AN EVALUATION OF THE ENVIRONMENTAL LITERACY OF EDUCATORS: A CASE STUDY

by

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DECLARATION:

I declare that **AN EVALUATION OF THE ENVIRONMENTAL LITERACY OF EDUCATORS: A CASE STUDY** 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.

…….. ……

HN HEBE **DATE**

DEDICATED TO MY FAMILY:
MY LOVING WIFE, GASENAKELETSO,
MY DEAREST DAUGHTER, NONTSIKELELO AND, MY SWEET SON, SANDILE

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I would like to thank **THE ALMIGHTY JAH** because without **HIM** nothing is possible. **HE** carried me through this difficult journey. **HE** meandered, tumbled, and toiled with me throughout.

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Headman Ngilosi Hebe

Pretoria, 2009

QUOTABLE QUOTE:

“The stomach is the only part of man that can be fully satisfied. The yearning of man’s brain for new knowledge and experience and for more pleasant surroundings can never be fully met. It is an appetite which cannot be appeased” (Thomas Edison).

SUMMARY

This study departs from the assumption that the environmental literacy of educators is significant in the effective implementation of environmental education. The study explores and interprets the environmental literacy of currently serving educators (in-service educators) in the towns of Makwassie and Wolmaransstad. Semi-structured and unstructured interviews were used for data collection in this qualitative, case study-based research inquiry.

The interview schedule was designed to cover six concepts/issues, namely, pollution, global warming, the ozone layer, water, human population growth, and sustainable development.

The findings reveal that the level of environmental literacy varies from educator to educator and that various factors influence the environmental literacy of educators. The study recommends meaningful, ongoing educator training and support, more research in the area of educator environmental literacy, as well as an investigation into classroom practice in order to determine the level of the implementation of environmental education.

Key terms: currently serving educators, education, environmental education, environmental literacy, environment, evaluation, global warming, literacy, human population growth, and sustainable development.

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CHAPTER ONE

ORIENTATION TO THE STUDY

1.1 INTRODUCTION

This chapter provides an orientation to the study by reflecting on the following: brief background to the study, the problem statement, the aim of the study, the research method and design, the demarcation of the study, the significance of the study, and, finally, an outline of the study programme - division of chapters.

1.2 BACKGROUND TO THE STUDY

This case study focuses on the evaluation of the environmental literacy of educators in two towns, namely; Makwassie and Wolmaransstad (refer to 1.4 and 1.6). However, it is important to provide a global significance in terms of the role played by educators in developing and promoting environmentally responsible behaviour among the citizens through environmental literacy, albeit, briefly. This is in view of the fact that environmental degradation is a global phenomenon (Arms 1994; Johansen 2006; Donner & Rodriguez 2008) hence the significance of a global perspective on the role of educators in this regard.

Teachers worldwide have a significant role to play in the development of environmentally literate citizens equipped with the skills, knowledge, attitudes and behavioural traits that support and promote the adoption of sustainable lifestyles. Accordingly, it is essential that the teachers themselves possess a high level of environmental awareness, and that they be able to instil in their learners the ability to think creatively and to apply theoretical environmental knowledge to the solving of concrete local problems (Ballantyne 1995: 29; Than 2001: 429).

The importance of the teachers' role in the development of environmentally literate citizens has been acknowledged in major global environmental conferences such as the Belgrade, Tbilisi, Moscow and Rio de Janeiro (Ballantyne 1995:29). At the same time, some studies have revealed that the public has a limited knowledge in respect of the way in which the systems in the environment function (Hooper 1988: 15; Ramsey 1993: 31; Corral-Verdugo, Frias-Armeta & Corral-Verdugo 1996: 23) and that there is "a lack of environmental concept among individuals of all ages" (Loubser, Swanepoel & Chacko 2001:317). It is, thus, important that educators develop the environmental literacy of all citizens, especially in their learners.

The creation of an environmentally literate citizenry is crucial and it is a curricular obligation in South Africa. The new curriculum, which is known as the National Curriculum Statement (NCS), for example, provides for the integration of environmental learning throughout the curriculum. The importance of environmental education and the role of educators in environmental learning were highlighted by the former Director General in the Department of Education, Mr TD Mseleku, when he issued the "suite of booklets, which is aimed at supporting the implementation of environmental learning …". He stated that:

> The Constitution of South Africa links environmental issues to values underpinned by human rights and social justice. In recognising the right to an environment that is not detrimental to citizens' health or well-being, the Constitution supports a national commitment to environmental responsibility. If this is to be realised, environmental education is crucial. As a response to this, the White Paper on Education and Training (1995) made clear the need for integrating environmental learning at all levels and phases of the education and training system…

> … Environmental learning should influence what is taught and how it is taught … The implementation of a new curriculum and environmental education is a major challenge for any nation, but also a great opportunity to reflect on one's practice and to take ownership of the process (NEEP-GET, Department of Education, 2004).

In the light of the above statement, and on the basis of the renewed commitment to uphold the ideals of the NCS while at the same time improving the implementation of the curriculum, as expressed by the Minister of Basic Education, Mrs Angelina Motshega, when she addressed parliament regarding the Curriculum Review Process on 05 November 2009 (http://www.education.gov.za/dynamic/dynamic.aspx?pageid=306&id=9148), it becomes even more evident that educators have an important role to play in developing and promoting environmental literacy. However, if they are to develop the full potential of learners with regard to environmental issues, the educators themselves need to be environmentally literate.

It is of critical importance, therefore, that the environmental literacy of South African educators be evaluated in order to determine whether they have the capacity to fulfil the education policy requirement of integrating environmental education into their teaching and learning activities.

1.3 PROBLEM STATEMENT

Many teachers in South Africa are faced with the immediate challenge of implementing "environmental learning across the eight Learning Areas and throughout the curriculum" (NEEP-GET Department of education, 2004). The environmental literacy level of these teachers is extremely significant in this regard because, as Van den Berge in Ballantyne and Oelofse (1989: 9) points out, "teachers ultimately control the pace and direction of change and have the ability to obstruct or facilitate the wishes of planners". At the same time, it

needs to be mentioned that, “what they teach is influenced by what they know and feel” (Richard & Johnson 1980 as quoted in Buethe & Smallwood 1987: 39). Those teachers who are environmentally literate will, therefore, be well positioned to enable their learners to become more environmentally aware.

On the basis of the policy requirement that South African teachers implement environmental education throughout the curriculum, the following question, which is central to this study, may be formulated:

What level(s) of environmental literacy do currently serving educators have in order to implement environmental education effectively?

1.4 AIM OF THE STUDY

In order to answer the preceding question it is essential to present the aim of the study, which is as follows:

- To evaluate the environmental literacy of educators, in the towns of Makwassie and Wolmaransstad.

1.5 RESEARCH METHOD AND DESIGN

Research may be defined as a systematic process of gathering and logically analysing information for some purpose (McMillan & Schumacher 1997: 9; Robbins, Odendaal & Roodt 2003: 444). Research is “aimed at developing an argument and a conclusion amounting to a knowledge claim” (Lythcott & Duschl 1996 and Robert 1982 both quoted in Robertson 1994: 21). Research methods (sometimes termed methodology) are employed to collect and analyse data (ibid.).

In view of the fact that this study is aimed at exploring and describing the environmental literacy of currently serving educators, the qualitative method of research will be used. The relevance of this choice of qualitative research method is enhanced by the fact that this study also intends to attempt to understand a certain aspect of human behaviour and experience. This is in line with the objective of qualitative research which, according to Garber (1996: 283), is to "promote better self understanding and increase insight" pertaining to the level of environmental literacy of currently serving educators. This study should also enable the researcher to make an effort to "understand the ways in which different individuals make sense of their lives and describe those meanings" (ibid.) with regard to environmental issues. It is, thus, appropriate that this study follows the interpretive paradigm because "the interpretive paradigm precipitated the tools we now know as qualitative methods" (Saks & Allsop 2007: 25 – 26).

Semi-structured and unstructured interviews will be used to gather information. These forms of interview should enable the researcher to move from the perspective of an outsider to that of an inter-subjective insider (Garber1996: 284; Babbie & Mouton 2001: 271), and, thereby, gain a better understanding of the level of environmental literacy of each interviewee.

1.6 DEMARCATION OF THE STUDY

The sample to be used will be drawn from educators who, at the time this study was conducted, were teaching in educational institutions in the towns of Makwassie and Wolmaransstad in the North West Province (refer to appendices 1, 2 & 3). These two towns are chosen with due consideration to financial constraints on the part of the researcher as well as their close proximity to the residential place of the researcher.

1.7 SIGNIFICANCE OF THE STUDY

There is a universal need for educators to be knowledgeable about the environment and to be prepared to teach others about it (Smith-Sebasto 1997: 314). At the same time, as was pointed out at the beginning of this chapter, South African teachers have a curricular obligation to integrate environmental education into their teaching activities. In view of this it is essential to determine, by way of empirical investigation, whether educators are able to meet the challenge of teaching learners about environmental issues. It is, thus, necessary - as this study seeks to do - to evaluate the environmental literacy of educators.

This study is, therefore, significant for two reasons. Firstly, it will assist in shedding some light on the extent to which South African educators are equipped to integrate environmental education into their teaching and learning activities. This is important because it would be inappropriate to assume that South African educators are, indeed, environmentally literate and are, thus, able to integrate environmental education into their teaching and learning activities with ease. Secondly, the literature review suggests that there have been very few studies conducted to determine the extent of environmental literacy of in-service teachers (Hsu & Roth 1998: 231; Summers, Kruger & Childs 2001: 36). This study should, therefore, make a contribution in this regard.

The final point worth reflecting upon before proceeding to the next chapter of the study is the way in which the study will be structured. Hence, the study programme - division of chapters will now be outlined.

1.8 STUDY PROGRAMME – DIVISION OF CHAPTERS

Chapter one provides an orientation to the study, chapter two focuses on the literature review, chapter three deals with the research design and methodology, chapter four presents and discusses the findings, while chapter five contains a summary of findings, discusses the limitations of the study, and provides some recommendations.

CHAPTER TWO

THE REVIEW OF LITERATURE

2.1 INTRODUCTION

The purpose of this chapter is to define and discuss the concepts that are deemed central to this study. In discussing these concepts, their respective importance to the study will also be highlighted. The word "concept" derives from the Latin words *conceptus* or *concipere,* which encompass "*to conceive*" (www.answers.com/concept&r=67). In this study the word "concept" is used to refer to "an idea or thought corresponding to some distinct entity, or which determines the application of the term" (Bopape 2007: 19). In essence, the word "concept" is used in reference to what a particular "entity", an idea or phenomenon is or should entail.

The following approach is adopted in this chapter. Firstly, each concept that is deemed significant to this study is defined and discussed, and secondly, a brief reflection on its significance to this study is presented. The concepts referred to in terms of this study include environment, education, environmental education (EE) – under the term environmental education, concepts such as global warming, human population, and sustainable development will be discussed. The concepts literacy, environmental literacy, currently serving educators and evaluation will also be discussed.

However, it is in the interests of this study to commence with a briefly discussion of the concept "literature review" so as to contextualise the intents of a literature review in terms of this study before proceeding with the discussion of those concepts which are deemed significant to the study.

2.2 THE DEFINITION OF "LITERATURE REVIEW"

A literature review may be regarded as "the process by which published and unpublished materials are selected to develop support for the research project" (Moore & Caelli 2004: 122). A literature review serves a variety of purposes in research. According to McMillan and Schumacher (1997: 120) "knowledge from literature is used in stating the significance of the problem, developing the research design, relating the results of the study to previous knowledge, and suggesting further research." The literature review also serves to "review the critical points of current knowledge on a particular topic" (http://en.wikipedia.org/wiki/Literature_review).
Kaniki (2006: 19 – 22) concurs with the above writers by pointing out that a literature review helps in:

Identifying knowledge gaps and in developing a research problem,
Identifying a theoretical framework,
Identifying conceptual and operational definitions, and in
Identifying methodologies.

Literature is, indeed, an important aspect of any form of research and, hence, the need for this chapter. In order to avoid ambiguity, it must be stated that the term "literature" is used, in this context, to refer "to all kinds of information, including books, journals, electronic materials, and oral information" (Kaniki 2006: 19). The following are, therefore, some of the concepts deemed significant to this study.

2.3 THE CONCEPT OF "ENVIRONMENT"

The concept "environment" is very broad (Arms 1994: 3) and it has been assigned various meanings by different people (Veitch & Arkkelin 1995: 5). The assigning of meanings to the word "environment" is done in line with individuals'

perceptions and fields of interest (ibid.). The diversity in meaning assigned to the concept "environment" arises from the fact that writers from different fields use the term within different contexts and on the basis of their individual perceptions of the environment (Chacko 2000: 17). Neluvhalani (2000: 12 cited in Bopape 2007: 18) asserts that an array of factors - political, economic, social, scientific and technological - influence the meanings assigned to this concept by different people. Accordingly, it is in the interests of this study to reflect on some of the definitions of the concept "environment" as provided by different writers.

According to Chacko (2000: 17) the term "environment" is "drawn from the verb 'to environ', which means to form a circle or ring around". This circle or ring refers to "the surroundings in which a person, animal or plant lives" (www.thefreedictionary.com/environment).

According to Chapter 10 of the National Environmental Management Act 107 of 1998 "environment" means the surroundings within which humans exist and that are made up of –

(i) the land, water and atmosphere of the earth;
(ii) micro – organisms, plant and animal life;
(iii) any part or combination of (i) and (ii) and the interrelationships among and between them, and
(iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well being."

Lotz-Sisitka and Raven (2001: 29 in Bopape 2007: 17) depict the environment as "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".

It is evident from the above definitions, especially the latter, that the environment is, indeed, a dynamic entity. This dynamic nature of the environment emanates from the co-existence, whether in a negative or positive way, between the biotic (living) and abiotic (non-living) factors that interact on an on-going basis. This interaction is necessitated mainly by actions, on the part of humans, which are aimed at satisfying and fulfilling their needs and wants. The profound impact of human beings on this interaction and, especially, the effects of human beings that alter the environment, make it even more vital for educators to be aware (literate) of the position and role of humans in the environment and, hence, the significance of the concept "environment" to this study.

The significance of the concept of "environment" to this study

In terms of this study, the concept of "environment" is important for two reasons. On the one hand, the diverse meanings assigned by different people to this concept are highlighted. This diversity in meanings that may be assigned to the concept suggests that even the respondents in this study may possibly have different understandings of the concept. On the other hand, an understanding of the concept environment should facilitate the understanding of the concept "environmental literacy" - another key concept in this study.

"Education" is another concept of importance in this study and, hence, the need to reflect upon it.

2.4 THE CONCEPT OF "EDUCATION"

The concept "education" is extremely broad and it has a wide variety of meanings that emanate from individual perspectives of what education, as a process, aims to achieve (Rowe 2005; Bopape 2007; Curoe 2008). However, the following definitions will, within the context of this study, suffice.

According to Payne (2008: 14) "education is the development of the learner's native powers by means of instruction carried on through the conscious and persistent agency of the formal educator, and depends upon the established connection between the world without and the world within the mind – between the objective and the subjective." Lebeloane (1998: 36) broadens the notion of education as a means of learner development by depicting education as "a facilitating process on account of which learners are empowered to construct their own knowledge and develop their own potential through discovering, exploring, interpreting and understanding information". As a coordinated process, with successful developmental outcomes, education is concerned with bringing about "pupil learning, including learning that, learning how to, learning why, etc" (Nola & Irzik 2005: 46).

The developmental outcomes of education include, among others, "the superior adjustment of a philosophically and mentally developed conscious human being to his intellectual, emotional and volitional environment" (Horne 2004: 251). Education also "implies increased power, facility, knowledge, skill, and at the same time the disposition to use these for the good not only of the individual but also of his associates, his country, and even of his age in so far as capacity and opportunity fit him for service beyond his immediate environment"(Rowe 2005: 1).

It is imperative to emphasise that the developmental outcomes of education may be ascribed not only to a single element but an array of life factors (Curoe, 2008).

Educators are certainly instrumental in, but not exclusively responsible for, the educational process. Nola and Irzik (2005: 46) assert that, “education is the co-ordinated process, typically but not always involving teachers … teachers need not always be involved in education, as there are always auto didactics, or the self-educated, who conduct their own processes of learning.” Similarly, Rowe (2005: 1) argues that the kind of growth that is brought about by education should “not be restricted to the sort of growth that takes place in the classroom or with the aid of the tutor – the library, the church, the street, the theatre, the symphony are alike educative.”

In essence, and for the purpose of this study, education may be regarded as a conscious or unconscious developmental process that occurs in an individual, as manifested in his or her behavioural processes, as a consequence of his or her interactions with the human and non-human environment. This development enables individuals (or at least should enable individuals) to act with great care in their interaction(s) with the biophysical, economical, social and political milieu. This interaction between individuals and their environment should be done in order to preserve, conserve and nurture the limited resources available in nature for the benefit of future generations. Accordingly, education, as a process that should enable positive change in human behaviour is, indeed, significant.

The significance of the concept of “education” to the study

The above discussion highlighted the importance of the concept education to the study by reflecting on the interplay that exists between the influences of an

educator and the environment in the learning and the development of individuals. In this respect, Rowe (2005) and Payne (2008) emphasise the developmental role of education in equipping learners in order to acquaint them with their roles both in and beyond their immediate environments. Similarly, Nola and Irzik (2005: 46 – 47) assert that educators are responsible for shaping the "learning process" – a process that includes learning about the environment. It was, therefore, essential to reflect on the concept education because this concept amplifies the interrelationship between some of the key components and concepts of this study, for example, the educators and the environment.

The discussion of the above concepts, namely, *environment* and *education* has made it necessary to also reflect on yet another concept that is significant to this study, namely, "environmental education".

2.5 THE CONCEPT OF "ENVIRONMENTAL EDUCATION"

The concept of "environmental education" has different meanings for different people and, thus, there is "a definitional problem" (Disinger, 2001) associated with this concept. The following discussion will seek to reflect on some of the definitions associated with the word "environmental education". However, the approach followed in the discussion of this concept will be slightly different from the preceding discussions on those concepts that are deemed significant to this study. The concept environmental education will, first, be discussed and, in the process, some of the concepts that might be deemed important in enhancing "*environmental knowledge*" (Skamp 2000: 103) will also be reflected upon, albeit briefly. This approach is necessitated by the fact that the concepts in question – human population growth, global warming and sustainable development - are not only important in the development of environmental literacy, but they also played an important role in the process of designing an interview schedule/questionnaire in this study.

Environmental education (EE) may be regarded as “the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness among man, his culture, and his biophysical surroundings. Environmental Education also entails practice in decision-making and self-formation of a code of behaviour about issues concerning environmental quality” (IUCN 1970 in Hart 2007: 690). The North American Association of Environmental Education states that:

> Environmental Education (EE) is a process which promotes the analysis and understanding of environmental issues and questions as the basis for effective education, problem solving, policymaking, and management. The purpose of Environmental Education is to foster the education of skilled individuals able to understand environmental problems and processing the expertise to devise effective solutions to them. In the broader context, environmental education’s purpose is to assist in the development of a citizenry conscious of the scope and complexity of current and emerging environmental problems and supportive of solutions and policies which are ecologically sound (Kohl 2008: 130).

According to Kgatitsoe (2002: 16) “environmental education is a way of life. It regulates the rhythm of every social fabric, be it politics, economics, culture and entertainment. It is a pivot around which man’s values, norms, morals, ethics, behavioural patterns, interactions, sustainability, attitudes, perceptions and generally man-environment relationships should grow.”

Each of the above definitions of environmental education is significant, particularly, in as far as expanding the conceptualisation of the processes and activities entailed in environmental education. For example, the first two definitions attempt to, among other things, reflect on the role of EE in equipping human beings in their ability to identify the problems and challenges facing the

environment as well as their role(s) in dealing with these problems and challenges. The last definition highlights the broad areas that are either touched upon, or should be touched upon, by environmental education.

However, one needs to point out that the afore-mentioned definitions have shortcomings that make it difficult for this researcher to accept them, at least, for the purposes of this study. On the one hand, the definitions of both the IUCN and the North American Association for Environmental Education are somewhat dated in that they were conceptualised more than twenty-five years ago. At the same time there is ambiguity in some of the phrases used in the IUCN definition of EE. For example, it is not very clear what is meant by the phrase "self-formation of a code of behaviour…". On the other hand, the definition of EE provided by Kgatitsoe (2002: 16) comes across as both emotive and vague. For example, there is no indication as to how environmental education is "a way of life", nor is there any clarification on the way in which EE "regulates every social fabric". In view of the afore-mentioned shortcomings, this researcher has deemed these definitions of environmental education less acceptable for the purposes of this study. Accordingly, the following definition is, on the basis of its simplicity and precision, deemed to be more acceptable.

> "Environmental Education refers to the branch of Experiential Education that is focused on teaching students about the natural world and their relationship with it. It typically focuses on ecosystems and the role humans play in those ecosystems. Environmental Education focuses on the ways human systems impact the environment and the way the environment in turn impacts human society"(http://www.bccymca.org/seasons/definitions/environmental/index.htm).

Environmental education programs are often aimed at changing people's perceptions about the value of the natural world. Such programs also teach people how to change their environmental behaviours by getting them to, for example, recycle and to build eco-friendly dwellings (http://wilderdom.com/environmet/EnvironmentalEducation.html).

It should be evident from the above that environmental education plays a significant role in the promotion of environmental literacy. Educators, therefore, should be well equipped to assist learners to become environmentally literate through the implementation of EE. There are various issues that may be deemed significant in enhancing environmental literacy and which may, therefore, be used in the implementation of environmental education by educators. According to Skamp (2000: 103), for example:

> Examples of environmental knowledge, which could be considered important to know, are: what do we understand about pollution, its causes and effects? What are ecosystems and causes of their deterioration? What is recycling and the costs and benefits associated with it? Can we do anything about ozone depletion and global warming? The conceptions individuals and societies have about "pollution", "ecosystems", "recycling", "greenhouse effect" and "ozone depletion" will influence their answers to these questions and may impact on their individual and corporate environmental decisions and actions.

There are many other issues or topics, apart from those mentioned by Skamp (2000), above, that might play an important role in the creation and promotion of "environmental knowledge" through the implementation of environmental education. It is, therefore, important to reiterate that educators, as facilitators of the learning process, through the integration of environmental education within various learning programmes, learning areas and subjects, need to be

environmentally literate in respect of a broad range of environmental issues and topics. Accordingly, as stated earlier in this subsection, the following discussion will reflect on some of the concepts or issues that may be used by educators to enhance the environmental literacy of learners. These concepts are human population growth, pollution, global warming and sustainable development.

2.5.1 Human population growth

Population growth may, generally, be regarded as the increase in a population that occurs when the birth rate is higher than the death rate (http://www.encyclopaedia.com/doc/106-populationgrowth.html). On the other hand, human population growth entails an increase, over time, in the number of people who inhabit a specific area (http://www.answers.com/topic/population-growth-2).

There has been a notable increase in the number of people who inhabit our planet over the past years. According to Todaro and Smith (2003: 259), there was an estimated 6,1 billion people on planet earth at the beginning of the twenty-first century, and by 2008, the world population had escalated to approximately 6,5 billion people (Moore 2008: 155). This increase in human population has had a profound impact on the general well being of the people but, more importantly, it has also had a profoundly negative impact on the environment. Donner and Rodriguez (2008: 1090 – 1094) note the following with regard to the effects of human population growth:

> Population growth, composition and distribution are perhaps the most important factors that have increased our vulnerability to disasters …
>
> It is noteworthy that large populations not only result in greater numbers of individuals being exposed to disasters, but when viewed within an ecological context, also create the conditions for greater exposure. For

example, population changes also affect the environment (e.g. deforestation, destruction of mangroves or expanding the coastal zone to areas which were once occupied by water), which in turn, increases the likelihood of disasters.

Apart from the disasters referred to by Donner and Rodriguez (2008) above, human population growth has been the major cause of soil erosion and, consequently, the reduction in arable land (Bouchat 2008: 148). The reduction in arable land has led not only to insufficient food supplies (ibid.), but also results in “inevitable war, pestilence and famine” (Lawson 2008: 1), and indeed, deaths.

There is no doubt that the impact of human population growth on the environment renders it even more urgent to act in accordance with the warnings issued by Thomas Malthus some two hundred years ago, that is, to take radical measures to limit human population growth (Lawson 2008: 10). Otherwise, future generations will be in greater trouble than anyone may possibly imagine. Accordingly, educators have an important role to play in educating people, especially learners, about the effects of human population growth on the environment. However, the question arises as to whether are educators themselves aware of the impact of human population growth on the environment? This question may be answered only through an evaluation of the environmental literacy of educators in this regard.

Human population growth results not only in problems such as disasters, famine, etcetera, as mentioned above, but there are many other effects emanating from this growth in the human population. Pollution is one of the environmental issues that are often attributed to human population growth. It is the opinion of this researcher that educators need to be environmentally literate

in respect of the concept and the phenomenon “pollution”. A brief reflection on pollution is, thus, essential.

2.5.2 Pollution

The *Macmillan English Dictionary for Advanced Learners* (Rundelll 2007: 1149) defines pollution as “the process of damaging the air, water or land with chemicals or other substances”. Other writers concur with this definition (Varma, 2005; Kidd, 2008). However, for the purpose of this discussion, the definition provided by the National Environmental Management Act of South Africa is deemed, due to its comprehensive nature, to be acceptable. According to the National Environmental Management Act (1998: 8 – 10):

> “Pollution” means any change in the environment caused by
> (i) substances;
> (ii) radioactive or other waves; or
> (iii) noise, odours, dust or heat,
> emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have an effect in the future.

In view of the fact that pollution leads to a serious deterioration in the quality of the environment, it is, thus, necessary to control environmental pollution (Varma 2005: 14). Educators, therefore, have a very significant role to play in promoting awareness in respect of the impact of environmental pollution. Thus, it stands to reason that the educators, themselves, should have a high level of knowledge/awareness regarding pollution and, hence, the need to evaluate their environmental literacy in this regard. Pollution is one of the key

contributors to global warming (ibid.) and, therefore, it becomes necessary to reflect on the concept of “global warming”.

2.5.3 Global warming

Global warming refers to the progressive, gradual rise in the average temperature of the earth’s surface due to an increase in the concentration of greenhouse gases in the atmosphere (Baird 2005: 13; Finn 2008: 191). Greenhouse gases, that is, the gases that trap heat in the atmosphere, for example, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and artificial chemicals such as hydrocarbons and sulphur hexaflouride (SF_6), are the main causes of global warming (Winkler 2005: 355, Jorgenson 2006: 1787; Finn 2008: 191). These gases are emitted into the atmosphere mainly as a result of human activities. For instance, the production and the use of energy results in the emission of carbon dioxide, while agricultural activities contribute to high concentrations of methane in the atmosphere (Winkler, 2008).

Global warming has a number of negative effects, not only in terms of the atmosphere, but also in respect of several other issues. For example, some of the gases that are released into the atmosphere not only result in an increase in global temperatures but they are also responsible for the destruction of the ozone layer (Jones 2008: 359). The ozone layer is that layer of gas which inhibits the ultra-violet (UV) rays from reaching the earth (ibid.). In other words, the release of certain gases into the atmosphere causes the destruction of the ozone layer, thus making it possible for a certain amount of ultra-violet rays to reach the earth. At the same time, some of the gases that are released into the atmosphere trap a lot of terrestrial radiation (ibid.), which, in turn, causes an increase in global temperatures. This increase in global temperatures has serious consequences in terms of various forms of life on earth.

According to Johansen (2006: 531) global warming is responsible for, among other things, the decline in biodiversity and the destruction of habitats, and it

has led to the “intense, rapid and pervasive mass extinctions” of fauna and flora in different regions worldwide. Similarly, Finn (2008: 191 – 192) argues that the increased temperatures as a result of global warming have, for instance, led to greater drought on the west coast of South Africa, and that it is not possible to rule out the future impact of these increased temperatures in respect of concerns such as maize production, the spreading of diseases due to the unsanitary conditions attributed to water shortages, and the rise in food prices.

The process of global warming clearly constitutes a significant threat to the welfare of future generations - probably more so than to the current inhabitants of the earth. Nevertheless, there are steps that may be taken to deal with this phenomenon of global warming. Bardeen (2007: 26), for example, suggests that global warming “can be slowed by reducing greenhouse emissions and recapturing carbon dioxide (CO_2) from the atmosphere”. However, it should be stated that, until people develop literacy in respect of the concept of global warming, the possibilities of meaningful intervention insofar as dealing with this phenomenon of global warming remain extremely remote. Accordingly, the role of educators in the creation and the promotion of environmental literacy in respect of global warming is cardinal.

There is, indeed, much that may be said about global warming, for example, the way in which global warming is related to the process of the greenhouse effect, the ways in which global warming may be managed, etc. However, it is not within the scope of this subsection, and, indeed, this study, to reflect on the details of global warming. The intent is to highlight and to emphasise both the fact that global warming is one of the issues that may, or should, be dealt with in and by means of environmental education programmes and that educators need to be environmentally literate with regard to an array of issues, including global warming.

In addition to the above concepts, namely, population growth, pollution and global warming, it is essential to reflect briefly on the concept of "sustainable development" before embarking on a discussion of the concept of "literacy". This is necessary in view of the fact that "the crisis of sustainability and the problems of education"(Nair, Jones & White 2002: 57) may be dealt with through the implementation of meaningful environmental education programmes. In essence, there is a link between sustainable development and environmental education.

2.5.4 Sustainable development

The concept of "sustainable development" is still evolving and, consequently, is has been assigned various definitions by different interest groups (Fien & Tilbury 2002: 2). These diverse definitions of sustainable development address the "social, economic and environmental (ecological) interests, and core values (Chacko 2000: 61 – 62). According to Fien & Tilbury (2002: 2) "the term 'sustainable development' was first given currency by the World Conservation Strategy (IUCN, UNEP, WWF 1980) and later reinforced by the Brundtland Report (World Commission on Environment and Development 1987)". In view of the fact that the concept "sustainable development" is significant to this study, it is worth reflecting, albeit briefly, on what it entails.

According to the Bird Life South Africa (2002: 17):

> "Sustainability" or "sustainable" means "to keep in existence or to maintain". In terms of resources, this means to use only as much as can be replenished in the long term, such as by not over-fishing or hunting a species to the point of extinction. Sustainable development is development that meets the needs of today without prejudicing the needs of tomorrow. However, when the term "sustainable" is linked with the term profit or growth it may be exact opposite of sustainable development.

On the other hand, Newton (2003: 2 – 4) has the following to say with regard to sustainable development:

"Sustainability … must encompass the notion of change and the notion of the maintenance of the system without change … 'sustainable' means (at least) maintaining equilibrium in the long-term and 'development' means (at least) progressive irreversible change".

The essence of what is entailed in and by sustainable development, as indicated in the above definitions, is also supported by the notion that sustainable development is "development which seeks to produce sustainable economic growth while ensuring future generations' ability to do the same by not exceeding the regenerative capacity of nature. In other words, it's trying to protect the environment." (http://www.en.wiktionary.org/wiki/sustainable_development).

The above definitions of sustainable development encompass the views of this researcher regarding this concept. In this context, sustainable development involves the satisfaction of the inevitable needs and, frequently, the non-essential wants of human beings through the judicious use of natural resources with due consideration not to deplete these resources so as to ensure, at least to an extent, that the needs of future generations may be fulfilled. Sustainable development, in this regard, also recognises the ecological niche occupied by every biotic (living) factor and every abiotic (non-living) factor as well as the interdependence between various living factors and non-living factors in the environment.

It should be evident from the above that sustainable development is important in environmental education, and particularly, in the creation and development of environmental literacy within the context of learning and teaching. It is,

therefore, essential that educators demonstrate some level of awareness regarding this concept, and, hence, the importance of evaluating their environmental literacy in respect of sustainable development.

The preceding discussion highlights the importance of various concepts and environmental issues as well as the need to integrate both these concepts and these issues in environmental education. The discussion of the concept of environmental education was necessary in the light of its significance in respect of this study, and, hence, it is appropriate to reflect, albeit briefly, on the importance of this concept to the study.

The significance of the concept of "environmental education" to the study

The concept "environmental education" is important because it is a significant vehicle for developing environmental literacy among citizens. The role of educators in using EE in the creation of environmental awareness, in the development of positive attitudes and in inculcating values in order to promote environmental literacy is, undoubtedly, indispensable.

Accordingly, the discussion on EE highlighted the need for educators to be environmentally literate with regard to a variety of concepts and environmental issues. This environmental literacy on the part of educators is necessary if they are to empower learners meaningfully to become responsible citizens who value the environment. The discussions of EE also introduced some of the concepts that are also deemed significant to this study in light of the fact that these concepts enabled the development of an interview schedule designed to realise the aim of the study. These concepts include human population growth, global warming, ozone layer, and sustainable development.

It should be clear from the above that educators have an enormous responsibility in creating an environmentally literate citizenry through environmental education. It is, therefore, essential that the educators themselves be environmentally literate in terms of a wide range of issues, and not merely in terms of those issues which were raised in the discussion of the concept "environmental education". However, the question does arise as to the meaning of the term "environmental literacy". The following discussion will focus on the concept "literacy", and, thereafter, an attempt will be made to reflect on what environmental literacy itself entails.

2.6 LITERACY

The definition of the concept "literacy" evolved over the last century (http://virtualinquiry.com/inquiry/literacy.htm). Various sources regard literacy as "the ability to read and write" (*Encyclopaedia Americana* 1992: 559, Nichols 2007: 121, Shiohata 2009: 66; http://wordnetweb.princeton.edu/perl/webwn?s=literacy). However, "today the definition has been expanded" (ibid.) as a result of the diverse nature of "stakeholders with investments in literacy: politicians, policy makers, program developers, literacy providers or instructors/facilitators, community groups, researchers, learners, and funders" (Fagan 2009: 1).

Literacy can be regarded as the state of being "knowledgeable or educated in a particular field or fields" (http://www.answers.com/topic/literate). A person may, for example, be knowledgeable in the field of medicine, mathematics or environmental science. An individual who is considered to be literate is able to think critically and take meaningful decisions (http://read.clients.intdev.co.za/LiteracyHub/tabid/1955/language/en-US/Default.aspx), and such a person is able "to locate, evaluate, use, and communicate using a wide range of resources including text, visual, audio, and video sources" (ibid.).

Literacy is, indeed, a much broad concept than mere “functional literacy” (Jacobs, Vakalisa & Gawe (2004: 153 - 154), which entails “the ability to read and write” (ibid.). It is because of this very broad nature of literacy that the researcher aligns himself with the following definitions of literacy as presented by UNESCO (2002) and Cardwell (2005), respectively.

UNESCO (2002: 4) states that:

> Literacy is more than the ability to read, write and do arithmetic. It comprises other skills needed for an individual’s full autonomy and capacity to function effectively in a given society. It can range from reading instructions for fertilizers, or medical prescriptions, knowing which bus to catch, keeping account for a small business or operating a computer.

On the other hand, Cardwell (2005: 117) asserts that “literacy is the continuous acquisition of knowledge, understanding, and skills that allow individuals to participate in decisions of contemporary issues, gather valid information when needed, and make informed personal and public decisions”.

The above definitions highlight the broad nature of the concept literacy. It is important to note that literacy, as stated above, enables the individual not only to get by on a daily basis but that it also empowers the individual to “function effectively”. An individual who functions effectively is not only able to read and write but is also empowered to take informed decisions and to participate fully in social development activities. It may, therefore, also be argued that an individual who is considered literate will be able to contribute meaningfully to the well being of the environment.

The above discussion highlights the fact that “literacy” as a phenomenon and as a process is valuable in terms of enabling individuals to participate

meaningfully in their social settings. It is, therefore, in the interests of this study also to highlight the significance of the concept “literacy” in terms of this study.

The significance of the concept of “literacy” to this study

The concept of literacy is, indeed, very important to this study. This importance may be attributed to the fact that this concept is not only linked to the research topic, “An evaluation of the environmental literacy of educators: A case study”, but it also relates to a number of concepts that are pertinent to this study. These concepts include, for example, education, environmental literacy and a host of other terms. At the same time the discussion of the concept “literacy” amplifies the interplay between “education” and “literacy” as illustrated in the assertion that, “reducing illiteracy is one of the major tasks of education around the world” (*Encyclopaedia Americana* 1992: 559).

Based on the above, it may be argued that literacy arises from education. It is, therefore, logical to state that even environmental literacy should and may be developed and promoted through education. Similarly, as a result of the fact that education occurs as a consequence of learning (Nola & Irzik, 2005), it is clear that environmental literacy should be developed and enhanced through the integration of EE into all education and learning activities, as suggested in chapter one of this study. Environmental literacy is the next concept to be reflected upon.

2.7 ENVIRONMENTAL LITERACY

Disinger & Roth (1992 cited in Hsu and Roth 1998: 232) indicate that, “the term ‘environmental literacy’ has been used since the late 1960’s, but it continues to lack precise definition”. This “lack” of “precise definition should, however, not be deemed a crisis because there is a movement towards a common understanding regarding environmental literacy” (ibid.).

Gayford (2002: 101) concurs with this view when stating that, “currently it is apparent that there is no generally agreed definition of environmental literacy but the term has such wide use now that shared understandings are beginning to emerge”. The following include some of the definitions assigned to the concept “environmental literacy”.

According to Joseph (2005: 3):

> Environmental literacy is the capability for the contextual and detailed understanding of an environmental problem in order to enable analysis, evaluation, and ultimately sound and informed decision making at citizen’s level. This means that environmentally literate citizens will have the knowledge, tools, and sensitivity to properly address an environmental problem in their professional capacity and to routinely include the environment as one of the considerations in their work and daily living. Environmental literacy is about practices, activities and feelings grounded in familiarity and sound knowledge. Just as reading becomes second nature to those who are literate, interpreting and acting for the environment ideally would become second nature to the environmentally literate.

On the other hand, Reading (2005: 29) defines environmental literacy as “the capacity to perceive and interpret the relative health of environmental systems and to take appropriate action to maintain, restore or improve the relative health of those systems. In essence, environmental awareness is the state of knowing, while environmental literacy is the state of being.”

The above definitions of both Joseph (2003) and Reading (2005) depict environmental literacy as an action-oriented capacity on the part of individuals to diagnose and to generate solutions to environmental problems. This

problem-solving orientation of environmental literacy is aimed at creating and promoting healthy environments that should enable future generations to live sustainable lifestyles.

It should, however, be noted that, although the above definitions of environmental literacy are acceptable, one is tempted to criticize them for their failure to acknowledge that environmental literacy may be categorized into different levels.

In essence, it is the view of this researcher that environmental literacy encompasses various levels or categories ranging from environmental illiteracy to superlative environmental literacy. It is for this reason that the following definition of Elder (2003) is deemed more appropriate for the purposes of this study. According to Elder (2003: 14 – 15):

> Environmental literacy is an individual's capacity to understand broadly how people and society relate to each other and to natural systems, and how they might do so sustainably; and to act in those insights in daily life …
>
> … **[environmental literacy]** requires awareness, knowledge, skills and attitudes to incorporate appropriate environmental considerations into daily decisions about consumption, lifestyle, career, and civics, and to engage in individual and collective action **[**author's emphasis**]**.

The fundamental point made by Elder (2003) regarding the concept of environmental literacy is that it is a process that "cannot be achieved without all steps of the ladder" (ibid.). The steps of the ladder referred to by Elder (2003: 16) are:

- General **awareness** of the relationship between the environment and human life
- **Knowledge** and understanding of human and natural systems and processes
- **Attitudes** of appreciation and concern for the environment
- Problem solving and critical thinking **skills**, and the
- Capacity for personal and collective **action** and civic participation.

The points made by Elder (2003: 14 – 16), above, highlight some of the views held by the researcher regarding environmental literacy. It is the view of this researcher that environmental literacy is the ability of individuals and social groupings to acknowledge the existence of and interdependence between biotic (living) and abiotic (non-living) factors within the environment as well as a willingness to undertake and engage in appropriate collective social activities to harness both the living and non-living factors within the environment. Environmental literacy, in this regard, is aimed at ascertaining the survival of future generations as well as that of various fauna and floral species. Environmental literacy may be developed through the continuous acquisition of appropriate awareness, knowledge, skills and attitudes pertaining to the interrelationships that exist among biotic and abiotic factors as well as the roles of these factors within various systems in the broader environment. Environmental literacy is, as pointed out by Chacko (2000: 57), “a continuum of competencies ranging from zero competency to very high competency” and it may take different forms and/or levels.

For the purpose of this study the following levels of environmental literacy, as presented by Loubser et al. (2001: 319), will be considered, namely, nominal environmental literacy, functional environmental literacy, and operational environmental literacy.

“Nominal environmental literacy indicates the ability to recognise most of the basic terms used in communicating about the environment and to provide their meanings” (Loubser et al. 2001: 319), while functional environmental literacy indicates a broader knowledge and understanding of the nature and interaction between human social systems and other natural system” (ibid.).

Individuals who possess functional environmental literacy, display skills and knowledge that enable them to identify and distinguish between the different components of the environment. These individuals are able to recognise the interrelationships that exist between the socio-cultural and politico-economic environmental factors. Such individuals are also aware of the role of each environmental component.

“Operational environmental literacy indicates progress beyond functional literacy in both the breadth and depth of understandings and skills” (Loubser et al. 2001: 319). Operational environmental literacy not only encompasses knowing the terms that are used in communicating about environmental issues and the interrelationships existing between various environmental components, but, more importantly, the individual who functions at this level is also aware of the kinds of problems that exist in the environment, and is able to use available resources to participate in the process of finding solutions to these problems. Such an individual is highly innovative and has the capacity to engage other people in discourse and dialogue in the quest to generate lasting solutions to both existing and potential problems within the environment.

It is significant to point out that, in terms of this study; the foregoing levels of environmental literacy constitute some of the criteria that will be used to evaluate the environmental literacy of currently serving educators. This is due to the fact that the above levels are not very complex and are also relatively easy to understand.

The above-mentioned points indicate, very succinctly, the broad nature and significance of environmental literacy. It is thus imperative to highlight, albeit briefly, the importance of the concept of environmental literacy to this study.

The significance of the concept of "environmental literacy" to this study

The term "environmental literacy" is not only central to the title of this study - "An evaluation of environmental literacy of educators: a case study" - but this concept also provided the researcher with an indication of the criteria to be used in the evaluation of the environmental literacy of educators in this study. It is also significant to note that any discussion of this concept highlights the interrelationship between environmental literacy and environmental education in the sense that environmental literacy may be developed by means of EE. For example Disinger (2005: 152) points out that "environmental literacy is generally seen as the bottom-line of environmental education". Similarly, Elder (2003: 15) asserts that "the overarching goal of environmental education is an environmentally literate citizenry". The other concept which merits discussion, as it also forms part of this study, is the concept "currently serving educators".

2.8 CURRENTLY SERVING EDUCATORS

The term "currently" is an adverb which is derived from the adjective "current" which means "belonging to the present time or being in progress now" (http://www.thefreedictionary.com/currently). The term "serving" is a noun, which is linked to the verb "serve" that means, "to carry out duties or be employed (in an organisation)" (Thompson 1995: 1266). The term "serve" also means, "to act in a particular capacity" (http://www.thefreedictionary.com/serve). Peloquin (2000: 227) has the following to say about the term "educator":

> An educator is known as someone who develops and provides learning opportunities to various individuals or groups. A dictionary definition suggests that one who educates is one who develops knowledge, skills, mind or character. An educator may engage in tasks such as helping learners identify needs, implementing educational methods, developing program offerings, and designing strategies to assess the impact of education. The word *educate* stems from a Latin word meaning to lead toward the ideal.

Payne (2008) concurs with Peloquin (2000: 227), above, in respect of the term "educator". According to Payne (2008: 28) "an educator is, therefore, a trainer, whose function is to draw forth persistently, habitually and permanently, the powers of a child, and education is the process which he employs for this purpose".

For the purpose of this study the term "currently serving educators" is used to refer to those educators who, at the time this study was carried out, were employed in a particular institution/school of formal learning. Such educators might or might not have been in possession of a "*teaching qualification*". They may have been temporarily or permanently employed at primary or secondary school. The type of school is insignificant, that is, it may have been a commercial school, a "main-stream school", a school for learners with special abilities, etc. However, it was important that the school be either a primary or secondary school and not an Adult- Based Education and Training Centre or a Further Education and Training (FET) College.

The significance of the concept of "currently serving educators" to this study

The discussion of the concept "*currently serving educators*" is significant in the sense that it provides an indication of the target population for this study. In

other words, the discussion enabled the reader to form a clear picture about the population from which a sample was drawn for this study. The last concept worth reflecting upon as it appears in the title of this study is “evaluation”.

2.9 EVALUATION

The concept “evaluation” has different meanings in different contexts (Knowles & Cole 2008: 494). According to Larnyoh (2008: 42) “evaluation is a process that enables us to form an opinion about the amount, value or quality of something after examining it carefully. It can take many different forms and approaches, according to what is evaluated”.

On the other hand, Hannum, Martineau and Reinelt (2007: 139) regard evaluation as “a process of inquiry for collecting and synthesising information or evidence. There is considerable variation in how information is gathered, analysed, synthesized, and disseminated and there are different purposes for which these things are done.” Hannum et al. (2007: 139) further assert that the process of evaluation “culminates in conclusions about the state of affairs, value, merit, worth, significance, or quality of a program, product, policy, proposal or plan”.

The above definitions of term “evaluation” indicate very clearly that evaluation is a process that involves the collection, analysis and synthesis of information. At the same time the “evaluator”, as it were, should be able to make some judgement regarding his or her impressions of the “element” that was or is evaluated. Various writers also share the preceding views regarding the process of evaluation (Skelding 2000: 67, Worral 2008: 494; http://writing.colostate.edu/guides/process/evaluate/pop2a.cfm). It is also significant to note that, for the process of evaluation to be meaningful and successful, a set of criteria should be outlined so as to reflect the basis of the conclusions drawn regarding the worth or value of the phenomenon or

phenomena under scrutiny (ibid.). The development of a framework or a set of criteria for evaluation is, in fact, “basic to evaluation” (Knowles & Cole 2008: 497 – 498).

In view of the fact that the term “evaluation” may mean different things to different people according to the context in which the term is used, this concept will, therefore, be used in line with the purpose of this study. This study, as mentioned before, is aimed at evaluating the environmental literacy of currently serving educators.

The term “evaluation” in this context refers to the process of gathering information pertaining to the environmental literacy displayed by currently serving educators (as defined above), the analysis of this information and determination of whether this information indicates either one or more of the levels of environmental literacy discussed, as discussed by Loubser et al. (2001), namely, nominal environmental literacy, functional environmental literacy and operational environmental literacy or, for that matter, a deficiency in respect of any of these three levels of environmental literacy. Thus, within the context of this study, the process of evaluation has to do with the collection of the information, the analysis of this information and the passing of judgement on the information with the intent to classify or categorise the information so as to draw informed conclusions regarding the environmental literacy of currently serving educators in this study. The concept evaluation is, therefore, significant to this study.

The significance of the concept of “evaluation” to this study

The concept of evaluation helped the researcher to develop the criteria or framework that serve(s) as the basis for the evaluation of the environmental literacy of respondents in this study.

2.10 CONCLUSION

In this chapter an attempt was made to define and to discuss those concepts that are deemed significant to this study. Firstly, the concept of “literature review” was briefly discussed so as to indicate the significance of and the need for this chapter. The concepts of environment, education, environmental education, literacy, environmental literacy and evaluation were then discussed and the importance of each concept in respect of this study indicated. The discussion of each of these concepts highlights the diversity of opinions regarding each concept. The discussion also assisted in removing ambiguity with regard to the use of each concept in this study and, more importantly, the importance of each concept in regard to this study was amplified.

It should be pointed-out that, although this chapter served to review relevant literature, a literature review is an ongoing process and, therefore, throughout this study reference will be made to existing literature in order to place the discussions and statements made in context. McMillan and Schumacher (1997: 143) reinforce this point stating that qualitative researchers “do a continuing literature review because the exact research focus and questions evolve as the research progresses.”

The above should shed some light on the significance of a literature review in this study. The next chapter will reflect on the methodology and design used in the quest to answer the research question posed in this study.

CHAPTER THREE

RESEARCH METHODOLOGY AND DESIGN

3.1 INTRODUCTION

In the previous chapter some of the concepts that are deemed significant to this study were discussed in order to highlight their significance to the study. The purpose of this chapter is to provide details regarding the research methodology and research design which were adopted in an attempt to answer the research question posed in this study. Firstly, qualitative research will be described with attention to its relevance and importance in respect of this study. The process that was followed in conducting the empirical research in the study will then be detailed.

3.2 QUALITATIVE RESEARCH: ITS RELEVANCE AND IMPORTANCE TO THIS STUDY

Qualitative research is one of various approaches followed in empirical research (Lebeloane 2004: 38). Various writers define qualitative research in different ways (Fouche 2005; Rossman & Rallis 2003; Mouton 2001; McMillan & Schumacher 1997). In this study, as in Saks and Allsop (2007: 24), qualitative research is defined as a research approach that uses real-life situations and experiences in order to analyse, synthesise and give meaning to the events that take place in the environment.

There are various assumptions or key features that set qualitative research apart from other research methods. The following points, therefore, seek to highlight the relevance and significance of the features/assumptions of qualitative research as they pertain to this study:

- In accordance with qualitative research norms, the researcher acted as "the main instrument" (Babbie & Mouton 2001: 270) during the research process. For example, the researcher used "purposeful" sampling in order to identify and to select the respondents who could be of value in answering the research question (Saks & Allsop 2007: 76). Similarly, the data gathering and data analysis processes involved the direct participation of the researcher as the "main instrument" (ibid.).
- The use of qualitative research enabled the researcher to interact personally with the respondents in order to gain information about their personal experiences (Lebeloane 2004: 42) as they (experiences) occur in the respondents' natural settings (Babbie & Mouton 2001: 270) as far as environmental issues are concerned and made it possible for the researcher to obtain in-depth information (Lebeloane 2004: 43) that, in turn, facilitated a meaningful analysis of the environmental literacy of the respondents.
- The qualitative research approach made it possible to detect and to interpret the subjective opinions of respondents (Lebeloane 2004: 43) in the quest to get their meanings (Saks & Allsop 2007; Babbie & Mouton 2001). The researcher was, therefore, able to get a better understanding of the respondents' views during the interaction.
- In line with the aim of this study qualitative research enabled the researcher to explore and to interpret the environmental literacy of the respondents in respect of certain concepts. Accordingly, the researcher was able to interpret the ways in which each respondent constructs his/her view of reality (Babbie & Mouton 2001; Cohen, Manion & Morrison 2000). In essence qualitative research enabled the researcher to gain an understanding of each respondent's conceptualisation of the environmental issues raised in the study.
- In line with qualitative research norms the data analysis was not conducted according to some predetermined hypothesis, as it is the

case with quantitative research (Panaretos 2002: 9). However, in the process of data analysis the researcher was informed by the nature of the data gathered (Saks & Allsop 2007: 80). Essentially the nature of information gathered from the responses determined the ways in which data analysis was carried out by the researcher.

The above are merely some of the aspects that reflect on the relevance and importance of qualitative research to this study. It is, thus, imperative to turn the focus to the manner in which the research was conducted in an attempt to answer the research question posed in this study.

3.3 RESEARCH DESIGN

The following discussion will, therefore, reflect on aspects such as the demarcation of the study, sampling, the techniques used in data gathering, the procedure for data collection and data analysis as well as the reliability and validity of this study.

3.3.1 Demarcation of the study

The South African National Department of Education has, in line with the Constitution of the country, devolved "substantial power in the provincial legislatures and governments to run educational affairs (other than universities and universities of technology), subject to a national policy framework" (Burger 2005: 209). The Provincial Education Departments have, therefore, among other things, the power to demarcate their own areas of operation.

The North West Department of Basic Education is, for administrative and managerial purposes, divided into four districts, namely, Bojanala, Dr Kenneth Kaunda, Dr Segomotsi Mampati and Ngaka Modiri Molema. Each District is

further divided into area offices and these area offices are, in turn, subdivided into circuits.

The area demarcated for this study, namely, the towns of Wolmaransstad and Makwassie, are located within the Maquassie Hills North and the Naledi Circuits, respectively. These circuits fall under the auspices of the Maquassie Hills Area Office, which is part of three area offices that are managed and governed by the Dr Kenneth Kaunda District. Matlosana and Potchefstroom Offices are the other two area offices within the Dr Kenneth Kaunda District (http://www.nwpg.gov.za/education/dkk/areaoffices.htm) [see appendices 2 and 3].

The towns that form part of this study are approximately ten kilometres apart. It must also be mentioned that the name Wolmaransstad is used, for the purpose of convenience, to refer to the "main" town, Wolmaransstad, as well as to the nearby Tsweleleng Township. Similarly, Makwassie, in this study, refers to both the "main" town and to the nearby Township called Lebaleng.

The two towns have a combined total of fourteen schools, which include four high schools, nine primary schools, and one "special" school. According to one administrator who is based at the Maquassie Hills Area Office there was, at the time the study was conducted, a combined total of approximately 379 educators, serving in these schools.

The above-mentioned area was chosen for this study because of budgetary constrains and because of its close proximity to where the researcher himself was based. The following discussion focuses on the way in which the sampling in this study was conducted.

3.3.2 Sampling

Sampling entails “the selection of research participants from an entire population, and involves decisions about which people, settings, events, behaviours, and/or social processes to observe” (Durrheim 2006: 49). In this study the “convenience” or “opportunistic” sampling strategy (McMillan & Schumacher 1997: 169; Kelly 2006: 288) was purposefully adopted (Cohen et al. 2000; Durrheim 2006). This strategy allows for the selection of unique and informative respondents on the basis of both their availability and their accessibility (ibid.).

However, there are certain disadvantages to convenience sampling and, according to McMillan and Schumacher (1997: 169) and Durrheim (2006:50), these disadvantages include the fact that it is not possible to generalise the findings because a sample obtained by means of this approach is not representative to the entire population which is under investigation. Nevertheless, in the context of this study, this strategy was deemed to be appropriate in that the aim of the study is not to generalise the findings but rather to explore and interpret (ibid.), by way of evaluation, the environmental literacy of educators.

A total sample of fifteen respondents was accessed either by the researcher himself or through contact people based at different schools in the demarcated area. The sample size of fifteen was deemed adequate for this study for two main reasons. On the one hand, there is a lack of agreement regarding sample size in qualitative studies. Babbie and Mouton (2001: 287), for example, argue that the “rule of thumb” regarding the sample size is “between five and twenty or twenty five”. On the other hand, the repetitive nature of certain responses obtained during data gathering made it evident that saturation point had been

reached (Kelly 2006: 289), and, thus, there was no need for more respondents beyond the number that had been accessed.

Prior to the process of contacting the respondents, the researcher wrote to and obtained permission from the relevant departmental officials at Maquassie Hills Area Office (see appendices 4 and 5). Similarly, educators were informed about the study and invited to participate by means of a written letter (see appendix 6). The researcher met most of the respondents (nine out of fifteen) in person prior to their participation in the study. These meetings took place as a result of the participants expressing an interest to participate in the study. This initial contact helped to establish a rapport with the respondents (McMillan & Schumacher, 1997). The following criteria were taken into account in the selection of respondents:

- Each respondent had to be employed in an institution of formal learning (school) in the demarcated area.
- The participants had to represent a variety of grades/phases and subjects/learning areas.
- The respondents had to be drawn from both previously disadvantaged ("township schools") and former "model C" (town) schools.
- Neither hierarchical positions in the work place nor gender/sex were taken into account (i.e. respondents were not selected on the basis of either their position in the workplace or their gender/sex). In essence, it did not matter whether the educator was, for example, at post level one or a principal. In other words, respondents were allowed to participate if they had expressed an interest in participating and if they met the selection criteria.
- The age of the respondents and the number of teaching years were also not regarded as relevant in the selection of the sample. In other words,

participants were not chosen on the basis of age or how long they had been in the teaching field at the time the study was conducted.

It must be pointed out that all the respondents in the sample met the abovementioned criteria. The following include some of the characteristics of the sample that indicate that the selection criteria had, indeed, been met.

Each of the fifteen respondents was, at the time of the study, employed at the demarcated area. Ten of the fifteen educators were drawn from four previously disadvantaged schools, that is, three females and two males from one high school, and two females and three males from three primary schools. The other five respondents were drawn from three former model C schools, that is, one male and one female from a high school; and two females and a male from two primary schools. The fact that the sample was drawn from primary schools and high schools also ensured that the various subjects/learning areas/learning programmes, grades and phases were represented.

It must also be stated that each respondent had a minimum of three or more years of educator training and that each one of them had specialised in one or more subjects at tertiary level (that is, at teachers' training college or at university level). For example, there were six educators who had specialised in History, three in Biology, three in Geography, two in Home Economics and one in each of the following - Mathematics, Animal Science, Setswana, English, Plant Science, Physical Science and Agricultural Science. With very few exceptions each respondent was, at the time of the study, teaching the subject(s) for which she/he was trained.

The sample also catered for various post levels/ranks, different age groups as well as varying periods of years of teaching experience. Of the fifteen educators, ten were post-level one educators; three were heads of departments

(H.O.D's), one was a deputy principal and one a principal. With regard to age groups, three of the respondents were aged between 30 and 35 years, three were between 36 and 40 years, five respondents were aged between 41 and 45 years, two educators were aged between 46 and 51 years, while the two oldest respondents were more than 51 years of age. In terms of the number of years spent by each respondent in the teaching field, the average length of teaching experience of the respondents was 17, 5 years. The least experienced educator had taught for two years while the three most experienced educators had each taught for 30 years.

There are, of course, a number of other characteristics that would merit mention in respect of the sample. However, for the purposes of this study, the preceding details should suffice. In addition, it is essential to proceed by reflecting on the processes that were entailed in the data collection in this study. The following discussion focuses on the techniques used for data gathering in the study.

3.3.3 Techniques used in data collection

Initially, the researcher had planned to use only semi-structured and unstructured interviews for data collection. Unfortunately, due to unforeseen circumstances, eight of the fifteen respondents participated in one-on-one interviews with the researcher while the other seven completed interview schedules/questionnaires.

3.3.3.1 Interviews

Semi-structured and unstructured interviews were used as the principal data gathering techniques in this study. The major distinction between these two types of interviews is that the former is characterised by the fact that questions are phrased in an open-ended way, thereby, enabling individuals to respond in

a less restricted way, while the latter provides the interviewer with greater latitude to ask questions in whatever order deemed acceptable, as informed by the interviewee's responses (McMillan & Schumacher 1997: 264 – 265).

The semi-structured and unstructured interviews proved not only to be relevant to the study itself but were also helpful to the interviewer as they enabled the interviewer to keep track of the interview processes and to follow up on any questions in terms of which greater clarity was needed, particularly, when later responses appeared to contradict those responses that had been made earlier during an interview. The interview technique was chosen for the following reasons.

The interview technique is, generally, not only "flexible and adaptable" (McMillan & Schumacher 1997: 263), but the technique makes it possible to clarify any misunderstandings and misinterpretations of questions and/or answers on the part of either the interviewer or the interviewee with ease (ibid.). The other advantage of the interview technique is that it does not require too many respondents (Babbie & Mouton 2001, Kelly 2006). More importantly, the interview approach was deemed appropriate for this study in view of the fact that "an interview can be conducted at an appropriate speed" (Cohen et al. 2000: 129) that may be determined by the respondent. The interview technique also proved to be appropriate because the field of environmental education, that is, the field of this study, is fairly broad.

One-on-one interviews between the researcher and eight of those respondents who were able to participate in the face-to-face interaction were arranged and agreed upon in terms of the schedules/programmes of each respondent. The researcher used an interview schedule/questionnaire (Ramroop 2004, Kelly, 2006; Bryman & Bell, 2007) to facilitate the process. This interview schedule/questionnaire had been developed and piloted using a sub-sample

(Kanjee 2006: 490) of three educators from one school within the demarcated area. The pilot process enabled the researcher to refine the questionnaire further (Subramaniam & Padalkar 2009: 398) and to eliminate non-essential items. As agreed upon by each of the interviewees the interviews were audio taped, while the interviewer also took down field notes during the data collection process.

The interviewer posed all the questions in English throughout the interview process. However, in view of the fact that three of the interviewees felt more comfortable when using languages of their choice and not necessarily the language of the researcher (Le Grange, 2000; Bryman and Bell, 2007) these three interviewees responded in their primary (home) languages - two in SeTswana and one in SeSotho. Language ambiguities were addressed as and when they arose during the interaction. The questions were, as far as possible, couched in the same form in which they had been written on the interview schedule. However, the responses by the interviewees often resulted in the interviewer having to rearrange the sequence of questions. Nevertheless, the researcher did succeed in maintaining focus and in adhering to the interview schedule/questionnaire.

Apart from allowing respondents to use the language of their choice, the researcher also used pictures (see appendix 9) because pictures do not only help interviewees to feel comfortable and to discuss issues in greater detail (Bryman and Bell 2007: 483) but they also help to “speed up the process of establishing field relationships” (Le Grange 2000: 169). Each of the interviews lasted, on average, between fifty minutes and one hour and fifteen minutes. At times the issues could not be exhausted at a go, and this necessitated rescheduling of some of the interviews.

3.3.3.2 Completion of the interview schedules/questionnaires

As a result of their "tight schedules" and being "too busy" it was not possible for seven of the fifteen respondents to interact on a one-on-one basis in an interview situation with the researcher. Instead, these respondents opted to fill in the interview schedules at their own convenience. The notion of respondents completing the interview schedules by themselves and at their own convenience is supported by various researchers (Akwa 1994: 33, McColl and Fayers 2005: 131, Wilson and Sapsford 2006: 104; Raj, Walters & Rashid 2009: 91). For example, Wilson & Sapsford (2006: 104) argue that an interview schedule "is administered by an interviewer or self-completion by the respondent". The questions in these interview schedules were presented as they had been presented to the interviewees, that is, they were not distorted. However, the one exception was that the researcher refined the interview schedule/questionnaire by creating columns and lines so as to enable the respondents to write down their responses (see appendix 8). Of the seven respondents who could not interact, one-on-one in an interview situation interviews with the researcher, five were from the former "model C" schools while two were from township schools.

The researcher made copies of the interview schedule/questionnaire, and he delivered these copies to the respondents or to the contact persons at each of the respondent's school personally. In order to ensure consistency, the researcher instructed these respondents to use the languages of their choice. Five of the questionnaires were completed in Afrikaans while the other two were completed in English. All seven questionnaires were collected within five days of delivery.

Apart from the interview schedule/questionnaire each respondent was requested to complete a respondent profile (herewith attached as appendix 7).

This respondent's profile was intended to solicit biographical information pertaining to each respondent. This biographical information proved to be significant during the data analysis process because it enabled the researcher to compare the responses in terms of the respondents' backgrounds.

The tape-recorded interviews were fully transcribed. In view of the fact that some of the interviewees/respondents had used languages other than English, it was necessary that a process of translation accompany this transcription. The field notes were also used for reference purposes during the transcriptions so as to fill in any gaps and to correct any contradictions between the audio recorded interactions and the field notes. The interview process was, as far as possible, carried out in tandem with the data analysis (discussed below).

3.3.4 Procedure used in data analysis

The data was analysed both qualitatively and quantitatively. Construct conceptualisation was used to analyse and to interpret the interviews in order to determine and to reflect on the way in which the respondents "think, understand or make sense of experiences, phenomena or particular relationships" (Robertson1993: 98). This process of construct conceptualisation was carried out by categorising each response or set of condensed responses given by the respondents to the questions pertaining to each of the areas covered by the interview schedule/questionnaire in terms of four evaluation criteria which had been decided upon by the researcher. It is necessary to state that the four criteria that were used for evaluating the environmental literacy of each respondent with regard to each of the six concepts/issues covered in the study were adapted from Loubser et al. (2001: 319) and can be briefly summarised as indicated below.

In terms of a specific concept a judgement was made according to whether the response or set of responses elicited revealed no environmental literacy,

nominal environmental literacy, functional environmental literacy and/or operational environmental literacy. In respect of this study each of the levels entails the following:

- **No environmental literacy** – the respondent appeared to have no knowledge of the concept(s) discussed.
- **Nominal environmental literacy** – the response(s) suggested that the respondent was able to recognise a particular concept and to provide the basic meaning of the concept.
- **Functional environmental literacy** – the respondent manifested an extremely broad knowledge of the concept and was able to distinguish the particular concept from, or relate it to, other environmental concepts/factors. In addition, the respondent was able to mention the function(s) and/or effect(s) of a particular phenomenon to the environment or to the factors (the living and non-living organisms) found in the environment.
- **Operational environmental literacy** – the respondent indicated progress beyond functional literacy both in terms of depth of understanding and skills, i.e. he/she was able not only to discourse about environmental issues and/or problems but also demonstrated an ability to provide/suggest solutions to challenges facing the environment, and/or was also able to present and/or even defend an argument in respect of his/her beliefs, attitudes or values in relation to an environmental concept/issue.

It must be indicated that, in cases where a respondent who had had to fill in an interview schedule/questionnaire had left a blank space/had not respond to a particular question, such a reaction was deemed as a “no response” because there was no tangible way of verifying the implication(s) concerning such a “response”. On the other hand, during the interviews verbal statements were

used in conjunction with non-verbal communication to ascertain the "no response" on the part of interviewees.

The above-mentioned process pertaining to data analysis indicates, in essence, that the criteria used for evaluating the environmental literacy of respondents in the study also helped in the coding and categorising of the data in the study. This was carried out in line with the notion that "concepts are the basic unit of analysis … statements made by subjects may be condensed into categories and classified according to a particular mode of classification/category decided upon by the researcher … categories must be developed and related" (Corbin & Strauss 1990: 7).

Apart from the use of the abovementioned criteria for data analysis, the researcher, for the sake of confidentiality, also used the letters of alphabet A to H to differentiate between the interviewees. On the other hand, those respondents who had completed the interview schedule/questionnaire were arranged and presented as Q1 to Q7. Where he deemed it necessary the researcher also used tables to summarise some of the findings of the study.

Reliability and validity are significant in the process of research and, accordingly, it is essential to reflect on their application in this study.

3.3.5 Reliability and validity

According to Cohen et al. (2000: 117) reliability is "essentially a synonym for consistency and replicability over time, over instruments and over groups of respondents. It is concerned with precision and accuracy; some features, e.g. height, can be measured precisely, whilst others, e.g. musical ability, cannot." Similarly, Van der Riet and Durrheim (2006: 92) state that "reliability is the degree to which the results are repeatable". In essence, reliability entails that

the approaches used to gain information in a particular setting can be used with similar results if used under the same conditions at a later stage.

On the other hand, validity refers to “the degrees to which scientific explanations of phenomena match the realities of the world” (McMillan & Schumacher 1997: 235) or the extent “to which the research conclusions are sound” (Van der Riet & Durrheim 2006: 90)”. In other words validity means that the results/findings of a research process are believable, true or logical and sound.

Unlike validity, reliability is a problematic phenomenon in qualitative or field research. For example, Babbie (2001: 309) argues that, “compared with surveys and experiments, field research measurements generally have more validity but less reliability.” Summers et al. (2001: 38) concur with this viewpoint when they assert that “the advantage of interviews is that they can provide in depth information of high validity”.

On the basis of the above-mentioned points, one may safely argue that both reliability and validity are extremely important factors in the research process and, hence, they are reflected upon in this study. However, in the context of this study validity and dependability (not reliability) were considered. This resulted from the fact that this study is based on interpretivism, and interpretive researchers “do not assume that they are investigating a stable and unchanging reality and therefore do not expect to find the same results repeatedly” (Van der Riet & Durrheim 2006: 93). Interpretive researchers propose that, instead of being presented as “reliable”; findings should be dependable (ibid). In this study dependability is achieved, as Van der Riet & Durrheim (2006: 93 - 94) suggest, by “providing the reader with frank statement of methods used to collect and analyse data”. In terms of validity, this study relied on the suggestions of McMillan and Schumacher (1997: 404 – 405), that

is, the use of participants' language in the presentation of findings as well as the verification of self-contradictory statements.

The above points are, certainly, not the sole aspects of reliability and validity. However, they should; in the context and interest of this study, suffice.

3.4 CONCLUSION

The research process requires that a researcher have a clearly thought out and articulated blueprint in order to conduct a study successfully (Babbie & Mouton 2001; Bryman & Bell 2007), and, hence the need for this chapter.

In this chapter an attempt was made to reflect on the research methodology and design used for the data collection and data analysis processes in this study. First, the relevance and importance of qualitative research to this study were highlighted. This was followed by details in respect of the way in which the data was collected and analysed. Reliability and validity were also discussed, albeit, briefly.

In the next chapter the findings of the study will be presented and discussed.

CHAPTER FOUR

PRESENTATION AND DISCUSSION OF THE FINDINGS

4.1 INTRODUCTION

In chapter three the research methodology and design used in this study were discussed. The purpose of this chapter is, therefore, to present and discuss the findings made as a result of the activities referred to in chapter three.

The following approach will be used in the presentation and discussion of the findings made in this study. The researcher will:

- Indicate the basic aspects/questions that were covered in the investigation concerning a particular concept/issue,
- Disclose the findings in respect of each concept/issue and elaborate upon these findings using both the statements made by the respondents and tables where necessary,
- Present a brief discussion regarding the implications of the findings in respect of each concept/issue, and indicate the level of environmental literacy of the respondents with regard to each concept/issue.

4.2 FINDINGS AND DISCUSSION

4.2.1 Pollution

In the study the environmental literacy of educators in respect of the issue of pollution was investigated by posing the following key questions:

- How would you define the concept “pollution” in your own words?
- May you, please, mention the other types/forms of pollution, other than air pollution?

- What impact, if any, does pollution have on plants, animals and human beings?
- What, in you view, causes pollution?
- What do you think should be done to deal with/ address the problem of pollution should the need to do so arise?

4.2.1.1. The findings made with regard to pollution

(a) Definition of the concept of pollution

All fifteen respondents were asked to define the concept pollution. Each respondent was able to provide a definition that was deemed acceptable because it covered, partly or completely, the essence of what pollution entails. For example, words such as; “dirtyfying” (RespondentQ1), “despoliation” (Respondent Q4); “impurification”(Educators E & G) were used in describing what happens to the air (Educators Q1, Q3, Q4, Q6), water (Educators C, D, F, G, Q6 & Q7), land (Educators B, C, D, G, Q3 & Q4), and the environment (Educators D, E, G & Q2) when pollution occurs.

(b) Types/forms of pollution

Apart from air pollution, which had been used as a point of departure so as to stimulate interaction between the researcher and the respondents, three other forms of pollution were identified/mentioned by the respondents, namely: land (13 respondents), water (12 respondents) and noise (2 respondents) pollution. Each respondent was, therefore, aware that, apart from air pollution there are other forms/types of pollution.

(c) The impact of pollution on various factors

Each of the fifteen respondents was able to mention one or more of the effects that each of the different forms of pollution has on factors such as human

beings, animals, plants and the general well being of the environment. The following conversations between the researcher and two of the respondents illustrate some of the effects of pollution.

Interviewer: Now, this unwanted rubbish in the air, in water and on land. Do you think it has any particular impact on the environment?

Educator C: It does in some way.

Interviewer: Can you elaborate?

Educator C: Let us take air pollution for example … er I'm made to believe …er … if it does n't cause harm to human beings, it does directly or indirectly to the ozone layer.

Interviewer: In which way would you say it harms human beings?

Educator C: Causes TB, … other airborne diseases … and these mine dumps … the dust thereof causes asbestos sickness.

Apart from its negative impact on human beings, pollution also has negative effects on other factors. Teacher A highlights this point in his interaction with the researcher.

Interviewer: Mmm … besides the negative effect that air pollution has on human beings do, you think it has any particular effect on other forms of life, besides human life?

Educator A: Besides humans, I should think there are other organisms, obviously, that need to inhale fresh air as humans. For instance, all the birds

that fly in an atmosphere…they also have to go through that air pollution. I should think it also causes some problems in the lives of those birds and the animals as well - so it's not only dangerous or problematic to human beings, even to animals.

Apart from air pollution, the respondents also mentioned several other effects that may be attributed to land, water or noise pollution. According to the respondents, the effects of land pollution include the following: dumped materials such as razors from clinics which might cause injuries to children (Educator E), animals may have their "alimentary canals blocked" if they consume dumped material (Educator E), and dumped material might also lead to "plants not growing well" (Educator Q6) because of "land fertility that is reduced" (Educators C & Q1) by land pollution.

According to the respondents, the effects of water pollution include the following: "animals die"(Educators C, Q3, Q6 & Q7), "plants die" (Educators E, G, Q1, Q2, Q3, Q6 & Q7), "people become sick due to diseases" such as cholera (Educators F, G, Q1, Q2, Q3, Q4, Q5 & Q7), and oil spilling into the sea reduces the oxygen supply to animals (Educators D, Q4 & Q5). On the other hand, according to those two respondents who referred to the phenomenon, the effects of noise pollution include the following: "animals become wild" (Educator Q5), humans are "inconvenienced" (Educator Q2), they become "restless" (Educator Q2) and they may even develop "hearing problems" (Educator Q5). Both educators stated that noise pollution has no effects on plants.

(d) Causes of pollution

Various causes of each of the forms/types of pollution identified by each of the fifteen respondents were mentioned. These include, among others, "smoke from industries" (Educators D, E, G, H, Q1, Q2, Q3, Q4, Q5 & Q7), "cars"

(Respondents E, G, Q1, Q2, Q3, Q4, Q5 Q6 & Q7),"chemicals from industry"(Educator B), and "overpopulation"(Respondent F), all these were cited as sources of air pollution. Twelve of the thirteen respondents who referred to land pollution mentioned dumping/littering as the main source of land pollution. They cited, for example, "waste from mines" (Educators Q1 & Q2), and "chemicals used in factories and agriculture" (Educator Q6) as some of the factors responsible for land pollution.

As far as water pollution was concerned, factors such as "industrial pollution" (Educators Q1, Q2, Q3, Q5 & Q6), oil spills from sea tankers (Educators D, Q1, Q2, Q6 & Q7), and municipalities (Respondent Q3) were cited as some of the causes of this form of pollution. In respect of noise pollution, both respondents Q2 and Q5 mentioned the strong, loud noise caused by different forms of transport (Educator Q5), factories (Educator Q2) and constructions (Educator Q2) as the main source of noise pollution.

(e) Solutions to the problems of pollution

Each of the respondents was able to offer one or more suggestions on ways in which to deal with each of the four forms/types of pollution referred to in this discussion. As far as air pollution was concerned, for example, the respondents indicated the need for "global cooperation" (Educator Q5), "pollution management policies" (Educators C, Q1 & Q5), and pleas to "industries to minimise emissions" (Educators A & D) as possible solutions to this form of pollution.

In terms of dealing with land pollution, the respondents suggested, *inter alia*, that "authorities" "improve waste management" (Educators Q1 & Q2), by making "dustbins available"(Respondents E, G & Q7), and by creating "special places for dumping" (Educators A, C & H). They also mentioned the need to "educate people" (Educators C, E, F, H & Q6) about land pollution. As far as

water pollution was concerned, respondents suggested, *inter alia*, "better services by municipalities" (Educator Q1), cooperation between police and municipalities to intensify legislation (Educator Q3), and "improving waste management" (Educator Q2) as possible solutions to this form of pollution. In respect of noise pollution, Respondent Q2 felt that there should be meaningful legislation against noise pollution while Educator Q5 could think of "no solution" to the problem of noise pollution.

In concluding this presentation of the findings regarding pollution, it is also necessary to mention the following about the views of the respondents with regard to some of the possible ways of dealing with "unwanted" tins/cans and tyres other than dumping them/throwing them away. The respondents suggested, among other things, that cans be collected and sold to recyclers (Respondents D, F, G, H, Q1 & Q3); and that old tin/cans could also be used in order to make ornaments to be sold to tourists (Educator Q4). As far as "unwanted" tyres were concerned the respondents suggested, among other things, that they be collected and used to make food plates for animals (Educators Q3), and as toys (Educator E) such as swings (Educators Q1 & Q7) in children's playgrounds (Educator Q4). According to respondent Q6 "unwanted" tyres could also be used for "decoration as flower holders" and for making doormats.

4.2.1.2 A discussion of the findings in respect of the concept of pollution

The above findings suggest that each respondent had an obvious grasp of the concept of pollution. This conclusion is based on the fact that each one of them was able to

- Provide a definition of the concept pollution

- Mention one or more forms/types of pollution other than air pollution (air pollution was used as a point of departure in the discussion of the concept of pollution)
- Mention/indicate some of the causes of pollution
- Mention/indicate some of the effects of pollution
- Suggest solutions to the problem of pollution.

In terms of the criteria laid down in this study for the evaluation of the environmental literacy of the respondents, the above findings suggest that each of the respondents in this sample demonstrated an operational environmental literacy in respect of the concept of pollution. Unfortunately, the literature search revealed no studies that could be used to compare/contrast with the findings made in this study. In essence no studies that dealt with the evaluation of the environmental literacy of currently serving educators in respect of pollution could be found. Similarly, there was no need to differentiate between the different categories of respondents in terms of the biographical information provided because all the respondents were, virtually, on a par in terms of their understanding of the issues raised pertaining to pollution.

The next section will contain a presentation and discussion of the findings in respect of global warming.

4.2.2 Global warming

The following questions were raised with regard to the investigation and evaluation of educator environmental literacy in terms of global warming:

- What is “global warming”?
- What, in your opinion, causes global warming?
- What impact, if any, does global warming have on plants, animals and human beings?

- Should you believe there is a need, what do you think should be done in order to address the problem of global warming?

4.2.2.1. The findings in respect of global warming

Unlike the findings in respect of pollution, which suggested that the respondents in the sample manifested an operational environmental literacy with regard to pollution, the findings in respect of global warming suggest various levels of environmental literacy in this regard. In order to provide a somewhat clearer illustration of the findings a table, accompanied by some elaboration, is presented below.

Table 4.1 Findings on global warming

Respondent	Definition of global warming	Causes of global warming	Effects of global warming	Ideas on dealing with global warming	Level of environmental literacy
A	No	No	No	No	NOEL
B	No	No	No	No	NOEL
C	No	No	No	No	NOEL
D	No	No	No	No	NOEL
E	Yes	No	Yes	No	FUEL
F	No	No	No	No	NOEL
G	Yes	No	No	No	NEL
H	No	No	No	No	NOEL
Q1	Yes	Yes	Yes	Yes	OPEL
Q2	Yes	Yes	Yes	Yes	OPEL
Q3	Yes	Yes	Yes	Yes	OPEL
Q4	Yes	Yes	Yes	Yes	OPEL
Q5	Yes	Yes	Yes	Yes	OPEL
Q6	Yes	Yes	Yes	Yes	OPEL
Q7	Yes	Yes	Yes	Yes	OPEL

KEY TO TABLE 4.1: "**No**" suggests that the respondent concerned had no knowledge/understanding regarding the aspect/concept/issue indicated while "**Yes,**" suggests a knowledge/understanding of the aspect/concept/issue. The acronym "**NOEL**" stands for No Environmental Literacy, "**FUEL**" stands for Functional Environmental Literacy, "**NEL**" stands for Nominal Environmental Literacy, while "**OPEL**" stands for Operational Environmental Literacy.

The following points need to be mentioned with regard to the findings as illustrated in the table above.

(a) Definition of the concept of global warming

Six (40%) respondents (A, B, C, D, F & H), as indicated by the negative "No" in table 4.1, were not able to define the concept global warming. Four of these respondents indicated that they had no idea what global warming is while the other two gave responses that suggested a lack of knowledge in this regard as is suggested by the following conversation:

Interviewer: What do you think is the meaning of the concept global warming?

Educator B: According to my understanding, I think when you are talking about global warming you are talking about floods.

Interviewer: What about floods?

Educator B: Er … sometimes when it rains … er when rain rains heavily …er.. you can find out that there is strong wind in the whole process, and then it ended up being the floods. Why, because … er … the strong air makes the building to rattle, and then not to be stable … so sometimes you find out that …

er … the strong wind makes the house roofs to fall down. So I think that is what we call floods.

Interviewer: So, in essence, would you say the concept of floods is synonymous with, or a synonym for, global warming?

Educator B: I think so.

Clearly, the respondent in the above interaction with the researcher had no idea concerning the concept of global warming, while Educator C seemed not to be too sure of his response although he did appear to have an idea that pollutants cause global climatic changes. This is indicated in his following response to the question that required him to define global warming.

Educator C: That would mean that because of various pollutants … cause climatic patterns to change … causing monsoons that were not there … I am not sure but I believe that one way or the other it was caused by pollutants (*his non-verbal language as depicted in his lowered voice and sagging shoulder suggested uncertainty*).

Interviewer: What, in your understanding, really happens to climatic patterns?

Educator C: (*In a lowered voice, still sounding unsure*) They change not for the better but for the worse … er … you see … let's take South Africa, for example, yourself and myself, … monsoons that fall late in September… these are caused by climatic changes.

It should be evident from the above conversation that, although Educator C did have some idea about the effect of pollutants on climate change, it is not clear from his answer that the climate changes referred to in this regard are the global increases in temperatures. On the other hand, nine (60%) respondents

(E, G, Q1, Q2, Q3, Q4, Q5, Q6 & Q7), as indicated by "Yes" in table 4.1, were able to demonstrate either a partial or a complete understanding of the concept of global warming. They indicated, for example, that global warming is *"when the earth becomes too hot*" (Respondent G), or that global warming is climatic change due to the emissions of greenhouse gases (Respondent Q1).

The views of the respondents regarding the causes of global warming will now be presented.

(b) The causes of global warming

As indicated by the "No" in table 4.1, eight (53, 33%) respondents (A, B, C, D, E, F, G & H) out of the fifteen respondents demonstrated no environmental literacy in respect of the causes of global warming. On the other hand, as reflected by the "Yes" in table 4.1, seven (46, 67%) respondents (Q1, Q2, Q3, Q4, Q5, Q6 & Q7), were able to mention some relevant factors, which they believed to be the causes of global warming. For example, global warming is caused by the pollution of the atmosphere (Educator Q3, Q4 and Q5) and this pollution is due to "the emission of green house gases" (Educators Q4 and Q7) resulting in "more heat being trapped" (Educator Q4). Factories emit "too much carbon dioxide" (Educator Q1 & Q2) and "other deadly gases" (Educator Q1). Air pollution (Educator Q6) was not the only factor deemed responsible for global warming and even "poor waste management" (Educator Q6) was cited as the cause of global warming.

The responses by the respondents of this study suggest that there are various effects of global warming on earth. These are indicated below.

(c) The effects of global warming

As indicated by the "No" in table 4.1, seven (46, 67%) educators (A, B, C, D, F, G & H), out of the fifteen respondents lacked environmental literacy in respect of the effects of global warming. On the other hand, as reflected by the "Yes" in table 4.1, eight (53, 33%) educators (E, Q1, Q2, Q3, Q4, Q5, Q6 & Q7), provided a number of valid responses about the effects of global warming.

The effects of global warming include*, inter alia*, the deaths of animals and/or plant species (Respondents Q1, Q4, Q5 & Q7), and animals losing their natural habitats (Respondent Q2) due to pastureland being minimised or lost (Educator Q1). Global warming also melts the ice in the "arctic parts of the world" (Educators Q2, Q4 & Q7) resulting in the "rise in sea level" (Educator Q7). Human health (Educator Q1) is severely affected as a result of "pests and plagues" (Educator Q1), and serious "economic loses" (Educators Q4 & Q5) that cause "poverty" (Educator Q1).

Some of the respondents were able to provide suggestions on ways in which to deal with global warming.

(d) Suggestions on ways in which to deal with global warming

Seven (46, 67%) of the respondents (Q1 to Q7) were able to offer some suggestions in respect of possible solutions to deal with global warming while eight (53, 33%) respondents (A to H) were not able to offer any solutions. The following meaningful suggestions were offered, among others, "factories should stop disposing smoke in the air"(Educator Q7) so as to limit the emission of greenhouse gases (Educator Q4). These could come about if legislation were passed on the emission of greenhouse gases (Educator Q5), greater awareness and cooperation (Educator Q5), and people using sources of energy that emit fewer gases (Educator Q4). On the other hand, respondent Q1

suggested that people should, in her own words, "*Dink Groen*" ("*Think Green*") because "ecological integration and sustainable development must become fundamentals" (Educator Q1).

The following points merit mentioning in respect of the findings on global warming.

4.2.2.2 Discussion of findings in respect of global warming

The findings on global warming suggest that seven respondents, namely, Educators Q1 to Q7, demonstrated an extensive understanding of the concept of global warming. Accordingly, as indicated by "OPEL" in table 4.1, it may be said that these respondents demonstrated an operational environmental literacy in respect of the concept of global warming. This assertion is based on the criteria which were used to evaluate the environmental literacy of the respondents in the sample. On the other hand, as denoted by "FUEL" in table 4.1, Respondent E demonstrated a functional environmental literacy level with regard to the concept of global warming while, as reflected by "NEL" in table 4.1, Respondent G displayed signs of nominal environmental literacy in respect of global warming. It may, thus, be concluded that the majority of the respondents (nine educators) in this sample did have some level of environmental literacy in respect of global warming.

It also needs to be stated that the seven educators who demonstrated operational environmental literacy in respect of the concept of global warming were not interviewees, but had completed an interview schedule/questionnaire. Five of these respondents, namely, Educators Q1, Q2, Q3, Q4 & Q5, were, at the time the study was conducted, based at former "model C" schools. This should be a matter of concern because it suggests that respondents from "previously disadvantaged" township schools had, in the main, no

environmental literacy in respect of a significant and profound environmental issue such as global warming.

However, these findings also illustrate an interesting point when one examines the study conducted by Summers, Kruger, Childs & Mant (2000) in the United Kingdom (UK). There are numerous responses in both the UK study by Summers et al. 2000 and this study that indicate a similar understanding of the concept of global warming between some of the participants in the two studies (the UK sample and the sample of this study). For example, in Summers et al. (2000: 304 – 305) some of the respondents acknowledged that global warming causes a "rise in mean global temperature", and that this change in climate "will adversely affect human societies"; "the fear that the polar (ice) caps are going to melt… sea-levels are going to increase" as a result of the emissions of carbon dioxide caused by human beings which, in turn, result in the phenomenon of global warming. These common views held by some of the respondents in the two studies are indicative of both the significance of global warming as a phenomenon that has a profound impact on the environment, and the need to highlighting its existence through environmental education.

The following section focuses on the presentation and discussion of the findings with regard to the ozone layer.

4.2.3 The ozone layer

The following key questions were formulated in order to determine and evaluate the environmental literacy of educators with regard to the ozone layer.

- What is the ozone layer?
- What is the role/ function of the ozone layer?
- If necessary, what do you think should be done in order to protect the ozone layer?

4.2.3.1. Findings regarding the ozone layer

The findings regarding the ozone layer, as in the case of the findings concerning global warming, suggest that the respondents in the sample demonstrated varying levels of environmental literacy. It is, therefore, essential also to present these findings with the aid of a table and certain explanations which should facilitate an understanding of the findings.

Table 4.2 Findings in respect of the ozone layer

Respondent	Definition of the ozone layer	Function(s) of the ozone layer	Measures to prevent the destruction of the ozone layer	Environmental literacy level
A	No	No	No	NOEL
B	Yes	Yes	No	FUEL
C	No	No	No	NOEL
D	No	No	No	NOEL
E	No	No	No	NOEL
F	Yes	No	No	NEL
G	Yes	No	No	NEL
H	No	No	No	NOEL
Q1	Yes	Yes	Yes	OPEL
Q2	Yes	Yes	NR	FUEL
Q3	Yes	Yes	Yes	OPEL
Q4	Yes	Yes	Yes	OPEL
Q5	Yes	Yes	NR	FUEL
Q6	No	NR	NR	NOEL
Q7	No	Yes	NR	FUEL

KEY TO TABLE 4.2: The concepts **"No"**, **"Yes"**, **"NOEL"**, **"FUEL"** and **"OPEL"** have the same meanings as reflected in **TABLE 4.1** while "**NR**" stands for No Response provided by respondent.

(a) The definition of the ozone layer

Of the fifteen respondents, seven (46,67%) educators (A, C, D, E, H, Q6 & Q7), as indicated by "No" in table 4.2, were not aware of what the ozone layer is – five of these by admission and the other two through the responses they provided. Eight (53, 33%) of the respondents (B, F, G, Q1, Q2, Q3, Q4 & Q5), as indicated by the "Yes" in table 4.2, provided responses that indicated that they did have some idea of what the ozone layer is. The following include some of the responses in respect of a definition of the term ozone layer.

According to Respondent F, the ozone layer is one of the layers of the atmosphere, while Respondent B referred to the ozone layer as "the layer of air". This layer of air, according to Respondents Q3 & Q4, is composed of oxygen, and this oxygen is compressed and consists of three oxygen atoms in its molecules (Respondent Q1). These definitions were deemed acceptable because they indicate that the respondents had a clear idea of what comprises the ozone layer.

On the other hand, the responses that were provided by Respondents Q6 & Q7 suggested that they had no idea of what the ozone layer is. According to respondent Q6, the ozone is "a layer of polluted air in the atmosphere that disturbs sunlight/heat". Respondent Q7 believed that it is the "layer in the atmosphere that stops gases going into space and separating the sun's rays so that they don't reflect directly on the earth". Apart from the definitions that were provided by the respondents, the respondents also made several points regarding the functions of the ozone layer - see below.

(b) The function(s) of the ozone layer

Of the fifteen respondents, seven (46, 67%) respondents (A, C, D, E, F, G & H) indicated that they did not know anything concerning the role of the ozone while Respondent Q6 (6, 67%), as indicated by "NR" in table 4.2, did not respond to the question on the function of the ozone layer. However, the other seven (46, 67%) respondents (B, Q1, Q2, Q3, Q4, Q5 & Q7) provided responses that did demonstrate an understanding of the function(s) of the ozone layer.

Some of the respondents used different, but related, words or phrases to indicate the role of the ozone layer with regard to ultra-violet sunrays. For example, according to Respondents Q7 "it protects the earth against ultra-violet rays". On the other hand, Respondent Q5 stated that "it minimises the amount of ultra-violet rays that reach the earth". According to Respondent B the ozone "is helping us from the sun … of which the sun shouldn't heat us direct".

The response of Educator B was accepted as pertinent to the function of the ozone layer despite the fact that this response did not provide a definite indication of what the ozone layer does. It is, however, necessary to point out that, throughout the interaction with Respondents B, the researcher could not help but notice that this respondent did have some linguistic shortcomings regarding English. The acceptance of the answer of Respondent B concerning the function of the ozone layer emanated from her recognition that the ozone layer is "the layer of air".

(c) Suggestions about the protection of the ozone layer

Of the fifteen respondents, as suggested by the "No" in table 4.2, eight (53, 33%) respondents (A, B, C, D, E, F, G & H), indicated that they had no ideas on how the ozone layer could be protected. Four (26, 67%) educators (Q2, Q5, Q6 & Q7) did not respond to the question (as indicated by the "NR" in table

4.2). As indicated by the Yes" in table 4.2, three (20%) respondents (Q1, Q3 & Q4) provided some meaningful responses in respect of possible measures to prevent or to minimise the destruction of the ozone layer.

According to Respondent Q1 it may be possible to prevent the destruction of the ozone layer by minimising pollution. This would require factories to minimise emissions (Educator Q3), and the combating of the general use of CFCs (Educator Q4).

4.2.3.2 Discussion of findings regarding the ozone layer

The findings on the ozone layer indicate that three (20%) respondents only, namely, Educators Q1, Q3 & Q4, demonstrated a more meaningful grasp of the concept of the "ozone layer", as indicated by "OPEL" in Table 4.2, these three respondents were the only respondents who met the criteria presented in this study in respect of operational environmental literacy as they were able not only to indulge in discourse about the concept of the ozone layer but they were also able to suggest solutions regarding the protection of the ozone layer. On the other hand, four (26,67%) respondents, namely, Educators B, Q2, Q5 & Q7 demonstrated functional environmental literacy (denoted by "FUEL" in Table 4.2) in that they were able to provide the function(s) of the ozone layer while Respondent Q2 was also able to indicate the effects of CFCs on the ozone layer. Respondents F & G (13, 33%) functioned at nominal environmental literacy level (indicated as "NEL" in table 4.2) in respect of the concept of the ozone layer. Six (40%) respondents (A, C, D, E, H & Q6) demonstrated an absence of environmental literacy (indicated by "NOEL" in table 4.2) regarding the concept of the "ozone layer".

The findings regarding the environmental literacy of the respondents in respect of the ozone layer are, in the opinion of the researcher, a matter of concern. This is as a result of the fact that very few respondents (20% of the sample

only) were able to demonstrate operational environmental literacy in respect of an extremely significant environmental issue, the ozone layer. Similarly, not a single respondent from the so-called "previously disadvantaged" township schools was able to offer any solutions to the problems affecting the ozone layer. These findings also have negative implications for the promotion of environmental literacy with regard to the creation of awareness insofar as the ozone layer is concerned.

As stated in chapter one, the absence of pertinent literature in this regard meant that, unfortunately, it was not possible to compare/contrast these findings with findings in any other study. The only study that may be used to compare/contrast the findings of this study was conducted in Liverpool in the United Kingdom (UK) and it involved "first and final year students on Primary Bachelor of Education courses at an Institute of Higher Education"(Boyes, Chambers & Stanisstreet 1995: 134). This study focused on the "trainee primary teachers' ideas about the ozone layer". The findings of these three researchers in the UK pertaining to the ideas of the "trainee teachers" about the ozone layer indicated that the student teachers in this sample demonstrated a high level of environmental literacy regarding the ozone layer in that "most students seem well informed about the nature of the ozone layer" (Boyes et al. 1995: 142). This conclusion drawn by the three Liverpool researchers could be attributed to the fact that the members of their sample seemed to be in agreement about certain key issues regarding the ozone layer. For example, "most affirmed it was high in the atmosphere (92%, statement 12) … affirming the idea that it was gaseous (89%, statement 1) … almost all of the students knew that the ozone layer protects the earth from solar UV radiation (97%, statement 4)…. almost all of the students associated chlorofluorocarbons (CFCs) with ozone layer damage (99%, statement 16)" (Boyes et al.1995: 136 - 137).

In drawing a conclusion from the findings on the ozone layer it must be stated that, although the sample used by the above three researchers appeared to have a grasp of the ozone layer as an environmental issue, this study in Liverpool was conducted within a different environment, under different circumstances, and, more importantly, using different research methodologies compared to this study. On these grounds, one could argue that it is not possible to compare the two studies. However, this does not imply in any way that the findings of this study could not be deemed to have raised a red flag that should concern educators with the serious duty of developing and promoting environmental literacy.

A discussion of the concept of “water” will now follow.

4.2.4 Water

The following questions were posed with regard to water:

- According to some sources (http://www.fbwip.gov.za), every South African household receives 6 000 litres of “free-water” every month from government. If this claim is valid, do you think that providing people with “free-water” is the correct thing to do?
- Do you think it is necessary for people to conserve water?
- If you believe that water should be conserved, provide some suggestions on how you think this could be done.
- During which period of a 24-hour day should people water their gardens, if such a need exists?

4.2.4.1 Findings in respect of water

The following findings were made with regard to the concept of water.

(a) "Free water" for "every household" in South Africa

Of the fifteen respondents, seven (46,67%), namely, Educators B, E, F, Q2, Q4, Q6 & Q7, were of the opinion that supplying free water to households was the right thing to do. On the other hand, six respondents (40%), namely, Educators A, D, G, H, Q1 & Q5, did not agree with the practice of supplying "free water" to households in South Africa. Two educators, namely, Respondents C and Q3 (13, 33%), provided ambiguous responses.

Those educators who argued in favour of "free water" for "every household" in South Africa provided various reasons for their views. They stated, for example, that water is a basic human right (Educators Q2 & D). It is also appropriate that those who do not work (Educator B), "*the have-nots*" (Educator E) who, because of poverty and unemployment (Educators Q4 & Q6), are unable to pay for water (Educator F) should receive "free water".

Those respondents who felt that there was no need for government to give "free water" to "every household" in South Africa provided varying reasons. They argued, for example, that the provision of free water leads to unnecessary waste (Respondent A) because people tend to abuse water (Respondents Q5 & G) as a result of ill discipline (Respondent H) and, hence, water should not be given free of charge.

On the other hand, Respondent Q3 suggested that, as long as water is available, it must be given freely to everyone but that, as soon as there is a shortage, people should pay for it. Respondent C was more ambiguous when he gave, in his own words, "a big no and a small yes" to the provision of "free

water" to "every household" in South Africa. On the one hand, he argued that water is "a basic necessity" which must be provided to people while, on the other hand, he referred to the provision of free water as "it's another form of wasting water".

(b) Ideas about the conservation of water

With the exception of Respondent Q7, all the respondents offered some ideas and suggestions on ways in which they thought water could be conserved. The suggestions provide by the respondents include the following:

The municipalities, government and residents must all cooperate (Educator Q3) in saving water. This could be achieved by building dams (Educator Q4 & Q6), fixing leaking water pipes (Educator Q4), planting in order to prevent soil erosion (Educator Q6), and by educating people about water usage (Educators Q1, Q4 & Q5). The respondents also suggested that it may be possible to minimise water by using water more than once, for example, by watering plants with the same water that had been used for washing (Educators A, C, D, F & G), by not leaving tap water running (Educators A, E, F & G), by showering rather than bathing - so as to save both water and electricity (Educators C & Q1), and by using rain water (Educators G, Q1 & Q6).

All the respondents were also asked to indicate the periods they deemed suitable for watering the gardens, if such a need existed. Nine respondents, namely, Educators A, C, D, H, Q1, Q2, Q3 Q4 and Q7 indicated that watering should take place very early in the morning or late in the afternoon. Respondents E, G and F replied "in the afternoon", Educators B and Q5 preferred the evening while Educator Q6 stated that garden should be watered in the afternoon or at night.

The reasons given by the educators for what they deemed to be suitable watering periods included less heat, low or no evaporation (Educators A, C, D, F, H, Q1, Q2 and Q6 because the sun is “not as strong” (Educators E and G), the water infiltrates easily (Educators Q3 and Q5), “water is being used during the day” (Educator A) while Educator B provided a very interesting, albeit bizarre response, when she justified her belief about the suitability of the evening period for watering the garden when she asserted that, “I think the meter readings are not running fast as during the day”.

4.2.4.2 Discussion of the findings in respect of water

The findings suggest that all fifteen educators had a substantial grasp of the issues raised with regard to the concept of water. This is based on the fact that each one of them was be able to present a substantiated argument with regard to their views about the supply of “free water” to “every household” in South Africa. The respondents were also able to provide some meaningful suggestions about water conservation. Viewed in terms of the criteria used for the evaluation of environmental literacy in this study, each respondent could be said to have demonstrated a level of operational environmental literacy. Such findings suggest that these educators would probably be able to integrate the concept of water meaningfully, as an aspect that could promote environmental literacy, in terms of their teaching-learning activities.

However, it is necessary to sound a word of caution regarding certain responses by some of the respondents. For example, Respondent Q3 suggested that water should be provided freely to every individual household as long as there was an abundant supply of water but that, as soon as shortages arose, every household should have to pay for water. This response raises a number of possible questions (that could have been asked had the researcher interacted face-to-face with the respondent). For example, who should pay for the purification of water to ensure that there is sufficient water to enable every

household to enjoy it freely? In addition, once consumers have become used to not paying for this commodity, who would convince them to pay for water once such a need arose?

Similarly, Respondent B claimed that water-meter readings run faster during the day compared to the evening and, hence, gardens should be watered in the evening. This does not make sense because it begs a question that the said respondent was not able to answer, namely, what makes the water meters run faster during the day and slower during the night?

These responses presented by Educators B & Q3 should be viewed in a serious light because, should such ideas be presented to learners, they may do more harm than good in terms of promoting environmental literacy.

The final point that one needs to make regarding the issues of water in this study is that the researcher was not able to find any literature that enabled him to compare/contrast his findings to other findings. In other words no literature that dealt with the evaluation of the environmental literacy of currently serving educators could be found. Similarly, there was no need, in the opinion of the researcher, to differentiate the responses in terms of the biographical data of the respondents because there appeared to be no significant differences in terms of the understanding of the respondents in respect of issues raised concerning water.

The following is the presentation and discussion of findings with regard to the concept of “human population growth”.

4.2.5 Human population growth

The following questions were formulated in the quest to fulfil the objectives of this study with regard to human population growth:

- According to statistics (Moore, 2008), the world's human population is currently above six billion and is still increasing. What impact, if any, does an increase in human population have on plants, animals and human beings?
- Do you think it is necessary to control human population growth?
- If you think it is necessary to control human population growth, please suggest ways in which this could be done.

4.2.5.1 Findings regarding human population growth

The following findings were made with regard to the concept of human population growth.

(a) The impact of increasing human population

Each of the fifteen respondents had something meaningful to say about the impact of increasing human population. According to them human population growth affects a number of factors in the environment in a variety of ways. For example, natural vegetation is removed in order to make way for human housing (Educators Q2 & Q7) and this results, in turn, in the destruction of natural habitats for plants and animals (Educators Q2, Q5 and Q6). The "hunting down of natural resources such as animals"(Educator E) is rife as the human population increases which, in turn, heightens the possibility of the extinction of certain animal species (Educator Q1), and the disturbance of the ecosystem (Educator Q1).

An increasing human population also leads to an"over utilisation of resources" (Educators C & Q2), "water shortages" (Educators G and Q6), and "pollution" (Educators Q1, Q4 & Q6) that may be "dangerous for nature and the ozone layer" (Educator Q1). Similarly, the depletion of natural resources (Educator B),

"land shortages for planting" (Educator Q1), an increase in poverty (Educator 4) and unemployment (Educator B) may all be attributed to an increase in the human population. The respondents not only mentioned some of the far-reaching effects of human population growth but were also able to offer some suggestions on ways in which to deal with the problem of human population growth.

(b) Ways in which to deal with an increasing human population

Each respondent in the sample highlighted the need to control human population growth. A number of suggestions, some of which were characterised by emotional and religious affiliations, were raised. These suggestions include the following:

"I think there should be mechanisms that are put in place to minimise human population," suggested Educator F. Educator Q6 advocated "birth control" but she did not say who should be responsible for birth control or how it should be implemented. On the other hand, Educator H was more explicit when he asserted that, "We the people must control the birth rate" and, thus, minimise "population growth" (Educator B). This could be achieved through prevention methods (Educator Q4) and "family planning" (Educator A). Although Respondent E agreed with the suggestions of Educators A and Q4 she did, however, feel that religious convictions should not be overridden by "prevention methods" and "family planning". She responded to the question, "Do you think human population should be minimised (or controlled)?" in the following way:

Educator E: Well … that should depend on beliefs, but the government should or may have to intervene in making sure that the population is minimised. But people's beliefs must be taken into account. If a person does not believe in the minimising of population through birth control then that should be respected because God is the one who decides how many children a person must have.

Five respondents (E, Q1, Q2, Q4 and Q5) adopted what could be regarded as hard line positions in respect of birth control and the restriction of population growth. For example, Educators Q1 & Q7 indicated that every household should have a limited number of children, and that there should be a legislated directive (Educator Q4) in this regard. Educators Q2 & Q4 suggested that each household should be compelled "like in China" to have one child, and that this should be a worldwide phenomenon (Educator Q2). Furthermore, Educator Q5 suggested that exorbitant taxes be imposed on larger families, and that the state should desist from subsidising big families.

Educator C, on the other hand, both appeared and sounded emotive about high population growth but also agreed with the use of education and awareness, as proposed by respondents Q3, Q4 & Q5, in dealing with the problem of increasing human population. This is how Educator C expressed his feelings concerning this matter.

Educator C: If I may be a little brutal, I would say leave AIDS as it is, do not find a cure for it … But … er … realistically speaking, I would say a lot of education is needed about keeping human population under control.

4.2.5.2 Discussion of the findings in respect of human population growth

The findings in respect of the phenomenon of "human population growth" suggest that each respondent in this study is aware of the profound impact of human population growth on the environment. These educators also appreciate the need to manage or to restrict human population growth. They were also able to generate some meaningful ideas on how human population growth may be minimised. In terms of the criteria stipulated for the evaluation of the environmental literacy of the respondents in this sample, these findings suggest that each respondent demonstrated a level of operational environmental

literacy in respect of the concept of “human population growth”. This latter point has positive implications for the integration of the concept of “human population growth” into activities aimed at developing and promoting environmental literacy.

Unfortunately, the researcher was not able to gather any literature that could have been used to relate these findings to other findings because the literature search did not reveal any pertinent studies in this regard. There was also no need to reflect on the effect of each respondent’s biographical data on the findings because each respondent appeared to have a firm grasp of the concept under discussion.

The following discussion will focus on the concept of “sustainable development”.

4.2.6 Sustainable development

The following key questions were posed with regard to sustainable development:

- What is meant by “sustainable development”?
- Some few years ago the World summit on Sustainable Development (WSSD) was held in South Africa. In which province and in what city did this summit take place?

4.2.6.1 Findings in respect of sustainable development

The findings in respect of the concept of sustainable development, like the findings regarding global warming and the ozone layer, suggest that all the respondents demonstrated different levels of environmental literacy. The

following table is intended to illustrate the disparity in environmental literacy among the respondents in this regard.

Table 4.3 Findings regarding sustainable development

Respondent	Definition of sustainable development	The venue of the WSSD in South Africa	Level of environmental literacy
A	No	Yes	NOEL
B	No	No	NOEL
C	Yes	Yes	NEL
D	Yes	Yes	NEL
E	Yes	Yes	NEL
F	Yes	No	NEL
G	No	No	NOEL
H	No	No	NOEL
Q1	No	Yes	NOEL
Q2	Yes	Yes	NEL
Q3	NR	NR	NR
Q4	Yes	Yes	NEL
Q5	Yes	Yes	NEL
Q6	NR	NR	NR
Q7	No	No	NOEL

KEY TO TABLE 4.3: The concepts of "**No**", "**Yes**", "**NOEL**", "**NEL**" and "**NR**" have the same meanings as in Tables 4.1 and 4.2.

The following findings were made:

(a) Definition of sustainable development

As indicated by the "No" in table 4.3, of the fifteen respondents, six (40%) educators (A, B, G, H, Q1 & Q7) were not able to provide acceptable definitions of the concept of "sustainable development" – three by admission while the other three provided unacceptable responses. as suggested by the "NR" in table 4.3. Two (13, 33%) respondents (Q3 & Q6) did not respond to the question while, as indicated by the "Yes" in table 4.3, seven (46, 67%) respondents (C, D, E, F, Q2, Q4 & Q5) were able to provide acceptable definitions for the concept under discussion. The following include some of the responses given by those respondents who did attempt to define the concept of "sustainable development" or "sustainability". It must be stated that some of the definitions provided below demonstrate that some of the respondents did manifest nominal literacy in respect of the concept, that is, when one considers the discussion presented in 2.4.1.3 of this study regarding the meaning of "sustainable development" or "sustainability".

According to Educator D, "Sustainability … is where things that are of importance to mankind should be used in such a way that they are not destroyed or totally wiped out, we are going to need them for a long period". Educator Q4, on the other hand, stated that sustainable development means using resources in order to improve our quality of life but that the resources must be used in such a way that they are available for the future, and the environment must not be harmed in the process.

Similarly, the following responses also reflect the same perceptions as the above definitions of sustainable development: "Human beings using resources in such a way that they are there again tomorrow for the continuous

sustainability of human existence" (Educator C), and to develop, but in such a way that the environment is not influenced in a "*negative way*" (Educator Q5).

However, some of the respondents did offer responses that did not, necessarily, reflect the meaning of sustainable development. For example, Educator Q7, regarded sustainable development as *"*maintaining development for many years" while Educator B asserted "I think sustainability means to sustain".

(b) Awareness regarding the World Summit on Sustainable Development (WSSD) 2002

Of the fifteen respondents, four (26, 67%) respondents (B, F, G & H) admitted that they knew nothing about the summit. Respondent Q7 (6, 67%) gave a wrong answer while two (13, 33%) educators (Q3 & Q7), did not respond to the question on the World Summit on Sustainable Development 2002. On the other hand, eight (53,33%) respondents (A, C, D, E, Q1, Q2, Q4 & Q5) correctly stated that the summit had been held in the Gauteng Province in Johannesburg while Respondent Q7 wrongly stated that it had been held in Durban in the province of KwaZulu-Natal.

Although this study was not aimed at determining the extent of the respondents' knowledge regarding the purpose of the World Summit on Sustainable Development some respondents were, however, asked about the significance of this event. Various responses were elicited, for example, Respondent C said that, "The world leaders were trying to wake up to the fact that slowly but surely human beings need to work out the ways of relating to resources". These world leaders discussed issues such as fighting and ending poverty (Educators D, Q4 & Q5), the protection and management of resources by changing the means of production (Educator Q4), and "the right and responsibilities of nations regarding development, climate change and biological diversity" (Educator Q1).

These responses suggest that some of the respondents did have some idea about the purpose of the WSSD.

4.2.6.2 Discussion of the findings in respect of sustainable development

The concept of sustainable development was included in this study mainly to ascertain whether the respondents had a basic understanding of the concept. In essence, the aim was to determine whether or not the respondents were able to define the concept .The inclusion of the question about the WSSD sought only to determine whether or not educators pay attention to events of international significance. For the purpose of this study, therefore, the respondents were expected to demonstrate nominal environmental literacy with regard to the concept sustainable development. Viewed in terms of the criteria stipulated in this study regarding the evaluation of the environmental literacy of the respondents, the following points need to be mentioned.

The above findings suggest that seven (46, 67%) of the respondents did have a basic understanding of the concept of sustainable development, that is, they were able to define the concept. This indicates that, as shown by the “NEL” in table 4.3, less than half of the respondents demonstrated nominal environmental literacy in respect of the concept of sustainable development. As indicated by “NOEL” in table 4.3, six (40%) of the respondents had no environmental literacy in respect of sustainable development while, as indicated by “NR” in table 4.3, two (13, 33%) of the respondents did not respond to the question on sustainable development. It was, therefore, difficult to ascertain whether these two educators knew of the concept or not and hence, one may be pardoned for surmising that they did, in fact, have no knowledge of the concept.

These findings also suggest that the majority of the respondents (more than 50%) did not have much of an idea about the concept of sustainable

development. This is a matter of concern because it implies that it is highly unlikely that the concept of sustainable development would be included in the teaching-learning scenario by educators with no literacy in this regard.

It is also a matter of concern that some educators seemed lost when asked about the World Summit on Sustainable Development 2002 because they knew nothing about it. This, therefore, implies that there are some educators with no awareness or knowledge regarding what takes place around them in respect of attempts to deal with environmental issues.

The literature suggests that considerable research is needed regarding the environmental literacy of educators in respect of the concept of "sustainable development". This is discernible from the fact that the researcher was able to access one study only which dealt, at least partly, with educator awareness regarding sustainable development. Cross (1998) conducted this study in Scotland (UK) and Connecticut (USA) using a sample of six in-service teachers. Its main focus was on "teachers' views about what to do with sustainable development".

It is significant to note that, despite the fact that the regions in which Cross (1998) conducted his study were, to use his own words, "widely different locations" (Cross 1998: 44) compared to South Africa, there are certain similarities between the two studies in terms of some of the respondents' conceptualisation of sustainable development. For example, the following is one of the responses solicited by Cross (1998: 44 – 45) when he posed the question "Tell me what you make of the term sustainable development?" to his respondents:

"I talk about it in terms of management of resources. Sustainable development means that you manage resources so that they will not be depleted, but at the

same time the people on the ground will be able to harvest from resources … (Teacher B)". (Sic.).

The above point was also made by a number of respondents in this study which, in turn, suggests that there might be a number of currently serving educators in South Africa whose environmental literacy, in respect of "sustainable development", compares favourably with that of other educators in certain parts of the world. However, the apparent absence of research in this area indicates that much still needs to be done in order to determine the extent of the knowledge of educators about sustainable development, both in South Africa and globally. This is significant, especially in South Africa, because the concept of "sustainable development" is, in the opinion of this researcher, extremely important in the promotion of environmental literacy and, hence, it is essential that educators be literate as far as this concept is concerned.

4.3 CONCLUSION

The purpose of this chapter was to present and discuss, in some detail, the findings made in this study. These findings suggest that the respondents demonstrated various levels of environmental literacy with regard to different concepts. For example, all fifteen respondents seemed to have a firm grasp of the concepts of pollution, water and human population growth. Each one of them was able to provide meaningful responses to the questions posed to them concerning the concepts of pollution, water and human population growth. Viewed in terms of the criteria used for the evaluation of environmental literacy in this study, it may be said that each respondent demonstrated an operational environmental literacy level which, in turn, has positive implications for the integration of the concepts of pollution, water and human population growth into environmental education.

However, the same may not be said about the concepts of global warming, the ozone layer and sustainable development. Very few respondents were able to demonstrate a firm grasp/understanding of each of these three concepts. For example, seven (46, 67%) respondents were able to demonstrate an operational environmental literacy level with regard to global warming while three (20%) attained operational environmental literacy concerning the concept of the ozone layer. All three respondents were, at the time of the study, based in the so-called former model C schools. Seven (46, 67%) of the respondents were able to define the concept of sustainable development. These findings have negative implications in terms of the integration of the latter three concepts in environmental education oriented learning-teaching activities.

Chapter five will summarise the findings, present the limitations of the study and provide some recommendations. This report will then be rounded off with some concluding remarks.

CHAPTER FIVE

SUMMARY OF FINDINGS, LIMITATIONS OF THE STUDY AND RECOMMENDATIONS

5.1 INTRODUCTION

Chapter four focused on the presentation and discussion of the findings which arose from the data collection and data analysis in this study. In this chapter the researcher will attempt to summarise the findings and indicate the limitations of this study. This will be followed by some recommendations, and concluding remarks.

5.2 SUMMARY OF FINDINGS

5.2.1 Findings which arose from the literature review

In chapter two some of the concepts deemed significant to this study were discussed and their significance to the study highlighted. These concepts include, among others, environment, education, environmental education, literacy, environmental literacy, currently serving educators and evaluation.

It emerged from the discussion that each concept has a different meaning for different people and, hence, it is essential that each concept be used in context. It also emerged that there is a variety of concepts that may be used in the evaluation of the environmental literacy of educators. Similarly, there are various concepts that may be used in EE-oriented learning and teaching activities.

5.2.2. Findings based on the research design and methodology

Chapter three presented the research design and methodology used in the study. The significance and relevance of qualitative research to this study were also briefly mentioned.

It became clear from chapter three that it is possible to use interviews and the completion of interview schedules/questionnaires together for the process of data gathering in research. The flexibility of qualitative research (Lebeloane, 2004) that enabled the use of pictures (Le Grange, 2000; Bryman & Bell, 2007) was also highlighted. It also emerged in chapter three that qualitative research encourages the use of the language of the respondent (Le Grange, 2000) and, hence, each respondent in the study was able to use the language(s) of his/her own choice.

5.2.3 Findings based on empirical research

In chapter four the data gathered by means of interviews and the completion of interview schedules/questionnaires by those respondents who were not able to avail themselves for interviews was presented and discussed. The findings made in this regard may be summarised as follows:

- All the respondents demonstrated that they had a firm grasp of the issues raised in respect of the concepts of pollution, water and human population growth (see 4.2.1, 4.2.4 and 4.2.6 respectively). On the basis of the criteria used in the evaluation of the environmental literacy of educators in this study (see 3.3.4) all respondents may be said to have demonstrated operational environmental literacy in this regard.
- Most of the respondents were found wanting with regard to the concepts of global warming (see 4.2.2 and table 4.1), the ozone layer (see 4.2.3 and table 4.2) and sustainable development (see 4.2.6 and table 4.3).

- A number of respondents demonstrated a notable lack of awareness (see 4.2.6.2 and table 4.3) of an important event such as the World Summit on Sustainable Development 2002. This is cause for concern because it indicates that these educators are not aware of the events happening around them and that such educators do not appear to possess one of the key components of environmental literacy, namely, environmental awareness. Clacherty (1992: 26-27) indicates that individuals who are environmentally literate must be aware of what is happening around them. This includes knowledge about social, economic and political issues.
- The findings also suggest that there has been very limited research in respect of the evaluation of the environmental literacy of currently serving educators, especially in South Africa. This is discernible from the fact that, in his discussion of the findings, the researcher had to rely, almost exclusively, on literature emanating from studies that were conducted in the United Kingdom (see chapter four).

The following conclusions may be drawn on the basis of the findings made in this study. It must be pointed out, however, that these conclusions are not, in any way, generalisations, but are presented in order to acknowledge that the researcher has, indeed, achieved what he set out to achieve. The findings enable the researcher to conclude that:

- Educator environmental literacy may be evaluated through the use of various concepts, issues and/or phenomena that are, according to Loubser et al. (2001: 320) and other notable researchers, significant enough “to be understood by environmentally literate citizens”.
- Educators may demonstrate the same or different level(s) of environmental literacy regarding various environmental concepts, issues, problems and/or phenomena.

- The effective implementation of EE is likely to be influenced by the environmental literacy of an educator.
- Each educator's background, for example, educational background, race, and so on may have an influence on his/her level of environmental literacy. Consequently, these would impact on his/her implementation of environmental education.

The researcher, in line with research norms, identified what may be considered as "limitations" to this study.

5.3 LIMITATIONS OF THE STUDY

McMillan and Schumacher (1997: 58) argue that it is imperative for the researcher to reflect on those factors that may be considered as "the limitations of the study". Maila (2004: 180 – 181) asserts that:

> …limitations do not in anyway suggest that the research study has failed to achieve what it set out to do. They only point out that certain processes, data gathering methods, data collected and certain findings have not been as successful as intended to be in the study or manifested as the research developed. In a limited manner (thus, the limitation notion) their inclusion is essential in the process of the research inquiry.

The following is that factor which this researcher deems to be the main limitation to this study.

5.3.1 Completion of interview schedules/questionnaires by some respondents

The researcher had hoped to interact, by way of interviews, with each respondent. Unfortunately, owing to the "busy" schedules of certain educators

in the sample, it was not possible to interview all the respondents. Each of those respondents who were not able to avail themselves for face-to-face interactions with the researcher was given a/an interview schedule/questionnaire and requested to complete it. Each one of them completed the interview schedule/questionnaire on his/her own, and in his/her own time. The researcher collected these within five days after they had been issued. The data thus collected was analysed, presented and discussed together with the interview data (see chapter 4).

It must be emphasised that, despite the already mentioned limitation, this study did not fail to achieve what the researcher intended to achieve. In other words, the study did, to some extent, achieve what it had aimed to achieve, that is “To evaluate the environmental literacy of educators in the towns of Makwassie and Wolmaransstad”.

5.4 RECOMMENDATIONS

Both the aim of this study, as stated in chapter one, and the findings presented in section 5.2, inform the following recommendations which the researcher would like to make.

- The Maquassie Hills Area Office - the education authority responsible for education in the towns in which the study was conducted - should; with the help of the district and provincial offices, initiate projects that are aimed at enhancing the environmental literacy of currently serving educators within the area in which the study was conducted. This could be done in partnership with tertiary institutions that have the necessary capacity in educator training.
- The local education authorities (Maquassie Hills Area Office) should also ascertain the extent to which educators, under their jurisdiction in the towns of Wolmaransstad and Makwassie, implement EE.

- More research should be conducted, not only in the towns of Makwassie and Wolmaransstad, but also in South Africa as a whole, to determine the extent of environmental literacy of currently serving educators.

The above are, in the opinion of this researcher, the key recommendations of this study. The following concluding remarks are, in the light of the entire study, deemed to be appropriate.

5.5 CONCLUDING REMARKS

In conclusion it is imperative to emphasise that there are enormous environmental problems and challenges, emanating from human actions, which are facing both South Africa (Van Rooyen, 1998: 121; The World Wildlife Fund, 2007: 1), and the rest of the world. These actions are propelled, to a large extent, by human wants rather than by human needs. It is, therefore, essential to develop strategies, continuously, that are aimed at addressing environmental problems and challenges so as to ensure the sustainability of resources for the benefit of future generations. An environmentally literate citizenry is, thus, essential in order to enable us (human beings) to address those problems that impact negatively on the environment. Accordingly, educators, have an enormous responsibility to empower the nation so that these environmental challenges are properly dealt with or, at least, ameliorated. Than (2001: 443) has the following to say about the role of educators in this regard:

> Teachers play a uniquely important role in determining the quality of environmental education for children. The implementation of environmental education requires from teachers not only a deep awareness of environmental problems, protection and education but also the ability of creative thinking, as well as the capability to apply knowledge of environmental education to teaching in the practical context of the local environment.

The capacity, the commitment and, indeed, the environmental literacy of educators are all very significant both in education and for the future of South Africa. In this respect Van Rooyen (1998: 121) attests that:

> Future success in addressing these issues [**these issues being the environmental problems**] depends largely on the successful incorporation of EE, as education for sustainable living, in both formal and non-formal education structures in this country. This may play an important role in providing individuals with the necessary physical, moral and mental preparation to help protect, manage and conserve the environment **[**my emphasis**]**.

It is, thus, essential to evaluate the environmental literacy of educators both regularly and continuously so as to determine their capacity to empower both the learners and the entire society to deal with environmental problems and challenges.

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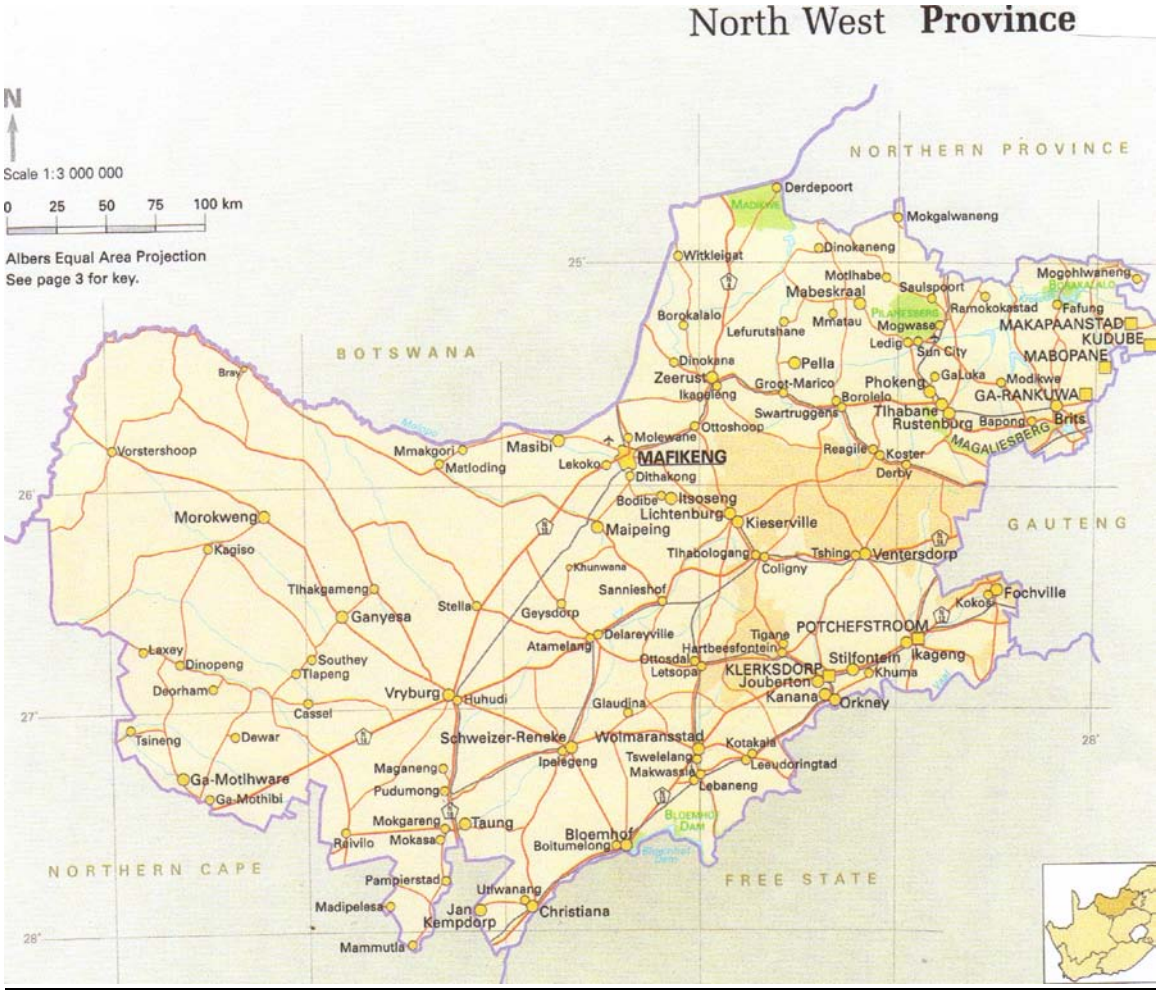
APPENDICES

APPENDIX 1: MAP OF SOUTH AFRICA

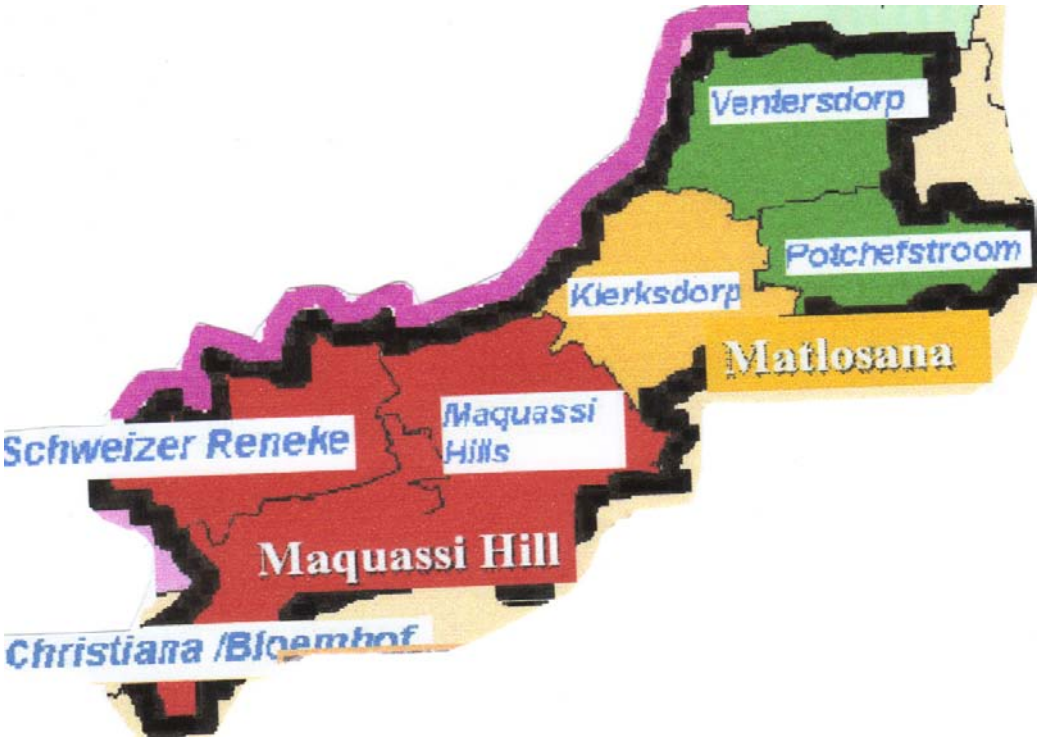
SOURCE :(http://www.nationsonline.org/maps/south_africa_prov.map.jpg [accessed 11 October 2009])

APPENDIX 2: MAP OF THE NORTH WEST PROVINCE



SOURCE: Winter, Oelofse & Bottaro. J. 2001

APPENDIX 3: MAP OF DR. KENNETH KAUNDA DISTRICT



SOURCE: (http://www.nwpg.gov.za/education/dkk/areaoffices.htm [accessed 18 July 2009])

APPENDIX 4: LETTER SEEKING PERMISSION

P.O. Box 866
Wolmaransstad
2630
12 June 2009

The Area Manager
Maquassie Hills Area Office
Private Bag X 1015
Wolmaransstad
2630

Dear Sir or Madam

I would like to request the learning site managers (at both primary and secondary schools), through you, in your circuits; namely, Naledi (in Makwassie) and Maquassie Hills North (in Wolmaransstad), respectively, to grant me permission to conduct research in their institutions. The research, which will be mainly in the form of interviews with selected individual educators, is aimed at gathering information that would assist in the completion of my current MEd (with specialisation in Environmental Education) studies through UNISA.

The dissertation title is:

"An evaluation of the environmental literacy of educators: A case study"

I would like to assure you, the learning site managers, and the other stakeholders of the institutions that will be visited - if granted permission -

that I will not interfere, in any way, with the day-to-day functioning of the institutions.

I will appreciate a positive and prompt response.

Yours in education

HEADMAN N. HEBE

Contact details:
Mobile: 073 323 3365
Home: 018 596 2996
Work: 018 597 4625
E-mail: herbzhn@telkomsa.net

APPENDIX 5: LETTER OF PERMISSON

education

Lefapha La Thuto
Onderwys Departement
Department of Education
NORTH WEST PROVINCE

Private Bag X1015
73 Kruger Street
WOLMARANSSTAD, 2630
Tel: 018-5969200
Fax: 018-5962853
ENQUIRIES: Mr. AJ Engelbrecht

DR. KENNETH KAUNDA DISTRICT

MAQUASSI HILLS AREA OFFICE

TO : ALL PRINCIPALS
MAQUASSI HILLS NORTH CIRCUIT
NALEDI CIRCUIT

FROM : Mr. AJ Engelbrecht
Area Manager
Maquassi Hills Area Office
Wolmaransstad

DATE : 19 October 2009

SUBJECT :PERMISSION TO CONDUCT ACADEMIC RESEARCH

Kindly be informed that permission has been granted to MR H.N.Hebe to conduct reseach in above mentioned circuits in MAQUSSI HILLS AREA in an attempt to complete his M.Ed degree with UNISA.

The title is:

"AN EVALUATION OF THE ENVIRONMENTAL LITERACY OF EDUCATORS:A CASE STUDY".

Will you humbly afford him the opportunity at your institution.

Thanking you

A.J.ENGELBRECHT
AREA MANAGER

APPENDIX 6: LETTER TO RESPONDENTS

P.O. Box 866
Wolmaransstad
2630

04 June 2009

Dear Colleague

In the preface of the booklet, "*Enabling an Environmental Focus in Social Sciences*: *a policy interpretation guidebook for the revised National Curriculum for GET*", published by the National Environmental Education Project (NEEP GET), Department of Education in 2004, our former National Director General in Education, Mr. T.D. Mseleku has the following to say:

"*The Constitution of South Africa links environmental issues to values underpinned by rights and social justice. In recognizing the right to an environment that is not detrimental to citizens' health or well-being, the Constitution supports a national commitment to environmental responsibility. If this is to be realized, environmental education is crucial. As a response to this, the White paper on Education and Training (1995) made clear the need for integrating environmental learning at all levels and phases of the education and training system …"*.

The above statement projects, very succinctly, the significance of inculcating the principles of environmental awareness and environmentalism among our learners through the integration of "*environmental learning*" across different learning areas, levels and phases. This, therefore, suggests that every educator has the responsibility to teach about environmental issues. However, what is not addressed in the above statement is the extent to which educators themselves are knowledgeable about environmental issues.

We simply cannot assume that educators are environmentally aware. Hence it is necessary to undertake a scientific enquiry to determine and evaluate the extent of educator environmental literacy.

The aim of this letter is, therefore, to urge, implore and, indeed, invite you to spare some forty-five minutes of your time to interact with me in a face-to- face interview so as to assist me in the quest to answer the research question, "*What level(s) of environmental literacy do currently-serving educators have in order to effectively implement environmental learning/education*?" This process is not only meant to assist the researcher in fulfilling an academic obligation towards the attainment of an MEd with specialization in Environmental Education, but this will go a long way towards helping our National Education Department in identifying the areas that need attention regarding our (educators') environmental literacy.

I will, therefore, appreciate it if you could, at your earliest convenience; contact me (you may "*buzz"* me I will call you back) so that we could make an arrangement for an interview. However, in case your commitments make it difficult for you to participate in a face-to-face interview, please feel free to complete the "*Interview Schedule*", herewith attached. Please try to respond to the entire document to the best of your ability, and you can be assured that your response(s) will be handled and treated with utmost confidentiality.
I will also appreciate it if you could try to complete the interview schedule as soon as you possibly can possible, and hand it over to the person that I shall have requested to issue it to you. I would also like to request you to try as far as possible not to use any resource material but, rather, rely on your knowledge, experience, etc to complete the interview schedule/questionnaire.

Should you have any enquiry pertaining this communiqué, the face-to-face interview or the interview schedule, please feel free to use the details provided in this letter to contact me.

I would like to thank you in advance for participating in this study.

Yours in education

HN HEBE

Mobile: 073 323 3365
Home: (018) 596-2996
Work: (018) 597-4625
E-mail: herbzhn@telkomsa.net

APPENDIX 7: RESPONDENT'S PROFILE

REPSONDENT NUMBER							

Please mark the block applicable to you by means of a cross (X), and respond as directed where necessary.

BIOGRAPHICAL INFORMATION

1. AGE CATEGORY (IN YEARS)

1.1 Below30……	
1.2 Between 30 and 35……	
1.3 Between 36 and 40……	
1.4 Between 41and 45……	
1.5 Between 46 and 50……	
1.6 51 and above……	

2. GENDER

2.1 Female ……	
2.2 Male……	

3. PERSONNEL CATEGORY

3.1 Principal……	
3.2 Deputy Principal……	
3.3 Head of department……	
3.4 Educator……	

4. QUALIFICATIONS (e.g. BA, BSc Ed, UDE (S), etc.

_____

4.1. Major subjects/courses for/in your highest qualification (not more than three) e.g. Chemistry III, Biology III, Physics III

_____

_____

_____

5. TEACHING EXPERIENCE

5.1 Years of teaching experience _____ Years

5.2 Learning area(s) or subject(s) and grade(s) or level (s) currently taught and the Teaching experience (in years).

LEARNING AREA/SUBJECT	**GRADE/LEVEL**	**TEACHING EXPERIENCE (IN YEARS)**

APPENDIX 8: INTERVIEW SCHEDULE

NOTE TO THE RESPONDENT/INTERVIEWEE

Please take note of the following matters before going-through /completing this schedule:

1. There are some pictures and articles that are provided in this interview schedule.
Although certain questions are based, partly, on these pictures and articles, this does not mean that your response should, essentially, be based on or confined to these sources. These sources are meant to stimulate the respondent/interviewee and, more importantly, to calm the nerves of an uneasy interviewee/respondent.
The respondent/interviewee is, therefore, urged to draw from his/her experiences knowledge, etcetera when responding to the issues raised in this schedule.

2. You are urged not to go out in search of answers from any resource material in order to respond to the issues raised in this schedule.

3. Please feel free to use any of the eleven South African official languages when completing the schedule (or during the interviews).

4. Please try to respond to all issues/matters raised in this interview schedule.

You are also requested to complete the respondent profile. This profile will assist the researcher when data analysis is carried out.

THANK YOU VERY MUCH FOR PARTICIPATING IN THIS STUDY

1. POLLUTION

Study figures 1.1, 1.2 and 1.3 very carefully and respond to the following questions.

1.1 How would you define the concept “pollution” in your own words?

_____

_____

_____

_____

1.2 Figure 1.1 shows air pollution. What causes air pollution?

_____

_____

_____

_____

_____

1.3 What effect, if any, does air pollution have on the following:

1.3.1 Plants?

_____

_____

_____

_____

1.3.2 Animals?

_____

_____

_____

_____

1.3.3 Human beings?

_____

_____

_____

1.4 What do you think should be done to control air pollution?

_____

_____

_____

_____

_____

1.5 Apart from air pollution can you think of other forms of pollution? Please, complete the table below in response to this question:

Form of pollution (excluding air pollution)	Causes	Effects on:	Solutions to the forms of pollution
1.5.1 _____ _____ _____	(i) _____ (ii) _____ (iii) _____	(i) Plants _____ (ii) Animals _____ (iii) Humans _____	(i) _____ _____ (ii)_____ _____ (iii)_____ _____
1.5.2 _____ _____ _____	(i) _____ (ii) _____ (iii) _____	(i) Plants _____ _____ (ii) Animals _____ _____ (iii) Humans _____ _____	(i) _____ _____ (ii)_____ _____ (iii)_____ _____
1.5.3 _____ _____ _____	(i) _____ (ii) _____ (iii) _____	(i) Plants _____ _____ (ii) Animals _____ _____ (iii) Humans _____ _____	(i) _____ _____ (ii)_____ _____ (iii)_____ _____

1.6 Refer to figures 1.2 and 1.3

1.6.1 Rather than throwing away and dumping, what better use can be made out of the following products:

(a) Tins?

_____

_____

_____

(b) Tyres?

_____

_____

_____

_____

2. GLOBAL WARMING

2.1. What is “global warming”?

_____

_____

_____

2.2 What, in your opinion, causes global warming?

_____

_____

_____

2.3 What impact, if any, does global warming have on:

2.3.1 Plants?

_____

_____

_____

2.3.2 Animals?

_____

_____

_____

2.3.3 Human beings?

_____

_____

_____

2.4 What do you think should be done, if you believe there is a need, in order to address the problem of global warming?

_____

_____

_____

3. THE OZONE LAYER

3.1 What is the ozone layer?

_____

_____

_____

3.2 What is the role/function of the ozone layer?

_____

_____

_____

3.3 If necessary, what do you think should be done in order to protect the ozone layer?

_____

_____

_____

_____

4. WATER

4.1. According to some sources (http://www.fbwip.gov.za; http://www.win-sa.org.za [both accessed 26 September 2009]), every South African household receives 6000 litres of "free-water" every month from government. If this claim is valid, do you think that providing people with "free-water" is the correct thing to do? Explain

_____

_____

_____

4.2. Do you think it is necessary for people to conserve water? Explain.

_____

_____

_____

4.3. If you believe that water should be conserved, please provide some suggestions on how you think this could be done.

_____

_____

_____

_____

4.4. During which period in a 24-hour day should people water their gardens, if such a need exists? Explain.

_____

_____

_____

_____

5. HUMAN POPULATION

5.1. According to statistics, the world human population is currently above six billion and is still increasing (Moore, 2008). What impact, if any, does an increase in human population have on:

5.1.1. Plants?

_____

_____

_____

5.1.2. Animals?

_____

_____

_____

5.1.3. Human beings?

_____

_____

_____

5.2. Do you think it is necessary to control human population growth? Explain your answer.

_____

_____

_____

5.3. If you think it is necessary to control human population growth, please suggest ways in which this could be done.

_____

_____

_____

6. SUSTAINABLE DEVELOPMENT

6.1. What is meant by “sustainable development”?

_____

_____

_____

6.2. A few years ago the World Summit on Sustainable Development (WSSD) was held in South Africa.

6.2.1. In which province and in what city did this summit take place?

_____

THANK YOU FOR PARTICIPATING IN THIS STUDY

APPENDIX 9: PICTURES USED ON THE INTERVIEW SCHEDULE/QUESTIONNAIRE

POLLUTION

FIGURE 1.1

SOURCE: PHOTO TAKEN BY THE RESEARCHER

FIGURE 1.2

FIGURE 1.3

SOURCE (USED WITH PERMISSION): * ENVIRONMENTAL RESOURCE ECONOMICS, DEPT. ENVIRONMENTAL AFFAIRS. PRETORIA .1993 (FIG. 1.2 & 1.3)