EE, and they need help from trainers in this area to ensure effectiveness and competency in EE. The diversity of teaching methods provides evidence that teacher education has helped

teachers develop the skills to apply these methods in their lessons. Not only should teachers learn about diverse methods most effective for developing EE competencies, they should also be required to apply these methods to the teaching situation, and to evaluate their effectiveness against the guidelines for EE (Schulze, 1994: 166). Teachers need to be trained in the methodology that will help them and their learners acquire environmental skills and knowledge for effective EE.

5.3.6 STUDY TOURS/EXCURSIONS

Questions on study tours and excursions were asked to determine which outdoor activities teachers used to enhance the utilisation of environmental resources as teaching aids, and whether or not educators took learners out to visit different places to enhance environmental teaching and learning.

TABLE 5.7 QUESTION 4.2: Study Tours

V	Study tours/ Educational outings or Excursions undertaken by your school	n	%
V60	1. Nature reserves	47	28,8
V61	2. Plant studies	47	28,8
V62	3. Animal studies	114	70
V63	4. Parks	48	29,4
V64	5. Environmental awareness centres	40	24,5
V65	6. Participation in environmental days	99	60,7
V66	7. Museums	85	52,1
V67	8. Exhibition shows	51	31,3
V68	9. Public service offices	41	25,2
V69	10. Factories	17	10,4
V70	11. The coast	20	12,3
V71	12. Recyclers	104	63,8
V72	13. Visits to local rivers or streams	22	13,5
V73	14. Using the local community	27	16,6
V74	15. Mines	75	46

5.3.6.1 Discussion of results

Teaching and learning outdoors integrates and infuses EE in learning areas and teaching methods (Powers, 2004: 5). Teachers cannot teach EE without being outdoors. Table 5.7 indicates that the following study tours were cited by 75 to 114 (46% to 70%) of respondents as the places or activities mostly visited or done by their respective schools: mines 75 (46%), museums 85 (52.1%), participation in environmental days 99 (60.7%), recyclers 104 (63.8%) and animal studies 114 (70%). It can be assumed that teachers do not adequately use environmental education resources that provide learners with appropriate environmental education skills.

5.4 CONCLUSION

To ensure the effective implementation of EE in all learning areas, teachers need to be trained in the approaches, methodologies, concepts, content, theory of EE, and classroom practice that will help them and their learners to acquire environmental skills. The findings in the study indicate that teachers participating in the survey held different academic qualifications and are professionally qualified by means of either a teacher's certificate or a teacher's diploma. The findings also indicate that the majority of teachers have received no pre-service training in EE, as it was not offered in teacher education of the past. Most teachers were not trained to facilitate EE, even though they were made aware of it while training as teachers. Therefore, they will not be able to

tackle interdisciplinary themes, and they might be reluctant or unable to introduce environmental issues in schools.

The results indicate that the majority of the teachers did not attend any INSET courses in EE in 2005. The professional development of teachers is more concerned with educational content in OBE than with environmental content. Therefore, teachers need to be trained in appropriate EE approaches, teaching methods, and teaching and learning resources, so as to be able to adapt to new approaches of teaching in which EE is infused in every learning area of the RNCS.

The summary of findings, limitations, recommendations and conclusions of this study are presented in the next chapter.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1. INTRODUCTION

Chapter five contained the data collected by means of the questionnaires. The main focus of this chapter is to provide conclusions and reflect on the entire study. This will include a brief discussion of the findings and limitations of the study, followed by relevant recommendations and concluding remarks.

6.2. AIMS OF THE STUDY

As already stated in Chapter one, the researcher identified the following aims:

- To elucidate the concepts “professional development” and “environmental education”, in order to present a balance between the theoretical and practical implementation of environmental education (EE).
- To determine approaches, models, teaching methods and resource materials appropriate to the teaching and learning of EE.
- To establish the contributions of resource materials to the teaching and learning of EE in schools.

- To determine the barriers and challenges that hinder the professional development of teachers in EE, and to identify those barriers that teachers encounter when implementing EE in their schools.
- To consider which pre-service training (PRESET) and in-service training (INSET) programmes could most effectively be used to promote EE within schools, and through them, the wider community.

6.3. BRIEF DISCUSSION OF THE FINDINGS

6.3.1. THE MAIN FINDINGS OF THE LITERATURE STUDY

6.3.1.1 Environmental Education and teacher professional development

Findings from the literature review in section 1.3 indicate that most teachers in South Africa lack training in EE (Chacko, 2000: 77), and infusing EE in all learning areas is expected by the Revised National Curriculum Statements (RNCS) (Department of Education, 2002: 10). The RNCS ensures that all learning area statements reflect the principles of social justice, respect for the environment, and human rights, as defined by the constitution. The literature review (section 1.3) also reveals that these teachers did not receive any PRESET in EE, have no formal training in EE, and also have no background in EE (Janse van Rensburg & Lotz-Sisitka, 2000: 1). The establishment of the National Environmental Education Programme (NEEP) by the Minister of Education was in order to facilitate EE processes, as important educational priorities, within the curricula (de

Jager, 2003: 9). De Jager (2003: 9-10) further quotes Wagiet, who states that the developmental objective of the NEEP is to enhance the capacity of teachers in South Africa, and enable them to implement environmental learning at a compulsory school level, integrated in the outcomes-based education (OBE) curriculum (section 3.3.2), by using the active-learning and learning tree models (sections 3.3.2 and 3.3.7 respectively). Today, teachers face the compelling responsibility of serving society by fostering the transformation needed to set the country on the path to sustainable development. The time has come to ensure that the concepts of EE are discussed and interwoven into a framework upon which current and future educational policy is based.

6.3.1.2 Environmental Education and the curriculum

Much attention has been paid to EE in the curriculum and in official documents, viz: the White Paper on the Environment (1989), the White Paper on Education and Training (1995), the Reconstruction and Development Programme (1994), the Constitution (1996), the Committee on Teacher Education Policy (1996), the Environmental Management Bill (1998), the White Paper on Environmental Management Policy (1999), OBE and the RNCS (Department of Education, 2002: 10) (see section 3.2).

OBE forms the foundation of curricula in South Africa (Department of Education, 2002: 1). Transformation, redress, equity and participation are of major importance, and EE can be an important vehicle of facilitation in achieving these goals (Le Grange & Reddy, 1997: 12). OBE and EE have many common areas (section 2.6.1). Both focus on the

relevance to needs of society as well as to learners' present and future needs; both adopt a holistic approach to the curriculum, and emphasise the importance of integration and cross-curricular approaches; both are learner-centred and encourage active participation on the part of learners, involving them in real and simulated action; both emphasise the importance of life-long learning; and critical thinking is also an integral part of both approaches (de Jager, 2003: 7).

6.3.1.3 Aims, goals, objectives and principles of environmental education

The aims, goals, objectives and principles of EE provide guidelines for teachers and curriculum designers on how to teach and learn EE (section 2.4). To achieve these aims, goals, objectives and principles of EE, South Africa requires a teaching workforce that is knowledgeable and skilled in teaching towards this end. An effective teacher, who has acquired knowledge and skills of EE through PRESET and INSET, makes effective professional development programmes possible. A healthy environment is dependent on the environmental literacy of its teachers. They cannot assist their learners to become environmentally literate if they themselves lack environmental literacy (section 3.8) (Swanepoel, Loubser & Chacko, 2002: 282). Literacy in terms of the most important concepts in EE is in line with the definitions, aims, objectives and guiding principles of EE (Swanepoel, Loubser & Chacko, 2002: 282).

6.3.1.4 Teaching methods and resources

Teachers need to be educated in the methodology that will help them and their learners to acquire environmental skills. The effectiveness of teaching in classrooms is influenced by the teacher's ability to find, use and develop teaching methods and resources appropriate to EE (section 3.7). Teachers cannot teach and learn EE without being outdoors, because outdoor activities are resources that integrate EE in method courses (Powers, 2004: 5). Fieldwork, as a teaching method, should be considered when facilitating EE, because field trips develop learners cognitively and affectively (Deenanath, 2004: 86). All teaching methods are only meaningful to EE when applied to a problem associated with the environment (section 3.6).

6.3.1.5 Professional development models appropriate to EE teachers

Change is urgently needed in South Africa because of the implementation of the OBE approach and the RNCS, which both focus on the infusion of EE in all learning areas. The model for teacher change is appropriate in this regard for the training of prospective and in-service teachers. The NEEP should train teachers in the implementation of the "active learning model", since this model supports active learning through the OBE approach and material development for the RNCS (section 3.3). The issue investigation and action training model, the Amoeba model, the Cascade model, and the Spiral model should not be ignored, as these models also provide knowledge and understanding of environmental issues. These models are learner-centred and encourage groupwork. The

NEEP's learning tree model should be emphasised in teacher education, because it brings everybody on board (curriculum staff, teachers and subject advisors) and covers all areas needed for the effective implementation of EE. The training model should be used to train teachers in the application of these models (section 3.3.8). The effectiveness of these models should be measured by training teachers in the application of the deficit model and the enquiry-based and self-reflective tool of the action research model. These models enable teachers to analyse their practice. Action research is schoolwork research and classroom research used by teachers to improve their own practice in the classroom and at school level.

6.3.2 THE MAIN FINDINGS OF THE SURVEY

6.3.2.1 Pre-service and in-service training in Environmental Education

There is little doubt, from the findings of this study, of the need for change in teacher education. The responses to Question 1 (V11-V12) of the questionnaire show clear support for the need for change in teaching and learning of EE in schools. A professional development model for teacher change could be followed during teacher education to train teachers in EE and the RNCS. PRESET in EE was acquired by only 54.6% of the teachers participating in the survey. Only 17.8% of teachers are qualified to teach EE, whereas an overwhelming majority of 82.2% of teachers are not qualified to teach EE. This should be a concern for the Department of Education (DoE) as the main provider of

professional development (PRESET and INSET) for teachers (section 3.7). The DoE has neglected the training of teachers in implementing EE in the RNCS (V13-V15).

Teachers regard EE as very important to the curriculum, and need to receive training in it (V20-21). The training model should be used to train teachers in environmental knowledge, content, theory and skills (section 3.3.8) needed for effective EE teaching and learning. The training model features in the NEEP's active learning model, the Amoeba model, the Cascade model, the issue investigation and action training model, the Spiral model, and the NEEP's learning tree model. Studies in South Africa (section 3.3.9) and findings in this study (V11) reveal that most teachers did not receive PRESET in EE and therefore, the deficit model and action research model for the professional development of teachers would be appropriate models to be used to overcome this barrier.

6.3.2.2 Knowledge and understanding of basic environmental concepts and attitudes towards the environment

Although the survey suggests that teachers understand basic environmental concepts and show positive environmental behaviour (V28-V47), the crucial issue of the ability to facilitate effective EE in the classroom, needs to be addressed. The majority of the respondents (85.3%) indicated that they had never attended a single workshop on EE (V13). Another concern is that most of the DoE workshops promote OBE/RNCS (V14), and that INSET in EE is sponsored mainly by the private sector/NGOs (V14-V17). It is

very important that the DoE instructs the NEEP project committee to provide INSET to teachers for the effective implementation of EE in schools.

The fact that some teachers responded “undecided” and “disagree” to whether they are willing to be involved in a project to develop a school garden (V32), shows a shortcoming in positive environmental attitudes and behaviour. The development of a school garden could lead to the achievement of the Natural Science learning outcome number 1: *Scientific investigation (concepts of life and living)* (Deenanath, 2004: 88).

6.3.2.3 Environmental Education in the school curriculum

A significant issue to be noted is that most respondents (72.8%) in the study indicated that the outcomes in the RNCS are relevant to EE (V26). The fact that the majority of the respondents (54%) in this study proposed that EE deserves to be a learning area on its own (V24), indicates that teachers have a problem in infusing EE content in all learning areas. Most respondents (41.4%) are unsure about whether or not their schools have an EE policy, and 25.3% of them indicated that they do not have such a policy (V23). This suggests that, if such a policy exists, it is not implemented in the school’s programme.

Most of the respondents (62%) indicated that they are involved in implementing EE in their schools (V25). This is quite doubtful, since most teachers (41.4%) are unsure whether their schools have an EE policy or not (V23). An EE policy is a plan that enables better teaching and learning, contributing to a healthy, enriching, happy and more

sustainable environment, by ensuring that the environment is integral to each learning area (Deenanath, 2004: 4). In order for EE to be functional and effective, guidelines for implementing mechanisms such as environmental audits, programmes, action plans, policy statements, evaluations and reviews, must be given (Deenanath, 2004: 5). EE is implemented in the school via the EE policy. Such a policy is an agreed expression of principles and values to guide action plans for improving school-based environmental activities (Deenanath, 2004: 6).

6.3.2.4 Teachers' levels of environmental literacy and EE practice

It is important to note that the responses reveal that teachers have been poorly involved in the teaching and implementation of EE in schools (section 6.3.2.3). The fact that teachers currently lack proper experience in integrating EE into their teaching and learning, could impede the meaningful infusion of EE in all learning areas. This situation can be attributed to the lack of adequate support structures for teachers in PRESET and INSET.

6.3.2.5 Professional development models for teachers

Teachers need to be trained in the professional development models that are appropriate to the effective teaching and learning of EE. Teaching methods feature within the approaches and models of teaching, because teaching methods are ways of actually doing something (section 3.5). Responses to Question 4.1 (V58) of the questionnaire show a clear support for the need for the professional development of teachers with regard to

models appropriate to the teaching of EE. Action research is often used by 35% of the respondents, and 51.5% of them “sometimes” use it. It is apparent that teachers need training in this model for effective school and classroom practice.

6.4 TESTING THE PROBLEM STATEMENT

The problem statement in this study relates to the need for the professional development of teachers for effective EE. It has been tested by means of the questionnaire, using the frequency distribution results. It is apparent that there is a need for the professional development of teachers for effective EE. Teachers need to be professionally developed by means of knowledge about different teaching methods, educational outings, environmental policies, environmental theory and content, and how these can be infused in the different learning areas of the RNCS.

6.5 LIMITATIONS OF THE STUDY

The researcher wished that the study could have had a much wider impact, in order to enhance the quality of the findings. However, during the course of the research process, there were limiting factors beyond the researcher’s control. After careful scrutiny of the entire research process, several factors were identified that could be possible shortcomings:

- The researcher wanted to involve a large number of stakeholders in the data collection for the study. A large number of education decision-makers such as subject advisors, provincial managers, district managers, parents, and learners, would have enhanced the scope of the research project and its findings and recommendations. However, this was not possible, given time and financial constraints.
- The researcher wanted to collect data from the Brits district schools where she works, but this was not possible because the North West Department of Education failed to respond to the request to do research in that area.
- Some schools were so small that they could not provide the researcher with the required target population of 12 intermediate phase teachers.
- The researcher also wanted to cover the entire Gauteng DoE, the foundation phase, the senior phase, and the further education and training phase. Time constraints and limited financial resources were, however, obstacles to accomplishing such a mission.
- It is the researcher's view that it would have been useful, for the purpose of this study, to interview teachers as well, in order to obtain their point of view on the research topic.
- It is the researcher's opinion that a case study involving teachers who are qualified in facilitating EE would have provided a wider perspective on the research findings. However, the researcher could not establish such a case study.

6.6 RECOMMENDATIONS

The researcher recommends that:

- The teaching of environmental education should be concerned with teaching learners ‘in the environment’, ‘about the environment’ and ‘for the environment’. The teaching of the local environment is very important because the learners, who have experience of what they are taught about, would then develop a good understanding of it. The teaching and learning strategies used to teach environmental education, such as issue investigation, problem-solving, and value clarification, should engage learners to be active and rational, not passive, recipients of knowledge.
- In future, it is important to include learners in the survey, in order to establish whether or not they are taught about the environment and environmental issues, and if they are, to determine the teaching and learning strategies their teachers use to teach the content, and how the learners are involved.
- Interviews would provide more depth and understanding beyond the responses to the questionnaire.

6.7 RECOMMENDATIONS RELATED TO THE RESEARCH PROBLEM

The researcher recommends that:

- The principle of integrated EE learning is integral to the OBE approach and the RNCS. Integration ensures that learners experience learning areas as linked and

interrelated. As EE is a functional field of study, it is advisable to integrate it as often as possible within all learning areas, through holistically planned approaches to lessons so that infusion can take place.

- It is important to target PRESET so that it offers interdisciplinary approaches in EE to teachers as a field of study. It is also advisable to offer INSET to experienced teachers through courses and workshops that will make them active participants in promoting effective teaching and learning of EE.
- Teachers should engage in institutional and non-institutional professional and academic programmes aimed at improving curriculum skills' implementation and professional growth on an on-going basis.
- PRESET and INSET should offer courses to teachers that provide access to different EE resources, approaches, models, teaching methods and strategies for building confidence and providing skills to overcome educational barriers to achieving EE aims, goals, objectives and principles in the classroom.

6.8 CONCLUSION

It is necessary to plant the seed of EE teaching and learning approaches from PRESET, and to nurture the seedling during INSET, in order to consolidate effective environmental learning in the schools. If EE is passed on to learners in schools, it can help citizens to become environmentally knowledgeable, skilled and dedicated citizens, who are willing to work individually and collectively to improve or maintain the quality of the environment (section 2.4.1). Learners will then become responsible adults who are

willing to maintain a healthy environment (Constitution of South Africa, 1996: 11).

Educating learners in EE means educating the community, nation and generation.

The NEEP-GET project committee, in collaboration with the DoE, should take the responsibility of providing INSET to teachers in EE. The NEEP should use all the models at their disposal to train teachers for the effective implementation of EE in the school curriculum, viz: the active learning model, the Cascade model, the Spiral model, the action research model, and the learning tree model for teachers and subject advisors. The findings from the study reiterate the recommendations of a number of researchers, such as Shongwe (1992: 18), Simmons (1993: 8) and Papadimitriou (1995: 85-86), regarding the need for pre-service as well as in-service EE training of teachers (Swanepoel, Loubser & Chacko, 2002: 284).

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