UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

HOW PRIMARY SCHOOL LEARNERS CONCEPTUALIZE THE ENVIRONMENT AND ENVIRONMENTAL EDUCATION

A dissertation by

MANTSOSE JANE SETHUSHA

Submitted in partial fulfilment of the requirement for the degree
Magister Educationis
In
Environmental Education

In the Department of Curriculum Studies
At the Faculty of Education
University of Pretoria

Supervisor: Dr L Jita

October 2006

DECLARATION

I declare that this study entitled

'How primary school learners conceptualize the environment and environmental education'

is my own work, that all the resources I have used or quoted have been indicated and acknowledged by means of complete references and that neither I nor anyone else at this university or any other educational institution previously submitted this study for degree purposes.

Mantsose Jane Sethusha

Signed _____ Date _____

DEDICATION

I dedicate this work to my husband Sello Lucas and our daughters Kegaugetswe and Galaletsang, for all the patience, encouragement and unconditional love that they have given me throughout my studies. The successful completion of this dissertation was made possible by their presence (and absence at appropriate times).

This research is dedicated with respect and gratitude to my mother Florence Mokgethoa and the memory of my late father Saul Morake Banda, who laid a strong foundation for this venture many years ago by putting me through all the different stages of education. I will always cherish your love and support.

May the Good Lord be with you always.

I love you.

ACKNOWLEDGEMENTS

My sincerest thanks and appreciation are extended to:

- God the almighty for being with me always and guiding me all the way. May HIS holy name be praised.
- My supervisor, Dr L Jita, whose professional guidance, motivation and support made this dissertation possible.
- The Institutional Support Coordinator (Makapanstad North Cluster) Mrs M.K.Z Mosala for her motivation.
- My principal, Mr H.F Mokwatlo for his support and encouragement.
- My study partners Sekina Sehlola and Maropeng Motshegoa for giving me courage during difficult times.
- My brother, my sisters and my in-laws for rendering support throughout my studies.
- My sister-in-law, Mrs Mpho Letlape, who has always been a mother to my children. Thank you ‘rakgadi’.
- My mother Florence and my deceased father Saul Banda to whom I dedicate this dissertation. Thank you for your untiring support through my studies.
- My husband, Sello for always believing in me and offering unfailing support and love throughout my studies. This dissertation is for you.
- My beloved daughters, Kegaugetswe and Galaletsang who have been patient with my busy schedule. I love you.

KEY WORDS

1. Environmental knowledge
2. Environmental sensitivity
3. Environmental awareness
4. Environmental action
5. Environmental responsibility
6. Environmental protection
7. Sustainability
8. Environmental Education
9. Environmental Learning
10. Environment
11. Pollution
12. Recycling
13. Conservation

TABLE OF CONTENTS

REFERENCES

APPENDICES

Interview schedule

Informed consent

ABSTRACT

Several researchers have noted that the knowledge and awareness of children with regard to environmental concepts and issues are at a low level. The major aim of this study was to investigate the knowledge and understanding of primary school children about selected environmental concepts and issues such as conservation, recycling, pollution and environmental protection. This study also aimed at understanding how the children's conceptions are developed and how the knowledge of these critical concepts shape their environmental awareness and practices outside the classroom. This information will assist those who have responsibilities for Environmental Education within schools and for those who develop support programmes for the protection, restoration and enhancement of the quality of the environment. The study was conducted at three primary schools and four children were selected from each school. This study involved the use of semi-structured interviews to ascertain details of children's knowledge and conceptions about environmental issues. The study has established that the majority of children that took part in this study understand the environment only from a physical and biophysical perspective. This is characterised by a limited conception of the environment where the environment is thought to be a place, a place with living things and a place with living things and people. The research findings in the study also indicated that the majority of children that took part in investigation utilized by this study recognised basic facts concerning environmental problems; however most of them could not apply their knowledge to comprehend the consequences or suggest potential solutions to the environmental problems. This study will help towards the establishment of a sound basis for Environmental education in schools.

CHAPTER 1

ORIENTATION AND BACKGROUND

1.1 INTRODUCTION

The importance of knowledge and conceptions has long been of interest to education researchers investigating children's conceptions. Indeed, educational researchers have played a lead role in this area and have argued, using qualitative methods, that children's prior knowledge significantly influences classroom learning and teaching. Children's prior knowledge and conceptions are important for educators to consider because learning has to build on learners existing mental structures. In practice however, for some, this translates as previously learned school facts, for others as misconceptions to be swept away (Geelan; 1997). According to Taber (2001), *a paramount factor in any meaningful learning is what has previously been learnt*. Frick and Kaiser (2004) highlight this aspect by arguing that to be fully effective, educational campaigns need to be designed with a profound understanding of the underlying knowledge structure. It is important to ascertain how much children already know and what type of knowledge is essential to promote target behaviour. It is this very idea that the present study seeks to explore in the context of Environmental Education (EE).

The literature on constructivist learning theories suggests similarities between constructivist techniques and teaching strategies used by environmental educators. Constructivism suggests that knowledge is created by the child, and not passively received from the environment. As such knowledge is constructed on the foundations of children's existing knowledge. This means that children create new knowledge by reflecting on their physical and mental actions, and ideas are constructed or made meaningful when children integrate them into their existing structures of knowledge. Klein and Merriet (1994) argue that *no one true reality exists*, only individual interpretations of the world. These interpretations are shaped by experiences and social interactions.

My study is based on such thinking about children's knowledge and conceptions about the environment. The conceptions and assumptions of children are unfortunately, often ignored when developing curricula or lessons on many subjects. There may be two possible reasons for this neglect: either because we do not know enough about what these assumptions and conceptions are; or secondly, because we do not take children's ideas and conceptions seriously to base curricula or lesson plans and decisions on them. Environmental Education is no exception to this trend of ignorance. My study is one attempt to reverse this trend of neglect with respect to children's knowledge.

As a 15 year veteran educator in the primary school, I have observed that children in the primary grade levels indeed come with their own conceptions of what the environment is and what it involves. Often however, we as educators do not have a ready sense and access to the learners' conceptions and assumptions about the environment and some other related key concepts in the environment. This is partly because of the dearth of relevant local research on children's conceptions and knowledge about Environmental Education. My intention in this study was to apply qualitative research approaches to find out what knowledge and conceptions children bring along to the learning of EE in the primary school classroom, and how these conceptions and knowledge may be used as a basis for challenging and improving their understanding of the environment and other related concepts. This study also sought to understand what the origins of children's conceptions are and what factors seem to sustain these conceptions.

1.2 BACKGROUND TO THE PROBLEM

According to Chacko (1998), there is a general concern about the increasing deterioration and exploitation of the natural environment, especially in the South African context. It can also be observed that most of the environmental degradation that occurs today is the result of the failure of our society and educational systems to provide citizens with the basic understanding and

skills needed to make informed choices about interactions and interrelationships in the environment. An understanding of the basic interactions between humans and the environment and skills is needed to make informed choices. In view of the increasingly serious global impact resulting from human activities, it is important that children understand that 'environments change'. They also need general principles to find solutions about specific environmental problems confronting modern society. Therefore it is necessary to investigate the knowledge, conceptions and understanding of children about environmental concepts and issues and how their knowledge could influence further learning in EE and their practices and behaviours towards the environment.

An increased recognition of the importance of Environmental Education provides an important reason for developing children's understanding of environmental issues. The GET programme in South Africa makes the following case for the inclusion of EE in schools: that environmental issues be dealt with in learning outcomes. This is clearly presented in the learning area of 'Life Orientation'. Assessment standards in this learning area cover participatory activities that are related to problem solving as far as environmental issues are concerned (Revised National Curriculum Statement; 2002). Similarly, Barraza and Walford (2002) have also argued the importance of placing EE centrally within the school curriculum. They mentioned a major educational reform that was announced in Mexico in 1990, which for the first time mentioned EE as a topic to be included in the curriculum (Barraza and Walford; 2002).

According to Palmer (1995), EE has also been given more prominence in many other countries. They highlight the fact that major government initiatives have aided the development of EE in the UK. That the publication of the White Paper in 1990, curriculum guidance for educators in environmental topics and reviews of the National Curriculum continued to emphasise environmental topics and encouraged public participation in environmental matters (Palmer; 1995).

Finally, from a constructivist perspective, the importance of paying attention to children's conceptions cannot be over-emphasised. Constructivism is one learning theory, whose basic tenets include among others;

1. *Introduction of a real life-problem by the learner or the educator for the learner to solve.*
2. *Learner-centred instruction facilitated by the teacher.*
3. *Productive group interaction during the learner process*.
4. *Authentic assessment and demonstration of learner progress*.

(Klein and Merriet; 1994)

Tice (1995) states the case for constructivism in teaching and learning as follows: *reality has to be constructed by the learner, thus teaching and learning must themselves be constructive*.

Taking these ideas on constructivism seriously, this study sought to understand how children think about some key concepts in EE. This study aims to establish what the children's knowledge and conceptions of such critical concepts as **environmental protection**, **pollution**, **conservation** and **recycling** are. These concepts were selected based on the rationale that; to be successful in developing an environmentally literate society, educators need to pay attention to some important key concepts in the field and promote environmentally friendly practices around these concepts as a starting point.

My interest in these four environmental concepts is based partly on the reviews of the following sources and documents; *Environmental Education Research, and Studies in Science Education*. Lengwati (1995), for example, puts pollution at the top of the list of all environmental priorities in South Africa. I agree with Lengwati, mostly from my daily experience of the issue in South Africa. In my community for instance, water is polluted by dumping rubbish in it, washing clothes and bathing in it. The community depends on river water, streams and pit water for human consumption. Pit latrines are still used because flushing water is scarce. As a result, ground water is affected. Mosquitoes and flies accumulate around the latrines and subsequently spread infectious diseases. A growing number of rural areas face the challenge of

providing an adequate and safe supply of drinking water. John (2004) supports the importance of paying attention to pollution and finding solutions to the problem.

Next on the priority list of environmental concepts and problems is conservation. Magadlela (2004) argued that conservation in South Africa is of utmost importance. His project was a pioneering environmental initiative in that its implementation combined ecological concerns and social development benefits.

Similarly Vickers (2002) also supports the importance of paying attention to conservation and finding solutions to the problem by indicating that conservation can and must play a central role in the future if we are to survive and thrive within our existing resource limitations.

Third on the list is the concept of recycling. Cherif (1995) mentions the fact that recycling is cheap and certainly healthy for humans and other species. He further highlights that, with proper implementation, recycling can help boost the economy, generate jobs for low income citizens as well as benefit the environment.

Finally another important environmental issue is environmental protection. We need to conserve natural resources and maintain a clean environment. Lengwati (1995) indicated that in South Africa, we experience environmental degradation daily through;

1. *Overgrazing in communal lands leading to soil erosion and infertile soil.*
2. *Cutting of trees for firewood leaving the land exposed.*
3. *Ploughing where soil is not suitable for ploughing.*
4. *Demolishing of grassland areas by forestry plantations for use in paper manufacturing thereby drying up streams and rivers, ponds and swampy areas eliminating wild life in the area.*
5. *Creating squatter camps and bare areas in townships and rural villages by road graders, altering the natural contours of the*

land, thereby causing erosion, soil degradation and drying up sources of natural water.

6. *Using an old ploughing system on arable lands exposing subsoil to sunlight killing living organisms and demolishing the fertility of the soil.*
7. *Closing of a mining industry in one area, leaving the waste behind and opening it in another area to avoid labour disputes thereby destroying the landscape at yet another site*.

Knowledge about pollution, recycling, conservation and environmental protection is of utmost importance because it could provide knowledge about the prevention of damage to the local environment within the South African context especially.

1.3 MOTIVATION FOR CONDUCTING THIS INVESTIGATION

As an educator in the primary school, I have encountered many children who are unable to express in their own words, how for an example recycling of waste material happens and what its economic implications are. This is quite surprising, especially with the older children, because by the time they are in the higher classes in the primary school, they should at least have a background of some concepts in environmental education from their prior learning and experiences. Young children need to know some of these concepts because *knowledge of environmental concepts and issues is necessary to maintain environmental quality* (Chacko; 1998).

Environmental awareness and responsibility is a key factor that has to be taught in our schools so that children can make the right choices to protect the environment. I believe that what is learnt by children at an early age will have a strong influence upon their attitudes, values, decisions and ways of solving environmental problems. The problems of the environment can be solved through environmental literacy (Chacko; 1998). This is true with other environmental issues such as plant, water and animal conservation, pollution, recycling and environmental degradation. Could lack of understanding be due

to the fact that teaching has not been based on children's own thinking about the different environmental phenomena? Has knowledge been reduced only to school knowledge in environmental education without having challenged the children's everyday understanding? I ask these questions because children's views need to be taken into consideration when planning lessons in Environmental Education and such lessons should also challenge children's everyday understanding of the environment.

If we as educators want to help children obtain extensive knowledge of the environment, we ourselves must know more about children's ideas about different phenomena in order to learn more about their starting point of learning. Only then shall we be able to create teaching and learning situations in which children's ideas will be challenged. It is for this reason that I opted to research about children's knowledge and conceptions about the environment.

Children often take for granted that everything that they cannot observe does not exist and may construct their own explanation in order to understand and describe a phenomenon. As educators we need to create a classroom atmosphere where pupils can recognise, discuss and reflect upon their ideas. It is also our task as educators to help them to evaluate their own ideas in comparison with others. Under such circumstances we can also get to know more about children's conceptions and knowledge of environmental issues.

Scholarship in EE has been limited to environmental understanding among high school learners, tertiary students, teacher in-service training and beliefs and attitudes as far as environmental education is concerned. We know very little about knowledge and conceptions of young children in South African schools. Loughland (2002) has for example, explored learners conceptions in Australia. Barraza and Walford (2002) also did a similar study of comparison between English and Mexican school children with reference to environmental knowledge and understanding in two countries; Mexico and England. All these studies worked from a premise that schools need to encourage and empower children in such a manner that environmental awareness is promoted. Sadly, there has not been enough research conducted to explore

the issue of how children's knowledge and conceptions of critical concepts (pollution, recycling and plant, water and animal conservation) shape their practises with respect to the environment outside the classroom in developing countries. In South Africa in particular, studies on primary school children's knowledge and conceptions are few. My study sought to close this gap by presenting findings from a study of primary schools in the North West Province of South Africa.

1.4 AIMS, RESEARCH QUESTIONS AND OBJECTIVES OF THE STUDY

1.4.1 Aims

This study was aimed at determining the knowledge and conceptions of children about the environment. To pursue the research agenda, my study investigated the following research questions:

1. What are the children's conceptions about some critical concepts in Environmental Education? (Selected concepts are pollution, recycling, conservation and environmental protection)
2. How are these conceptions developed; what seems to be their origins and what shapes these conceptions?
3. How does the knowledge and conceptions of these critical concepts shape children's environmental practises outside the classroom?

1.4.2 Objectives

In striving to achieve the above aim, the following objectives serve as guidelines:

1. To investigate, by means of interviews, children's knowledge and conceptions about the environment.
2. To explore the role of educators and of Environmental Education with regard to environmental protection.

3. To try to propose guidelines which can be helpful in dealing with environmental protection in the school curriculum and in the classroom.

1.5 OUTLINE OF THE CHAPTERS

This study is divided into the following five chapters:

CHAPTER 1

The chapter serves as an orientation and background of the study. It introduces the research topic and highlights the motivation for conducting this investigation. The research questions, as well as the aims and objectives of the study are explained in this chapter.

CHAPTER 2

The chapter provides a critical investigation of the literature on the theoretical background of children's knowledge and conceptions about the environment and environmental issues. The role of Environmental Education in environmental protection is also discussed in this chapter.

CHAPTER 3

The chapter outlines the research methodology and procedures followed in data collection.

CHAPTER 4

In this chapter, analysis and interpretation of data is outlined.

CHAPTER 5

This chapter provides the reader with a summary of the findings, distinct recommendations and concluding remarks of the study.

CHAPTER 2 LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 INTRODUCTION

Environmental problems have become a constant and perennial challenge facing modern society. What seems to change however is the way in which people interpret and view these environmental problems. Several researchers have argued that the nature and extent of the environmental problems have increased dramatically over many years, to such an extent that the environmental problems now constitute a global crisis (Le Roux; 2001, Wilke; 1997, Hugo; 2004). Consequently, if the environment is to be utilized to its optimum, it is necessary that a thorough knowledge of its functioning be acquired. With every environmental problem, there are usually a number of contributing causes, whose interactions and feedbacks make it difficult to identify the most effective course of action and predict the consequences of intended remedies with any certainty (Hugo; 2004). Whatever solutions are needed towards environmental problems, government does not need to impose them, all the time. Community members also need to engage in activities that will lead to environmental protection. Many people are becoming increasingly aware of the need to sustain the health of the planet and the integral web of connections that link together all life on earth. It is rather important to understand how our activities affect the environment and ourselves, and that the solutions still lie much more in our attitudes, values and actions.

The present chapter examines mostly the literature on (children's) knowledge and understanding of the Environment and the present crises and issues surrounding the Environment and Environmental Education issues of current concern.

2.2 THE ROLE OF ENVIRONMENTAL EDUCATION IN ENVIRONMENTAL PROTECTION

Environmental Education aims to direct young learners to explore and investigate their own surroundings or their environment. There are many reasons why an integrated environmental approach offers better opportunities for environmental learning. SACOL argues that such an integrated approach is necessary because EE:

1. Focuses learners on their environment and emphasizes activity and involvement.
2. Helps in the development of valuable learning skills and positive attitudes with regard to society and the environment.
3. Takes into account the stage of development of young learners.
4. Promotes an activity-based approach to teaching.
5. Helps learners to understand and appreciate the relationship between people and their bio-physical surroundings.
6. Fits in with young learners' views of knowledge and the world (SACOL; 1999:18).

EE is an important tool in assisting children to develop a greater understanding of their ever-changing world (Wilke; 1997). Through EE, it is expected that children will gain the knowledge, skills and values needed to make decisions and to take action, which will sustain rather that deplete the planet. Murdoch (1993) and Le Roux (2001) outline the following possible kinds of learning with regard to Environmental Education;

2.2.1 Learning in the environment

This type of learning happens through experiences. Experiences in the environment enhance learning and appreciation of the way the natural world functions. These are experiences such as outdoor activities, which are planned purely for fun but at the same time aimed at raising awareness or developing specific understanding of the environment. This learning is called experiential learning or learning based on constructivism, since learners

construct their own meaning from their experiences in the environment. It is through positive experiences that children can be helped to overcome fears of the environment and to establish that important sense of connectedness with nature.

2.2.2 Learning about the environment

This aspect refers to the transmission of environmental knowledge and information or presentation of facts about environmental issues. This type of education was a trend that was observable in the past education system as the only method of learning. Many environmental problems are a direct result of sheer ignorance. In order to appreciate the need to protect the environment, children first need to understand some of the fascinating ways in which nature works. By understanding nature's cycles, interdependence, adaptation and diversity, we can better understand the impact that our actions can have upon it (Murdoch; 1993). EE therefore, teaches children about ecology and its relationships.

2.2.3 Learning for the environment

Learning for the environment implies an orientation to action. It is also influenced by social constructivism and socially constructed ideas (Le Roux; 2001:58). This implies that Environmental Education encourages children to reflect on their learning and to develop the skills to act on what they have learned. EE affirms the relationship we all have with the earth and is grounded in real-life and active experiences. It is also the type of education that is empowering. EE teaches children to use problem-solving and decision-making skills to help bring about change and to help in taking action.

Environmental Education has come to include all three orientations with facts about experiences in and action for the environment. EE programs should thus make an attempt to include all these categories of learning in children's activities.

The rationale behind environmental education for sustainability boils down to human extinction if current abuses of the environment continue. Until people accept their role as care takers of the environment there is a very real danger that South Africa's great natural heritage will be destroyed (Le Roux; 2001: 60).

Hellden (1995) is of the opinion that if educators want to help children obtain more extensive knowledge of the environment, then they must know more about children's ideas about different phenomena in the environment. Such knowledge of children's conceptions would help educators to know about children's starting points of learning. In this way educators would be able to create teaching situations in which children's ideas can be challenged and/or extended. As educators we need to do a great deal more to raise the level of environmental knowledge of children (Gambro and Switzky; 1996) as such knowledge is necessary for maintaining environmental quality. Boyes and Stanisstreet (1998) suggest that environmental campaigns are required in schools and for such campaigns to be successful, planners need to know what children are thinking.

Research has clearly indicated that a trained and caring educator is the most critical element in a quality classroom (Isbell and Exelby; 2001). Educators have to strive to provide children with many opportunities to expand their knowledge by actively participating in an environment that is appropriate for their level of development. A good learning environment empowers children to become confident learners.

2.3 CHILDREN'S KNOWLEDGE AND CONCEPTIONS

Wilke (1997: 49) defines environmental knowledge as knowledge about a large array of environmental issues. These issues would be local in the early years of children, and expand into more regional, national and international concerns at succeeding grade levels. As children grow older, their information about issues increases in depth and quality. Palmer (1995) takes the view that it is important to find out what knowledge learners have about the

environment so as to be aware of their incomplete knowledge, biased or stereotypical thinking which may constrain their understanding of environmental issues. It is important for educators to understand the nature of children's early knowledge and awareness of their physical and biological environment. Understanding the development of environmental knowledge is becoming increasingly important.

According to Gambro and Switzky (1996) young adults, the next generation of voting citizens, will be required to make vital decisions on environmental issues and as such they should be knowledgeable about the environment. The same sentiments were conveyed by Bradley and Zajicek (1999) when they argued that young people's environmental knowledge is important because young people ultimately will be affected by and will need to provide solutions to environmental problems arising from present-day actions. As future citizens, policymakers, consumers and voters, today's youth will be responsible for 'fixing' the environment, and they will be the ones who must be persuaded to adopt and pay the costs of future environmental policies (Bradley and Zajicek; 1999). Palmer (1995) takes this issue further by highlighting that young children who are about to enter the stages of formal education know a good deal about their environment and many posses a range of accurate content knowledge relating to people and their bio-physical surroundings, knowledge acquired before the influence of formal education programmes. In support of this view, Palmer and Suggate (2004) maintain that by the time they reach school age, young children have considerable knowledge of the world they live in. They have also acquired a number of skills, such as language and problem solving strategies. It would be very surprising, therefore if children did not bring with them theories and ideas about the environment when they first enter school.

Frick and Kaiser (2004) argue that knowledge is essential for successful action. In Environmental Education knowledge is provided to encourage people to avoid harmful behaviours such as pollution, littering, veld fires, deforestation and all other activities that endanger living creatures. It is thus important to design environmental education campaigns with a profound

understanding of the underlying knowledge structure. In his research on young people's conceptions of the environment Loughland (2002) indicated that environmental education needs to be based on children's understanding of the environment rather than on assumptions of what children know and believe. Sharing the same sentiments is Geelan (1997) who contends that learning depends on discovering what children already know and building on those foundations. Palmer and Suggate (2004) concurs with these views and stresses that a key question which surely underpins the teachers' task of designing an appropriate range of learning experiences for pupils, concerns the knowledge which they (the pupils) bring to the situation. In other words, the teacher must have some understanding of existing subject knowledge, skills and concepts, in order to build upon these in a meaningful and progressive way. Stevens (1997) also agrees that what students learn is heavily dependent on the understanding they bring to the task and that students come to class with many ideas and explanations about natural phenomena. From these deliberations, some inferences can be drawn to the effect that it is certain that a great deal of prior knowledge is brought to the learning situation.

Several empirical studies on specific aspects of environmental knowledge (recycling, how children see plants, waste management, photosynthesis and plant nutrition, water management and matter) indicate that children have low levels of environmental knowledge though. Chacko (1998) indicated in his study on comparison between rural and urban students that the factual and conceptual knowledge of a majority of children from these areas are low. Furthermore, Chacko also argued that children living in different environments may have radically different views of the environment. Similarly, Loughland (2002) noted that the meaning of the environment is not clear to young people. Continuing in the same vein, Dlamini (1995) noted that an alarming number of pupils in the North West Province (South Africa) are environmentally illiterate, while Araboglou (1993) noted that children at all grade levels have little knowledge and understanding of how local government and water management operates. Ambrose (2000) also concurred with these findings that, in general, children have limited knowledge

of concepts related to the environment. Whether the picture has changed remains to be established by this study.

Apart from the children's level of knowledge and supporting the idea that EE has to be seen as a strategy in achieving environmental improvement, other studies point towards the role of educators in helping children develop environmental awareness and knowledge. In their understanding of children's knowledge, several researchers regard the educators' role as crucial. Palmer (1995) suggests that there is a need for educators to pay close attention to progression in accurate understanding when planning topics on environmental issues for young children. Concurring with this view Chacko (1998) noted that better informed educators can probably help their learners become more aware of their environment. He further points out that what is learnt by children at an early age will have a strong influence upon their attitudes, values, decisions and ways of solving environmental problems. Sharing the same sentiments is Tunnicliffe and Reiss (2000) who highlighted that educators need to discuss with their pupils, their (the pupils') prior knowledge before attempting to teach them new material. Also, that schools should play a greater role if pupils are to learn the accepted environmental views. Children need to understand how their actions affect the environment and how the environment affects them. In this way they will learn to become environmentally literate citizens. Supporting such views is Richardson (1996) who contends that educators need special training to involve learners in outdoor learning experiences. This is done so as to develop abilities to enhance the value of such experiences. Outdoor educators should have the knowledge and skills to awaken in learners' environmental sensitivity and appreciation (Richardson; 1996). Once this is achieved, learners are likely to be motivated to take an active part in environmental improvement and protection.

Loughland (2002) explored young people's conceptions of the environment. This researcher looked at how children understood the environment as a whole. Loughland uses the theory of constructivism to lay out the theoretical framework of his study. He notes that learners construct their own ideas about

how the world works and conceive of the environment as how it affects them. The study focused on phenomenography as a research method and the findings indicated that children describe the environment in six qualitatively different conceptions. Loughland showed that the limiting conceptions (identified as 1-3) were associated with an idea that the environment is some form of object, whilst the more integrated conceptions (identified as 4-6) were associated with the notion that there is some form of relation between people and the environment.

On the other hand Jeronen and Kaikkonen (2002) used a case study approach to investigate thoughts of children about the environment. Their narratives were based on the writings and interviews with the children and their findings identified themes that focused on environmental sensitivity, awareness, knowledge and action. The theoretical starting points that guided Jeronen and Kaikkonen's study on thoughts of children about the environment were feelings and emotions associated with environmental sensitivity, attitude and values associated with environmental awareness and values associated with responsibility. In contrast Tunnicliffe and Reiss (2000) approached their study from a constructivist perspective. These scholars mention that in order to name and classify a plant they see, children use their existing mental models to provide the plant with a name and classification. The authors carried out fieldwork to understand how children see plants and their findings indicated that children classify plants under "edible" and "poisonous" and that the naming and classification is at the expense of environmental understanding.

Chacko (1998) explored the understanding of environmental concepts and issues (such as population, wildlife, endangered species, energy, ozone layers and acid rain) among grade 10-12 students from urban and rural schools in South Africa. The study involved the use of questionnaires, observation of the school setting and discussions with some students. Chacko found that the knowledge and awareness of environmental issues were limited and that students from schools in urban areas had better scores than

students from schools in rural areas. These results, in summary, indicate that the majority of students have low levels of environmental knowledge.

A study conducted by Palmer (1995) indicates the understanding and misunderstanding of concepts related to waste management. This study described semi-structured interviews and discussion methodology to ascertain details of children's knowledge and misconceptions about this key environmental issue. The study involved children from 4-6 years old, and the findings seem to indicate that higher levels of understanding were demonstrated by 6% of the 4 year olds, who could explain that some waste can be recycled whilst other materials cannot be. Furthermore, Palmer found that about 2% of the sample understood the concept of conservation or reduction of waste. The study raises some important implications for teachers of children in the first three years of schooling. This was more so because the study described also formed part of a larger international research project which focuses on environmental subject knowledge and development of concern for the environment. In a document entitled 'Toward a rationale for recycling in schools', Cherif (1995) maintains that recycling can reach a level of collective consciousness if educators begin at the fundamental level- by teaching school children that it is an essential and natural mechanism that has created and sustained life on earth. Cherif further recommended that the teaching of recycling should be emphasized and that children should be shown real examples of recycling at all biological levels.

According to Ambrose (2000) there is a dearth of literature on children's conceptual knowledge. Conceptual knowledge refers to knowledge of general patterns of an environment (Guth & Reiser in Ambrose; 2000). Ambrose explored a study on 'Sighted children's knowledge of environmental concepts and abilities to orient in an unfamiliar residential environment'. In an unfamiliar residential neighborhood children were individually evaluated and compared on their conceptual knowledge of a (familiar) residential neighborhood. The findings of this study indicate that the 6 year olds demonstrated some basic concepts of residential environments but did not demonstrate oriented travel in an unfamiliar residential environment. They focused primarily on near

space and paid little attention to the route as they walked. In contrast, the 10 year olds demonstrated oriented travel and conceptual knowledge of a residential neighborhood and seemed to apply these concepts and remained oriented to the unfamiliar residential neighborhood. They used their knowledge of objects in the environment at a variety of distances from them and were able to return to their locations. These children displayed confidence while walking, knowledge of the environment, and an awareness of their location in the environment. This study generated insights into factors that may be related to way-finding and added to the empirical data on the assessment of orientation and mobility in children. However, Ambrose (2000) concluded that more research is needed to develop protocols that assess children's age-appropriate orientation and mobility and to identify age-appropriate concepts for children aged 6 and younger.

Some scholars in Environmental Education suggest that knowledge is essential as it raises general awareness and provide individuals with the confidence to voice opinions on environmental issues. Fisman (2005) focused on children's ecological knowledge and their awareness of the form and features of their local environment. This emphasis is aligned with Sobel's (1996) research, which suggests that elementary school students are not developmentally prepared to deal meaningfully with major environmental issues. Fisman (2005) contends that teaching children about positive aspects of their local environment would build their sense of caring and connection to the place where they live. He further stresses the fact that the goal of EE is to produce citizens who are knowledgeable about the bio-physical environment and its problems, aware of strategies that can be used to deal with those problems and actively engaged in working towards their solution. The main aim of that study was to examine the effects of an urban environmental program on children's environmental awareness of their local bio-physical environment. Given that the urban ecosystem comprises both built and natural forms, awareness in this study includes both nature (soil, water, rocks) as well as awareness of the built environment (buildings). Fisman's study involved a combination of qualitative and quantitative data. Three different forms of data from children were used: knowledge questionnaires, drawing

exercises and semi-structured interviews. The findings from the study indicate that students' awareness on the physical environment had not changed as a result of their participation in the program but indicated little gain in awareness of bio-physical environment.

In view of the foregoing factors, the present study focuses on the following set of issues as identified in this review; children's knowledge and conceptions about the environment and children's individual construction about environmental issues.

In order to understand children's knowledge and conceptions, Padeliadu and Paraskevopoulos (1998) conducted a study to provide information on the environmental knowledge of 5th and 6th graders in a Greek city. This survey study was meant to examine children's knowledge about plants, animals, energy, pollution and the interaction between humans and nature. It was found that students referred mostly to plants that grow in parks, gardens and pots-places, where students have had personal and direct experience. Students also named many plants that include edible parts or fruit only. These responses seemed mostly to have been as a result of information written in their textbooks. The findings of the "Greek study" indicated that children's knowledge about the environment is influenced by their immediate experience as well as by the content of their textbooks. Overall the children's knowledge about plants and animals is however, limited. With regard to energy and pollution the results further indicated that children did not understand these concepts and were not capable of discriminating between cause and effect.

Similarly Gambro and Switzky (1996) conducted a national survey of American high school students' environmental knowledge. Environmental knowledge was defined as a student's ability to understand and evaluate the impact of society on the eco-system. This knowledge was demonstrated by recognizing environmental problems as well as comprehending the origins, implications and consequences of those problems. The researchers reported disappointing levels of knowledge about environmental issues such as acid rain, the greenhouse effect and future sources of energy. The researchers

found that in 12th grade the average student could not correctly answer four of the seven items on the scale, and only approximately one third of the high school seniors correctly answered five or more of the items.

Another body of research seems to show that children's prior knowledge can significantly influence classroom teaching and learning. A case study explored by Ozay (2003) found out that students have varying levels of knowledge about photosynthesis, respiration and energy prior to teaching. The aim of the study was to investigate the misconceptions held by grade 9 students in Turkey about photosynthesis and plant nutrition. A questionnaire was constructed comprising seven open-ended questions designed to test students' conceptions about important areas of plant biology. Results showed that many students had conflicting and often incorrect ideas about photosynthesis, respiration and energy flow in plant eco-systems, even after teaching. This suggests that students' initial ideas are deep-rooted and difficult to change. By developing curricula and helping teachers become more aware of students' misconceptions, a different approach to teaching EE may help to reduce students' difficulties in understanding environmental concepts.

In their research on children's environmental knowledge Makki et al (2003) discovered that grade 10 and 11 students had inadequate knowledge of basic environmental concepts and issues. The understanding derived from this article on 'Lebanese secondary school students' environmental knowledge and attitudes', is that children are willing to take the necessary actions to protect the environment, but lack the knowledge base to make informed decisions. Questionnaires were used to assess the students' environmental knowledge, attitudes, beliefs, affect and intentions and commitment to environmentally friendly behaviors. The results indicated that participants had favorable attitudes towards the environment but lacked in their environmental knowledge and that environmental knowledge was significantly related to parental education level and to participants' environmental attitudes, beliefs, affect and behavioral commitments.

A further point is that it is important for children to know about global environmental matters so as to understand causes and consequences of different environmental problems. In a study investigating perceptions of how major global environmental effects might cause skin cancer, Boyes and Stanisstreet (1998) indicated that a high proportion of students were aware that depletion of the ozone layer leads to a higher penetration of ultraviolet rays, which in turn may cause an increase in the incidence of skin cancer. However a large proportion of these students confused the action of heat rays with that of ultraviolet rays and they also thought that raised temperatures are culpable. Only 1 in 10 of the students exclusively held the scientifically correct model: that ozone depletion, via higher penetration of the ultraviolet rays, may lead to skin cancer.

Mussler and Malkus (1994) also argue that children express concern about the environment. The authors described the development of a scale to measure environmental attitudes of children. The scale items reflected children's knowledge of environmental issues and it used an age-appropriate format. This was a quantitative study administered to 8-12 year olds. The findings from this study indicated that some children display positive attitudes towards the environment. Environmental knowledge displayed in this study involved knowledge about saving water, recycling, sources of water, plant protection, rain forests and waste management.

Loughland et al (2003) examined the factors influencing young people's conceptions of the environment. These factors were explained because the relationship of the factors and the children's knowledge would seem to be an important aim of environmental education. In their research, the authors looked at the factors – both demographic and those based on students' views expressed in the questionnaire that correlated with the students' expressing a relation conception of environment rather than an object conception. The factors identified were location, population, socio-economic, school year and language background.

Some studies highlight the development of environmental knowledge and awareness among children. A longitudinal study was conducted by Palmer and Suggate (2004) in this regard. They investigated the acquisition and development of environmental knowledge, awareness and concern in young children. Their report was based on one aspect of the study; namely the development of children's ideas about environmental issues between the ages of 4 and 10 years. The study used a combination of autobiographical and semi-structured interview techniques of data collection with both qualitative and quantitative forms of analysis. The results were grouped into three sections: First, the children's factual knowledge about two distant environments (rain forests and polar lands) was considered. Secondly the children's ideas about the reasons for and the effects of environmental change in the two areas were discussed. Thirdly the types of reasoning used by the children in their explanations of the effects of environmental change were examined. The analysis of understanding in Palmer et al's study indicated that children as young as 4 years of age are capable of making simple accurate statements about the effects of major environmental change on habitats and living things. Occasionally by the age of 8 and certainly by the age of 10, pupils are capable of appreciating and explaining the complexity of some of the relationships that exist among plants, animals and their habitats, and to provide accurate reasoned explanations of some of the effects of significant changes to global environments.

Connell et al (1999) explored how young people perceive the environment by giving them opportunities to identify their own sense of priorities and to use their own words as they talk about their concerns, feelings and ideas on the causes and possible solutions to environmental problems. The authors conducted a pilot study with young people aged 15-17 years to assess the value of focus group interview methods for this purpose. According to them the pilot study confirmed the value of the focus group as a powerful technique for giving young people the opportunity to speak of their environmental views in contrast with the way quantitative surveys can tend to pre-define and limit the views that young people can express. In their explanations of the findings, the researchers indicated that the young people surveyed placed

most trust on information about the environment which they gained through personal experience or from people living in their own area. Their main findings were that young people were knowledgeable about the environment and were aware of, and very concerned about a range of local and global problems. These scholars also reported that young people believed that the two major causes of environmental problems were people being too lazy to care and powerful institutions, such as big business and governments, that chose to put profits ahead of the environment. In their research the authors discovered that young people were generally pessimistic about their future and felt powerless to do much about the environmental problems. However they also hoped that government and industry would change and indeed believed that education could help empower people to save the environment. The findings of this pilot study extended and elaborated upon previous studies of young people's environmental attitudes, knowledge and behaviour. Indeed the pilot study identified several interesting aspects of young people's environmental attitudes that had not been considered in previous studies based on questionnaires. Firstly it identified the important role of personal experience as a source of environmental information. Secondly it established that the young people who participated in the pilot study understood environmental problems to be the result of individual lifestyle rather than structural causes; and thirdly, that they displayed relatively low levels of confidence in their capacities to contribute to environmental change.

It is important to note that the child's knowledge is the product of their interactions with a variety of settings and media. Kola-Olusanya (2005) explored a study to understand where children learn outside of school. The researcher examined the different informal learning contexts for children; home, museums, zoos, nature parks and wilderness and indicated how learning occurs in such settings and also how these domains can contribute to free-choice environmental learning. The author concluded that free-choice learning settings provide learners with opportunities for direct experience with real objects, people or places. This suggests that learning settings such as the home, zoos and museums can be used to provide opportunities for intrinsic and self-motivated learning experiences, and stimulating learning

environments with the goal of developing positive relationships with and understanding the environment. This type of learning encourages change in learning about the environment, improves levels of interest and increases knowledge through contextual cues from the outside world (Kola-Olusanya; 2005). Tunnicliffe and Reiss also agree that the home is predominantly the source of such environmental knowledge, coupled with the children's direct observations out of school.

The literature reviewed for this study has provided a glimpse of how scholars internationally have tried to understand children's environmental knowledge in the different countries. This literature gives us an idea that different scholars approach children's knowledge and conceptions about the environment in different ways. Much of the literature reviewed focuses on studies conducted in well-developed countries. The literature is helpful, however, in the sense that it also provides an understanding of how children interact with their environment and reflects the way children interpret environmental issues and problems. Almost all researchers and scholars reviewed attach children's environmental knowledge to sources of environmental information such as; the home, the school, direct observation, personal experience and media. Other researchers though continue to stress on the role of environmental educators as crucial for such learning.

2.4 THEORETICAL FRAMEWORK

As mentioned in chapter 1, my review of the literature is mainly from a constructivist perspective. Current research and teaching is often underpinned by a constructivist approach, which recognizes that both individuals and groups of individuals construct ideas about how the world works. It is also recognized that individuals vary widely in the way they make sense of the world and that both individual and collective views about the world undergo change over time (Novak in Loughland; 2002).

Recently constructivist views of knowing, thus of teaching and learning have been showing up all across the learning areas. Reality, as Tice (1995) puts it,

has to be constructed by the knower, thus teaching and learning should themselves be constructive.

The literature on constructive learning theory suggests similarities between constructivist techniques and teaching strategies used by environmental educators. In contrast a review of literature on traditional classroom instruction suggests that the educator informs learners of the facts by teaching or demonstrating activities. This type of instruction is based on the theory that learners learn because teachers teach. An alternative approach is that of constructivism.

Bodner in Le Roux (2000:67) indicates that in constructivism knowledge is constructed in the mind of a learner. The work of educational psychologists like Piaget, Ausubel, Bruner and Vygotsky made educators recognize the importance of learners' prior knowledge and how learners use this prior knowledge to gain new knowledge (Le Roux, 2000:67). Palmer and Suggate (2004) agree that in meaningful learning, as contrasted with rote learning, individuals relate new knowledge to relevant concepts and propositions that are already known. This view of learning assumes that young children actually know a good deal as and when they enter schooling and that education is a process of re-education: reconstructing what they already know and value it into new patterns (Palmer and Suggate; 2004). In line with Ausubel's belief that the most important single factor influencing learning is what the learner already knows, it is understood that learning will inevitably be more successful if teachers can relate to and build upon pupils' existing understandings of whatever concept or phenomenon is being addressed.

The implication of a constructivist perspective, as outlined by Klein and Merriet (1994) is that "*knowledge is actively constructed by the cognizing subject, not passively received from the environment"* and *"coming to know is an adaptive process that organizes one's experiential world; it does not discover an independent, pre-existing world outside the mind of the knower".*

Geelan (1997) eloquently puts it;

"Constructivist perspectives on teaching and learning generally affirm two principles: knowledge is actively constructed by learners, rather than transmitted by teachers; and such knowledge is constructed on the foundations of student's existing knowledge"

The theoretical perspective highlighted here can be developed to provide an understanding about the implications for teaching and learning in the classroom. This perspective allows learners to explain their past experiences and it is necessary for educators to take this into account in teaching. Individuals seek understanding of the world in which they live and work and develop subjective meanings directed towards certain objects or things (Creswell; 2003). Consequently these meanings are varied and multiple. The basic generation of meaning, according to Creswell, is always social, arising in and out of interaction with humans. In other words, meaning is not simply imprinted on individuals but formed through interaction with others (hence social constructivism) and through historical and cultural norms that operate in individuals' lives.

By drawing on the works of different researchers (Klein and Merriet; 1994, Geelan; 1997, Tice; 1995 etc.) I am able to add to my framework the role of educators in fostering children's knowledge and conceptions about the environment. Klein and Merriet (1994) take the view that teachers need to modify questioning based on an understanding of children's prior knowledge and thought processes. After a problem has been presented to children, they must take initiatives and risks in attempting to solve the problem. They need to ask questions that assist them to clarify their positions and validate learning. As children engage in investigating problems they are responsible for making sense of their world and constructing new relationships.

The theoretical starting points as highlighted by Jeronen and Kaikkonen (2002) indicate the elements that form the life-world of children, being the natural and the cultural environment, where cultural environment includes both the built and the social environment. The scholars also highlight that

feelings and emotions are features of life experiences that forms a basis of environmental sensitivity. Environmental awareness is, on the other, hand seen as the wholeness of observations, attitudes, wishes, fears and appreciations concerning the natural environment, our cultural environment and any relationships between them (Jeronen and Kaikkonen: 2002). According to the scholars, a person who is aware of environmental issues has descriptive and interpretative knowledge about separate facts phenomenon and cause-response relationships in the environment. He or she understands the ecological problems and is aware of the effect of human beings on the environment. The readiness includes the will and skill to act for a better life and what it leads to in responsible action.

Overall, the research reviewed here seems to speak in one voice that children's prior knowledge should be taken into consideration and that a meaningful orientation to environmental education would be one where a student's own experience of the environment is explored and then challenged. Educational programmes need to be developed that acknowledge children's understanding and such programmes should focus on helping students shift their awareness from the limited views to the more expansive views. In the present study, I have thus taken note of the major themes and findings of the literature to develop possible areas of exploration and ways of making sense of my data for this South Africa study.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

This research study was aimed at uncovering the knowledge and conceptions of children about the environment and other issues relating to the environment. It uses a qualitative research approach as its mode of inquiry. In my approach, I employed data collection strategies that assisted me to be closer to the children, to explore their school environment and to interact with them personally in order to get a clear understanding of how they conceive of their environment.

The main data collection techniques used in the study were the interviews. I began the study by exploring the literature, to get a sense of how such children's conceptions about the environment have been studied and analysed in the literature. That is, what knowledge already existed with regard to children's conceptions and views regarding the environment, and the gaps that exist in this regard. I then arranged for semi-structured interview conversations with the learners. The semi-structured interviews conducted were face-to-face interviews with children at the schools. Nineteen questions were prepared prior to the interviews as initial prompts, but some were subject to change, with additions and follow-up done based on the children's responses. The interviews were conducted at three different schools, with four children from each school.

The main research problem to be explored in the study as stated in the previous chapter was to apply qualitative research approaches to find out what knowledge and conceptions children bring along to the learning of EE in the primary school classroom, and how these knowledge and conceptions may be used as a basis for challenging and improving their understanding of the environment and other related concepts. To explore this research problem, I developed and pursued the following critical research questions:

1. What are the children's conceptions about some critical concepts in Environmental Education? (Selected concepts are pollution, recycling, conservation and environmental protection)
2. How are these conceptions developed; what seems to be their origins and what shapes these conceptions?
3. How does the knowledge and conceptions of these critical concepts shape children's environmental practises outside the classroom?

The purpose of this chapter is to outline the data collection approaches and procedures. The research methods used to gather data are also explained, justified and motivated by comparing with some relevant literature.

3.2 RESEARCH DESIGN

It is important before research is undertaken to create guidelines that would give order and direction to the research project so as to assist the researcher not to lose focus of the research inquiry (Burton and Bartlett; 2005). This is done through research design and methodology.

My research design details all the issues involved in planning and executing a research project – from identifying the problem through to reporting and publishing the results (Punch; 2005). In contrast, at its most specific level, the research design of a study also refers to the way the researcher guards against and tries to rule out alternative interpretation of results (Henning et al; 2004).

3.2.1 Qualitative Research Approach

This study adopted a qualitative research approach to understanding the knowledge and conceptions of children about their everyday experiences within their environment.

Qualitative research, according to Garbers (1996) aims at the development of theories and understanding. The objective of qualitative research is to promote better self-understanding and increase insight into the human condition. In qualitative research the emphasis is on improved understanding of human behaviour and experience. As a qualitative researcher I tried to understand the ways in which different individuals make sense of their lives and to describe those meanings. In the present context, I was interested in the lives and sense making by the primary school children of South Africa. One of the chief reasons for conducting this as a qualitative study is that the study is fairly exploratory. This is primarily because not much has been written about the topic or the population being studied in this particular case. I have not come across many studies of children's meanings and interpretations of environment and environmental education within the South African (or even African) context. I therefore wished to listen to the children participants and build an understanding based on their ideas.

I took advice from Creswell's observation that in a qualitative approach the inquirer often makes knowledge claims based primarily on constructivist perspectives, that is the multiple meanings of individual experiences, meanings socially and historically constructed with an intent of developing a theory or pattern (Creswell; 2003).

I expected to obtain the views and perspectives of children as key informants; that is, what they say, understand and do. I sought to probe deeply into the research setting in order to obtain an in-depth understanding about the way children understand the environment. I was not only concerned with the way things are but also concerned with providing insight into what children believe and feel about their environment.

3.3 RESEARCH ROLES

Qualitative research is interpretative research with the researcher typically involved in a sustained and extensive experience with participants. This introduces a range of strategic, ethical and personal issues into the qualitative research process (Creswell; 2003). With these concerns in mind, qualitative researchers explicitly identify their biases, values and personal interests about their research topic and process. Other elements of the roles of the inquirer are to gain entry to a research site and ethical issues that might emerge.

As a qualitative researcher I had to protect the interests of participants. This I did by assuring them that they would not be identified by name. I also assured the participants confidentiality. Confidentiality according to Gay and Airasian (2003) means that I know the participants names but promised not to divulge them, while anonymity means that no one would know the participants' names.

Although it was difficult to identify all the potential problems that could arise in a research study, I made it my responsibility to be aware of and avoid threats to study participants.

I requested principals of schools to issue out consent forms to parents who would allow their children to participate in the study as the study involved minors. In the consent form I explained to parents that they have the right to withdraw their children at any time from the study. The informed consent forms are useful for both the researcher and the participants and ensures that both know their reciprocal rights and expectations (Gay and Airasian; 2003). In the consent form I also explained to the parents the nature of the study and the expected roles and activities of the participants. At all the three schools, I was striving to achieve mutual trust with participants as this underlies all research studies (Merriam; 1998).

For the purpose of this study, I adopted the role of an **interviewer.**

McMillan and Schumacher (2001) define interviews as *open response questions to obtain data or participant meaning; how individuals conceive of their world and how they explain or make sense of the important events in their lives.*

In this study I conducted face-to-face interviews and personally visited the schools to interview the children. The children's responses were tape-recorded, with full permission and consent from their parents. This was done to ensure reliability and that important information could not be omitted. I initially prepared open-ended questions for all participants. I opted to use open-ended questions so that participants could best voice their experiences freely. The open-ended questions allowed participants to create their own options for responding. I regarded the interview as important because it provided useful information and permitted participants to describe detailed personal information. With the interviews I had better control over the types of information received since I could ask specific questions to elicit information.

I used semi-structured interviews because they involve direct interaction between the researcher and the participants. As the interviewer I was free to move the conversation to cover any issue of interest that could come up. I also asked supplementary questions not included in the schedule so as to explore general views or opinions in more detail.

Again I opted to use semi-structured interviews because they are built up of open-ended questions that allow participants to answer in whatever way they choose. This makes them useful for investigating sensitive topics. Although interviewers have little control over semi-structured interviews, they are a means to obtain directives as to what interviewers know and have little knowledge about (Creswell; 2003)

Interviews aimed to ascertain pupils' knowledge about environmental issues, to identify common gaps in knowledge, partial knowledge, misconceptions and stereotypical ideas and to illuminate types of reasoning employed by young people in the articulation of environmental knowledge.

A problem that I encountered during interviews was that my presence affected how the participants responded. Some children were uneasy even though I tried to make them relax before the interviews by engaging in some small talk. In addition the presence of a tape recorder made some children feel uncomfortable. However I managed to give attention to the conversations and re-assured participants that no harm will affect them.

At the three schools I was offered a suitable room for conducting the interviews. The principals assured me that they would try very hard to avoid distractions that might occur.

This study relies entirely on the information given by participants during interviews for findings and conclusion. Therefore it was important to ascertain that the interview process becomes effective and reliable.

3.4 SELECTION AND DESCRIPTION OF THE SITE AND PARTICIPANTS

The study was conducted in three primary schools. These schools are situated in the North West province, which is one of the nine provinces of South Africa. The education department in North West province is divided into five regions. I chose to focus on the region where I am presently employed, which is Bojanala East Region. This regional office is at Hebron village, about 40 km from Pretoria. The region is divided into four Area Project Offices (formerly known as circuit offices). Again, I decided to focus on the APO where I work, which is Moretele APO. This choice is due to the fact that the schools are near to my residential area and also within my workplace, as such I did not travel long distances for data collection for this project. As a deputy principal, I am also familiar with most principals in this APO because of our interaction in meetings and projects related to the department.

The majority of schools within Moretele APO are rural, known for poverty and for being under resourced and as such classified under the *poorest of the poor* by the department of education (National Norms and Standards for

School Funding; 1998). The buildings are old, mostly with no libraries nor laboratories. The communities are only black, with a variety of ethnic groups such as Northern Sotho, Ndebele, Tsonga and Tswana. To gain access to these schools, I wrote letters requesting permission to conduct the study to the area project manager and to the regional manager. I personally delivered the letters and the APO manager referred me to the Institution Support Coordinator (ISC). I explained my study to the ISC; she signed it and informed me that she would announce this to the principals as she was scheduled to meet them in the same week. However she requested me to send separate letters to the identified schools.

I sent out the letters to the schools that formed part of the sample with dates and times of the interviews, still to be confirmed telephonically (letters requesting permission and granting permission are given in the appendix) and also to the regional education department and the APO. I concentrated only on schools willing to participate in the study. I decided to focus on the first three schools to reply in time (that is, within a week of the initial request) as I was already behind with my own time lines regarding the study.

3.4.1 Sampling

Only twelve children were needed for this study from the three schools (four children from each school). All three schools presented class registers from which children were randomly selected. Concentration was on the grade 6 learners, as this is the highest grade in all the schools in Moretele APO. I chose to focus on the grade six learners based on my experience that these learners would have at least come across some environmental concepts from the earlier grades and they are presumably relatively mature at this stage. The children were randomly chosen. Every child had an equal chance of being selected but only a limited number was required. The number was deemed appropriate for the study because it would be manageable, and as such assisted me to obtain a better understanding of my research questions. I also regard the sample as reasonable because it is not a survey, which demands a larger sample size. A qualitative study requires information rich in

depth, description and context, as such a large sample would be irrelevant for the purpose of my study.

3.5 DATA COLLECTION PROCEDURES AND STRATEGIES

Data for this study was collected from three different schools. This included 40- minute recorded interviews with the participants. In addition, the participants agreed to record impressions of their experiences, thoughts and feelings in a tape recorder. Data was collected after permission to conduct research was granted by the regional department of education, the APO and the relevant schools.

School A (Swaranang Primary School)

I started with my data collection at this particular school. I arrived at this school at 7h30 in the morning because my appointment was scheduled for 8h30 and I needed to conduct all four interviews and finish them within one day. I anticipated that this would be possible as each interview was assigned 30-40 minutes.

This school is situated in a rural village known as Zuuferkuil, about 40 km north of Pretoria. It is a big school which has four blocks of six classrooms each. There is one administrative block, which consists of the principal's office, the deputy principal's office and the administrative assistant's office. There is a classroom next to the deputy principal's office, which has been converted into a computer room with 21 computers. The school has electricity and water. The school yard is very big, with natural thorny trees. The surroundings are not well looked after because I could notice papers and plastics in the yard. This suggested to me that littering was definitely a problem here. When I approached the school blocks I however noticed that there was a big drum that served as a dustbin towards the entrance.

I arrived at the same time with a number of educators and waited next to the administration block. One educator started to supervise paper pick-ups in the

yard and outside the gate. The principal then arrived and invited me to the office. I explained my mission and the principal reassured me that all stakeholders were informed about my visit and that I could start right away. The principal then made arrangements for me to use the deputy principal's office as she was on leave. I chose four learners from the grade six classes through the class register and we all gathered in the office. To avoid confusion and possible problems I started a briefing session with all four children before the interview phase began. The principal had in the meantime organised a sign-post "DO NOT DISTURB. INTERVIEWS IN PROCESS" and pasted it on the door. This was the most welcoming attitude I have ever come across.

The briefing session lasted for about 10 minutes with the children given the chance to raise questions on issues of clarity. The children had by this time decided on their own as to who would go in first. I realised that the children at this school were relaxed and looking forward to the interview. I started the interviews at 09h00 where I had nineteen questions prepared for all respondents. At 13h30, I was done with the interviews and thanked the children and the principal and left.

School B (Makeng Primary School)

This is the second school that I visited. The school is situated in a village known as Waleman, about 30 km from Pretoria. My appointment was scheduled for 8h30 as well and I arrived at 08h00. I met one boy who was late for class who directed me to the principal's office. As I walked towards the office I observed the school surroundings. There are no trees planted except for the natural trees that looked like they existed for ages. The school buildings are old but neatly painted. There was no one in the office and one educator who saw me standing outside the door came and ushered me into the office, then went to call the principal who was in class. The principals' office is a very small room, fully packed, with a photocopier and a computer on the other end. A woman probably in her early 50's came and greeted me with a friendly smile. She introduced herself as the deputy principal and indicated that the principal was attending a meeting at the APO.

I introduced myself as well and by this time I could realise that my appointment was totally forgotten despite the fact that I had previously called the principal to confirm. However the deputy principal informed me that my letter was received well in time and she immediately drew a file where the letter was kept. Indeed the letter had been circulated to all educators as their signatures were appended. I explained the procedure I was going to follow and likewise the deputy principal brought the grade six class lists.

There was a lot of movement at this school, I thought maybe because the principal was not there. I then learned that two choirs had won at the APO level music competitions and they were proceeding to the regional level that same weekend. The deputy principal informed me that she would quickly remind the educators of my visit and get me the children. I anticipated a lot of noise disturbance because of the excitement but the deputy principal assured me that the situation would be controlled which is exactly what happened.

I conducted a briefing session with the children, who were excited and looked confident. There was a cheerful young boy among the group who was called *'President'*. I believe this nickname is because he indeed has a good sense of humour. When the children discussed about who would go first it surprised me that Mr 'President' actually wanted to be the last one, leaving the three with limited options. They finally concluded the order of the interviews and we started at 09h00. The interviews at this school took a longer time than I had anticipated. The children seemed to be more knowledgeable than the ones I had visited earlier on. I finished interviewing the children at 14h15, went to the office, thanked the deputy principal and left the office. A young boy was waiting for me and offered to carry my hand-bag and files. I now understood why Mr 'President' volunteered to be the last participant in the interviews. We walked up to the bus stop talking about soccer and laughing. I knew I had made friends at this school.

School C (Titso Primary School)

I visited this school a week after the previous one because of the music competitions. I wanted the excitement to cool off because this is one school in the cluster that is very active in such activities. I walked a long way from the bus stop to the school. The school is situated at Volenteen village, 35km from Pretoria, and surrounded by big trees. It is located outside the village. Although the buildings are old, this school looked cleaner compared to the first two. There are beautiful trees and flowers in the schoolyard. I also noticed that even roses were planted in front of the classrooms. I looked around as I was walking to the office and discovered that there was not even a single paper in the schoolyard. This, I thought, was an impression.

I could also notice the office and went straight to the principal's office. There I found a middle aged woman who invited me in. She introduced herself as the principal and I explained my mission. We talked a while about our studies where I learned that she was once a student at the University of Pretoria. She indicated that one educator had brought seedlings for the school garden, and that all grade six boys were busy planting those seedlings. However she went out and requested the educator to call the children back to class and suggested that they would continue with the ones who would not be participants in the study. She then requested the deputy principal, a gentleman almost my age, to assist me with everything that I required because she had a school governing body meeting to attend.

The deputy principal made the necessary arrangements with the grade six classes and together we selected children for participation in the study using the class registers. Upon selection we discovered that two of the selected children were absent and the deputy principal had to go back to class to mark the register. This was to ensure that the children we selected were all present. After selection of the four children we gathered in the deputy principal's office and I started with the briefing session. The deputy principal requested to be present in all interviews with the children and I did not object. I actually thought it would be better if the children had somebody that they knew around

than being in a room with a total stranger. He then requested one boy to act as a warder, making sure that no one entered the room.

The first interview started after the children had decided on the order of interviews. There is usually some noise in our schools, especially when the young ones go out for short and long break. This is a general problem in our rural schools. I could hear the principal trying to calm the children down. However the situation was under control immediately after short break.

I continued with the rest of the interviews and at 13h45 I was almost done. The children at this school were shy at first and not opening up compared to the ones at the previous school but the situation improved during the interviews. I thought this was because I was a total stranger to them. However, they were able to answer all nineteen questions. We discussed for a while about researches done at primary schools with the deputy principal and I thanked him and together we left for the principal's office. He then gave the principal a report of what transpired in the interviews. I left this school at about 14h30 and had to walk that long way to the bus stop again.

3.6 DATA ANALYSIS PROCEDURES

A data analysis plan must be in place when one conducts a research study. This plan is formulated as soon as data collection has been finalised and in fact even before. After the interviews, data was analysed through a coding system to identify similarities and differences and to come up with findings and conclusions.

The process of data analysis involves making sense out of text and image data. It also involves preparing the data for analysis, conducting different analyses, moving deeper into understanding the data, representing the data and making an interpretation of the larger meaning of data (Creswell; 2003). This is an on-going process involving continual reflection about the data, asking analytic questions and writing memos throughout the study. It is not

sharply divided from the other activities in the process, such as collecting data or formulating research questions.

The process of data analysis also involves using open-ended data, which requires asking general questions and developing an analysis from the information supplied by the participant.

I kept written records of the interviews and noted the dates, times and places. In order to manage the data I kept files for each respondent. I transcribed the tape-recorded data and followed the steps as recommended by Creswell (2003). I carefully read through the data to get the general sense of it, to identify key ideas from the interviews and to reflect on its overall meaning. I coded the data according to topics, which were generated from the data itself in the following manner; ideas that depicted environmental knowledge, environmental sensitivity, environmental awareness and ideas that depicted environmental action.

3.7 LIMITATIONS OF THE STUDY

Limitations of the study relate to potential weaknesses of the study. The limitations of this study are that; The fact that children generally do not have much background of Environmental Education, as it is not a separate subject in their curriculum should be taken into consideration as it may result in the possibility of the interview questions being unclear to them.

3. 8 VALIDITY AND RELIABILITY OF THE STUDY

Leedy (2001) contends that validity refers to the accuracy, meaningfulness and credibility of the research project as a whole. Creswell (2003) on the other hand maintains that to ensure external validity rich, thick and detailed descriptions has to be provided so that anyone interested in transferability will have a solid framework for comparison.

Validity and reliability of a qualitative study can be confirmed by establishing that the research findings and hence interpretations based on those findings are credible (McMillan and Schumacher; 2001).

In this study I provided a detailed account of the focus of the study, my role as a researcher, participants' position and the basis for selection and the context from which data was gathered. Participants were interviewed, interviews were tape recorded and accurately transcribed. Data collection and analysis strategies were reported in detail in order to provide a clear and accurate picture of the methods used in this study. To ensure reliability, validity and accuracy of the data collected, I used live interviews and taped records to enable me to cross-check the transcript over and over again. I read the data over and over to see if the segments, descriptions and explanations made sense.

3.9 CONCLUSION

The study of knowledge and conceptions of children about the environment required personal interaction with the participants. The interviews were conducted to get first hand information from the children themselves. Data was then analysed through coding to reach anticipated conclusions and findings of the study. In this chapter I explored in detail the procedures used to gather and analyse data for this specific study. Different data collection techniques such as literature review and interviews were used. Participants' responses were given during the face-to-face interviews with children and later analysed and conclusions drawn.

CHAPTER 4

MAJOR RESEARCH FINDINGS

4.1 INTRODUCTION

The previous chapter explained in detail the methodological approach used in the study. The methods of data collection were fully discussed as well as analysis procedures followed to realize the findings of the study. In this chapter the information gathered through interviews explained in chapter 3 are examined and discussed in detail. Interviews in this research played a major role, as most of the information provided by participants was essential in answering the major research questions. Different views and opinions about the environment were given by the participants.

4.2 MAJOR RESEARCH FINDINGS THROUGH INTERVIEWS

I used semi-structured interviews to collect data from the participants. The interview questions were prepared prior to the interviews and I had a larger control over the whole interview process. I had the power to add questions, augment with follow-up questions based on the answers provided by participants. I also assured the participants of confidentiality and made them comfortable and relaxed to answer questions. I noted, during these interviews with children gestures, facial expressions and body language that indicated the frustrations of not understanding the questions. This I rectified by explaining the questions further and in detail for the children to understand all questions as intended by the study.

The questions posed at the interviews required children to indicate their understanding of the environment, reflect their knowledge on environmental concepts such as pollution, recycling, conservation of plants, animals and water, and protection of the environment. Questions were examined and discussed according to the responses given by the children.

4.2.1 Children's understanding of environment

Children were asked two questions about the environment. The first question was; 'What do you understand by environment?' Eight out of twelve children understood the environment to be a place. Examples of the children's responses were: 'I think the environment is ……*our place; the world in which we live; our country; our houses; our village'*. Children described their understanding by using single word descriptions or by some fuller descriptions of the place. The meaning of the statements indicates that these children only experience the environment in a limited or uni-structural way. On the very same question, only three children understood the environment as a place that contains living things. This kind of conception describes the environment as place but it is different in that it includes living things such as animals. Examples from the children's responses are; the environment is*…our world with animals; animals in our village*. Only two respondents described the environment as a place that contains living things and people. This conception includes the first two but adds 'people' as a component of the environment. The example here is *'the environment is the world in which we live and people working in the environment'; 'our world with animals and people'*. One respondent described the environment as a place with living as well as non-living things. The example noted here is…'the *environment is a place with animals, people, water, houses and roads'.* This respondent described the environment in an inclusive way. The second question that required children's knowledge about the environment was 'What does the environment consist of?' Most children described the environment as consisting of natural and man-made objects. Examples of this conception are; the environment consists of..*trees, animals, people, sand, water, flowers, grass, stones, plants*. Generally speaking, children referred mostly to natural objects. Only few made references to *clothes, furniture, roads, fences, electricity, cars, houses and other buildings*. Only one child at 'School B' indicated that the environment consists of economic and political factors. The answer was stated as follows;

'*We have people working on our roads in the environment; we have the government, water, schools and surgeries for doctors'.*

Only one out of twelve children indicated that the environment consists of results of people's actions, for example littering and that it is the responsibility of children to clean up.

4.2.2 Children's knowledge about pollution

Almost all the children gave a general description of pollution as '*making the environment dirty'.* Some respondents stressed this by mentioning that the environment is made dirty by *littering*. When asked what they meant by littering the respondents indicated that '*people are throwing tins, plastic, papers, bottles anywhere'.* One respondent displayed a much more extensive understanding of pollution by mentioning the different types of pollution. The actual response was '*I also know of pollution as a result of papers, air pollution and water pollution- like when children play in water'.* Another respondent indicated that people pollute the veld by *'using it as a toilet'.* When asked to expantiate, this learner indicated that some people, when they are pressed, just hide behind the bushes to relieve themselves and this not only makes the environment dirty but is also a health hazard. On the question of what causes pollution, most respondents mentioned that it is caused by waste containers and materials (paper, plastic, tins, ash and bottles). Only one respondent indicated that substances such as oil and petrol cause pollution when spilled. Another respondent mentioned that there is also natural pollution which is 'dust'. Three respondents mentioned the following as causes of pollution;

1. *'Lack of knowledge about environmental protection and recycling'*
2. *'Animal excretions such as cow dung'.*
3. *Animals like rats which tear off paper, clothes and card boxes'.*

Children were then asked to explain how pollution takes place. All twelve children indicated that pollution is a result of people's irresponsible actions. Examples depicted here are; *littering, burning waste, not using dust-bins, throwing peels of oranges and bananas everywhere*. One respondent mentioned; '*I often see adults drinking beer and throwing empty beer bottles and tins everywhere. This is dangerous as children play with those*

bottles and tins'. Another respondent in 'School B' mentioned; '*In cases where people do not afford to buy dust-bins they must dig big holes in the backyard and dispose of their waste*'. A learner in 'School A' also made mention of the fact that '*when people burn waste, the flames can go up and damage electricity wires and poles, and we will be without electricity for some time and the smoke also cause diseases'.* It is very clear that children associate pollution with people's actions and their responses indicate that they are sensitive towards the environment.

4.2.3 Children's understanding of recycling

Four questions were based on children's knowledge about recycling. The children were expected to reflect their understanding of recycling by mentioning things that could be recycled, explaining how recycling takes place and how it can be encouraged. In defining recycling most children indicated that '*recycling is using things again'*. When they were asked what these *'things'* could be, most children mentioned plastic, paper, tins, bottles and boxes. Generally, children mentioned materials and containers as the only recyclable things. A respondent in 'School C' indicated that steel can also be recycled. This learner explained that steel is melted in big machines to produce new products such as silver rings. Two respondents in the same school mentioned household equipments such as television sets and radios, and indicated that these can be repaired and re-used, and old furniture that can be used to make new ones. In 'School A' an indication was made by one respondent that *'we also recycle seeds'*. When I asked him to elaborate he indicated that *'We buy seeds once and plant them. After some time the plants grow and we get the seeds again from them. We keep them for future planting. These are seeds for fruit, vegetables and mealies'*. Another respondent mentioned that books are also recycled. The response was put as follows; '*If I use exercise books this year and they are not full by the end of the year, I can still use them next year'.* Most children are familiar with recycling of paper, plastic, tins and bottles. In 'School A' almost all children indicated that they take bottles to the local store and the storekeeper gives

them money. However these children do not seem to understand what happens to the bottles thereafter. The fact that they get money in return motivates them to take even more bottles to the store. In explaining how recycling takes place, some children mentioned how they use paper, plastic and bottles. These include daily activities that children are engaged in. A learner in 'School C' mentioned that at their school, children carry books in plastics because they do not have school bags. Others mentioned that they use bottles to carry water to school as there is no water at school and that at home they use bottles to keep water in refrigerators. One respondent indicated that "*nowadays plastic is bought in shops, so we have to keep some at home to use as shopping bags'.* Another mentioned that paper is cleaned and re-starched in machines to make new books and steel is taken to the scrap yard and can be used to fix cars and make burglar proofs. A respondent in 'School B' made mention of the fact that; '*bottles are cleaned and taken to other countries, they pour some substances and change expiry dates and sell the stuff again'.* Another respondent indicated that; '*tins are washed and repainted and re-used'.* In 'School C' one respondent indicated that clothes can also be recycled. The understanding reflected by this learner was actually based on the 're-use' perspective. This learner indicated; '*we do not throw away torn clothes, we mend them and we can also donate them to poor communities'.* On the question of how recycling can be encouraged, most respondents indicated that education is the key. This is observed in the following responses;

'People who do recycling must educate the communities'

'People must be provided with information on how recycling is done'

'Provide recycling bags to people and reward them with money'

'Organize meetings, campaigns and write notices to inform people about recycling'

Most respondents indicated that awareness is an important factor in restoring environmental protection. The general idea reflected on this issue of recycling is that children are aware that waste cannot be left lying around. It should be placed in a bin, in a hole or the recycling people must come and fetch it.

4.2.4 Children's understanding of water conservation

Two questions on the interview schedule required children to provide their knowledge and understanding of water conservation. Most respondents indicated that taking pre-cautionary measures is extremely crucial when we deal with water. These measures include closing taps tightly after use, avoiding water pollution and using amounts only required. Two respondents mentioned that storing water is also an important way of saving water. These children displayed the following understanding;

'*We store water in drums and buckets for future use'*
'Water is also stored in dams. We must not pollute it by washing in dams or by throwing waste in it'.

Another respondent indicated that water is purified by chemicals and used again. This respondent displayed an understanding of water recycling. Two other examples of saving water were as follows;
'*When I drink water, I do not fill the whole glass because I know I will not finish it. If I happen not to finish the water in a glass, I put it away for the next time when I am thirsty'.*
'*At home we water the garden only with water that has been used, like water used to wash dishes, clothes, clean and sometimes we fetch water from the local river to use in our garden'.*

Only one respondent indicated that dams are used to store water and as such people should avoid polluting dams. On the question of why is it important to save water, almost all respondents mentioned what they use water for. This is reflected in the following responses; …'*bath; wash clothes, dishes, cars; drink; cook; water the garden'.* All these responses indicate that children regard personal use of water as most important. One respondent from 'School C' indicated the issue of sustainability. This is reflected in the statement; '*we need to save water for future use, so that when water is scarce one day, our children can survive. If we waste water we will die of thirst one day'.*

4.2.5 Children's understanding of animal conservation

Only two questions were asked to respondents to indicate their understanding and knowledge of animal conservation. Children were expected to explain how and why animals need to be protected. The basic facts mostly indicated were that animals need food, shelter and water. Five out of twelve respondents indicted that; '*wild animals should be taken to the zoo, they cannot roam around everywhere'.* Only two mentioned that some animals are protected in farms, camps and game lodges. Two other respondents displayed sensitivity towards animals by mentioning that people have to stop abusing animals. One indicated that children beat donkeys, ride on their backs, and throw stones at them. The other one mentioned that some people kill animals just for fun. This respondent also indicated that animals must be taken to hospital when they are sick. Some respondents indicated that wild animals should be kept away from the village by erecting a high and strong fence between the village and the veld. Only one respondent from 'School A' mentioned the issue of illegal hunting. This learner indicated that this type of activity must be reported to the police and the responsible people should be punished. On the question of why animals should be protected, most children explained how useful animals are to people. Some of the responses are as follows;

'….*like the dog it guards our house at night'*
'…*some animals provide us with meat, milk, skin, feathers and wool'*
'We slaughter cattle at weddings, for funerals, and at parties'
'My grandfather uses his donkey cart to fetch water from the river'
'*I have a cat at home; I like it because it keeps away mice and snakes'*

Three other respondents made mention of the fact that animals also deserve to live just like human beings. An interesting idea that came up in 'School A' was that *'animals make our environment beautiful'.* This learner elaborated by indicating that '*it is so nice to watch birds flying, fish swimming and cattle grazing in the veld'.*

4.2.6 Children's knowledge of plants

There were three questions based on children's knowledge and understanding of plants. Children were required to name the plants that they know and indicate how and why plants have to be protected. All children named *fruit trees, vegetables, flowers, grass, mealies and natural trees*. On the question of how plants should be taken care of, children generally referred to 'watering'. Some children also indicated the following;

'We prune our roses so that they grow nicely'
'I make nice beds for my mother's flowers'
'I use rich and fertile soil to plant flowers'
'At home we have made a fence around the garden to keep animals away from the garden'
'I mix soil with cow dung to make manure and then plant vegetables'
'We protect plants from the wind and the sun by covering them with orange bags'
'It is important to remove weeds from our gardens'

One respondent from 'School A' indicated the following; '*There is a big garden, I forgot what they call it, but I know it has all these beautiful flowers and trees, some are very old. People go there to see these trees and flowers and they are also able to buy the seedlings and plant them at home'.* On the question of why plants need to be protected, most children indicated the importance of plants as follows;

'*We use flowers to decorate our homes'*
'Fruits are important food in our bodies; they give us energy and vitamins'
'My grandmother makes medicine from some wild plants and trees'
'Flowers are a sign of love- we give flowers to the ones we love on Valentine's Day and we also take them to the graveyard, in remembering our loved ones who passed away'
'Trees are useful in breaking away strong winds that can blow our houses off and provides us with shades.
'Animals feed on grass'

4.2.7 Children's knowledge and understanding of environmental protection

The last three questions on the interview schedule required children to display their understanding of environmental protection. Children were asked to indicate what can be done to protect and take care of the environment, why and what their contributions would be. Some children mentioned that education is very important in environmental protection. Examples of responses are;

'People must be made aware of consequences of pollution
'Environmental campaigns must aim at teaching about recycling and pollution'
'Locally people must organize meetings and discuss cleaning campaigns'
'Educate people about conservation and animal protection'

A respondent from 'School A' displayed her understanding as follows; '*It is the responsibility of the government and municipality to ensure that the environment is taken care of'.* Another learner in the same school indicated; '*I think that there should be strict laws against people who hunt illegally, those who cut down trees and those who pollute the environment'.* One learner in 'School B' indicated that the condition of roads need to be upgraded because in their area children are often hit by cars due to the absence of robots and tarred roads. On the question of why the environment needs to be protected, almost all respondents indicated that '*it is our only shelter, the only place where we can live'.* Other responses to the same question were as follows;

'*We must cut long grass because snakes hide there'*
'If we do not clean the environment we will get diseases such as TB'
'*Wild animals will kill us if they are not caged at the zoo'*
'We cannot live in a dirty and unhealthy environment'

An interesting perspective mentioned by one learner in 'School C' was the following; '*God created us to take charge of the earth, so we have to take care of the environment and protect all living things'.*

On the last question children were required to indicate how they would contribute towards environmental protection. Almost all respondents again stressed that people need to be educated about environmental protection. Other responses were outlined as follows;

'I would organize a meeting to discuss cleaning campaigns'
'I would involve the community and local municipality in cleaning the environment'
'I would make people aware of the effects of living in an unhealthy environment'
'I would involve the youth because they are leaders of tomorrow and at the moment they are the ones breaking bottles and fighting with them'
'Write notices everywhere about the importance of taking care of the environment'
'Encourage the community to clean the streets and remove weeds'
'Inform people to avoid crime and protect people in hospitals'

One respondent in 'School C' mentioned that his contribution would be '*to make sure that people have houses, help them to get jobs, teach them how to take care of the environment and encourage them to fight child abuse'.* Another respondent from a different school indicated that '*law enforcement'* is important and that '*people have to make sure that they are not in conflict with the law'.*

According to the analytical procedure, all data were analyzed in a repeated and thorough manner by reading all written materials and noting qualitative similarities and differences. Themes were determined by taking the common and central characteristics of the contents as the point of departure. The children's responses were categorized according to the following themes;

1. Ideas that focus on environmental knowledge
2. Ideas that focus on environmental awareness
3. Ideas that focus on environmental action
4. Ideas that focus on environmental sensitivity

4.2.8 Ideas that focus on environmental knowledge

In this theme, the answers depicted the areas of knowledge. This kind of knowledge is about environmental issues. Children mentioned different kinds of facts, concepts, environmental phenomena and environmental relationships.

Examples of the statements that show children's environmental knowledge are;

'*The environment is a place where we live'*
This response indicated that a good number of children in the primary school see the environment as only providing a place to stay. One respondent indicated '*If we destroy the world;-our only place, where will we live? We have to take care of the environment'.* This expression indicates that children are aware that the environment does something for them and they in turn can do something towards the environment.

'The environment consists of natural and man-made objects'
The natural objects mentioned here are; stones, sand, water, soil, plants and animals. Man-made structures referred to are roads, buildings, fences, cars, electricity, clothes, furniture and houses.

'People's irresponsible actions lead to pollution'
Most children are aware that littering is a problem. They also attribute it to people's actions. In answering questions related to pollution, children used their daily experience and observances. This is evident in the following statement; *'people throw away papers, plastics, tins and bottles anywhere in the streets'.* Children are again aware that this is not only unhealthy, but dangerous as well. Knowledge about air and water pollution was also indicated by one respondent.

'Water is important in our lives'

Children understand that water is important for personal use. Some children reflected knowledge about taking pre-cautionary measures in dealing with water. They indicated in most of their comments that taps should not be left dripping. One respondent mentioned that they (children) are fond of playing a "summer time" game. In this game children fill buckets with water and splash each other. They usually play this game when it is very hot.

'Animals need shelter, food and water'

The children display knowledge of taking care of animals but the idea of conservation is not quite clear to all of them. However, some could mention the different animals that they normally see at the zoo. One respondent was able to mention the game farm 'Mabula Lodge' which is not far from where she lives. She indicated that she saw different kinds of wild animals that are kept there. From the responses given by children it is evident that the information they have is basically from their direct experience with animals, especially domestic animals as they are common in rural areas.

4.2.9 Ideas that focus on environmental awareness

Within this theme the answers depict various types of environmental destruction. The statements of children reflect the various aspects of destruction and the concerns and worries about nature. The children reflected awareness on their local environment. Environmental destruction is represented by the following;

'*Littering'*

One respondent made mention of the fact that children are the ones who litter and they should clean up. This statement reflects awareness on the side of children. Another indicated that after eating fruit, children just throw peels everywhere. Children are also aware of improvisation as one learner mentioned; '*If people cannot afford dust-bins, they can dig holes in the backyard and dispose of their waste'* and another indicated; '*we use plastics to carry our bags to school'.*

'Killing animals'

In response to this environmental issue, most children mentioned the animals that they know. Children referred to domestic animals the most. The animals that they mentioned most often were the pets and animals that people keep for domestic use. Animals that live free in nature were minimally mentioned or not mentioned at all by some respondents. Other than chicken, no birds were mentioned. Generally children referred to animals known to them directly (pets), animals used for food (cow, chicken, sheep) or work (donkey, horse) and animals often mentioned in stories (jackal, elephant, lion). As a primary school educator I have realized that most of the information the children have about animals is the information that they got from their textbooks. For instance, in the grade six 'Life Orientation' textbook there is a chapter on domestic animals. This chapter describes mostly animals related to producing, with emphasis on what the animals give to us or on what we can get from the animals. In the very same chapter there are questions like; 'Why do we take care of animals?' The responses provided in the book are; "to give us food", "we take raw materials from them" and "they provide service". This information suggests that some animals are very useful and children are taught to take care of them and protect them for their own needs. Obviously the responses provided in the books promote a human-centered view of animals.

'Cutting down trees'

This response also indicates that children are aware and concerned about environmental protection. The general response from the children was that trees should not be cut because they provide shade. Another response was that trees are important because they break away strong winds that can blow their houses off. A contrasting statement made by one of the respondents was that the leaves of trees make the environment dirty.

'Illegal hunting'

Only one learner expressed awareness of illegal hunting and mentioned that the law should take its course on this matter. This suggests that not many children are familiar with this concept.

'Wasting water'

Children are aware of the need to save water for future use. They also indicated in their responses what they use water for. However children's ideas are limited in the sense that their knowledge is only localized. They refer to saving water only for human consumption.

Overall, the children's answers show concern about plants, animals and nature as a whole. These children were able to mention the environmental problems and also relate them to people's actions. Most children were able to identify education as the most important aspect in making people aware of issues within their environment. The children also reflected their experiences and observations when answering the questions. This is evident in the following statements;

'*After drinking beer people throw the bottles and tins anywhere'*

'Young people break bottles and fight with them'

4.2.10 Ideas that focus on environmental action

Some of the children's responses reflected the ability to apply their knowledge in attempting to solve environmental problems. These ideas represent a positive attitude towards the environment and its protection. The positive attitude involves a range of activities which the children think would improve the present state of the environment. The children's responses also indicate that they take pride in what is around them and also that they are aware that they need to look after their surroundings. Their responses again indicate that they are aware that they have a responsibility towards the environment. Some of the children's statements described direct action of taking care of the environment;

'Children must clean up litter'
'Collect paper, plastics, tins, bottles and boxes for recycling'
'Not abusing, killing and beating animals'
'Use manure when planting trees and flowers'
'Remove weeds from our gardens'
'Protect plants against wind and the sun'
'Make fences around the garden to prevent animals and people from treading on plants'
'Make a fence around the village to keep away wild animals'
'Building cages and shelters for domestic animals'
'Providing animals with food and water'
'Organize meetings to discuss cleaning campaigns'
'Use water wisely- do not play with water, close taps tightly and do not pollute water'

The meaning of consciously working for the benefit of the environment and human beings is seen in all answers. Responsibility in this instance is manifested as protection and respect for nature and respect for life and the environment. The environmental action most commonly cited was taking care of pollution. Children also mentioned that environmental action is a government responsibility.

4.2.11 Ideas that focus on environmental sensitivity

This theme comprises statements which depict feelings, emotions and a sensitive approach towards nature. Within this theme the opinions of the children are positive. Examples of children's statements were as follows;

'Watering the plants regularly'
'Taking care of plants because they give us food'
'Protecting flowers because they decorate our homes and we send them to our loved ones'
'Protect trees because they provide us with shades'
'Avoid pollution, do not waste water, do not cut trees'

'People must not kill animals'
'Store water for future use'
'Protect animals by taking them to the camps, game farms and the zoo'
'We must take care of the environment because it is our only place to stay'
'We cannot live in a dirty and unhealthy environment'
'The law needs to be enforced-people who kill animals must be punished'
'Encourage the youth to take care of the environment'

Children overwhelmingly identified 'people' as a major cause of environmental problems. The children particularly identified people's irresponsible actions such as;
'*littering'*
' polluting water and the air'
' cutting down trees'
'killing animals'
'burning waste'

All these responses suggest that children have individualistic framework for thinking about the causes of environmental problems. However, despite this framework, children seemed willing to acknowledge how their own lifestyle could contribute to environmental problems. Indeed they tended to talk in the third person in all the interviews and did not mention how for an example they could reduce their personal consumption or use resources sparingly.

In explaining how the environment could be protected, a few children mentioned personal responsibility as the most important factor. One citation was that;
'*The youth must protect the environment because they are future leaders'.*
Most children however suggested that increased awareness education is necessary for improving environmental protection.
In showing that children are to a certain extent aware, sensitive and willing to take action towards environmental protection, they believed that the government needs to enforce laws and penalties towards environmental protection.

Children's environmental knowledge was a result of personal observations and experiences. The home was also indicated as another important source of environmental information. An example cited by one learner was that '*my grandmother makes medicine from wild plants'.* Over and above, the school was regarded as the most important source of information as one respondent indicated; '*our teacher once told us that paper is re-starched in big machines to make new ones'.* Some environmental concepts were learned from other 'learning areas' in the classroom situation. The zoo, game farms and animal camps are also sources of the children's environmental knowledge. This was reflected in the following response; '*I saw different wild animals at Mabula Game Lodge, which is not far from where I stay'.*

4.3 CONCLUSION

Based on the interview discussions held with the children, it is evident that they are strongly concerned about environmental problems, especially in their local community. The children expressed positive views in dealing with environmental protection. Having captured data on children's knowledge and conceptions about the environment, the next chapter provides an interpretation of this data. I will conclude by examining what the possible implications of these findings are and what other possible areas of research would be useful in pursuing a more complete understanding of children's knowledge about environmental issues in South Africa.

CHAPTER 5

ANALYSIS OF THE FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

In the previous chapter I analysed and explained data collected during interviews. Major research findings were discussed and the children's responses analysed. Interview responses were classified in categories of ideas that focused on **environmental knowledge**, **environmental awareness,** environmental sensitivity and **environmental action**. These analytical categories were adopted from Jeronen and Kaikkonen (2002) who first used them to examine the "thoughts of children and adults about the environment and environmental education' in Finland. A number of conclusions were reached based on this analysis of the data. It is envisaged that although the findings of this study may not be generalized to other environments, but readers might find ways in which these findings begin to identify some common issues which may be applicable to other settings. Primarily, the present study has attempted to contribute to a better understanding the children's knowledge and conceptions about the environment.

This last chapter begins with a review of the entire study. It focuses on the information drawn from the literature review and the empirical data. Towards the end, the chapter will also highlight some conclusions of research, recommendations and aspects for future research.

5.2 SUMMARY OF THE FINDINGS

The aim of this study was to investigate the children's knowledge and conceptions based on the following questions;

1. What are the children's conceptions about some critical concepts in Environmental Education? Namely; pollution, recycling, conservation and environment.

2. How are these conceptions developed; what seems to be their origin and what shapes these conceptions?
3. How does the knowledge and conceptions of these critical concepts shape children's environmental awareness and practices outside the classroom?

These aims were achieved through research in the form of literature review followed by the analysis of the research data. Several important themes have emerged from the data, which I include in this chapter in order to help us understand the children's knowledge and conceptions about the environment. These themes will also help us to make sense of what other scholars have found in some of the studies related to the present research as discussed in chapter two. Four main themes have emerged, in general, from the data in this study, viz.

1. Ideas that focus on environmental knowledge.
2. Ideas that focus on environmental sensitivity.
3. Ideas that focus on environmental awareness.
4. Ideas that focus on environmental action.

These findings corroborate what Jeronen and Kaikkonen (2002) found in a similar study on the thoughts of children and adults about the environment and environmental education in Finland. The key argument emerging from these two researcher's study, which has influenced the present study, is that the development of environmental awareness should be based on conscious experience, ideas, beliefs and knowledge. Knowledge in this instance does not only refer to the facts and concepts but also understanding of phenomena and relations.

Besides the importance of the theoretical knowledge, I noted in this study that children construct new knowledge also through action. This observation tends to confirm the findings from Frick and Kaiser (2004)'s study, which revealed that knowledge is essential for successful action. Education can thus be seen as a significant factor when fostering environmental knowledge, awareness,

sensitivity and action. The research findings in the study also indicated that the majority of children recognised basic facts concerning environmental problems; however most of them could not apply their knowledge to comprehend the consequences or suggest potential solutions to the environmental problems. These findings are in line with those of Makki et al (2003) whose results confirmed that children seem willing to take the necessary actions to protect the environment, but lacked the knowledge base necessary to make informed decisions. The difficulty in making the connection between knowledge and action is thus a critical finding in the study.

5.3 DISCUSSION OF KEY CONCEPTIONS EMERGING FROM THE PRIMARY SCHOOL CHILDREN

The study has established that the majority of children understand the environment only from a physical and bio-physical perspective. This is characterised by a limited conception of the environment where the environment is thought to be a place, a place with living things and a place with living things and people. Most children identified the environment with the place where they live; their country, village or their world. The children also mentioned that the environment consists of natural and man-made objects such as sand, stones, soil, houses, schools, fences, cars and electricity. It can be concluded then, that the majority of children in this study may not be aware of other types of environments such as the economic, political and social environments. Similar findings have been reported by Loughland (2002) for instance, that the majority of children see the environment as an object. Evidence collected in this study suggests that children possess some kind of environmental knowledge, even though this knowledge is limited and less sophisticated. This has immediate implications for the teaching of environmental education. A more meaningful orientation to this kind of education would be one where children's own experiences are explored first and foremost, and then challenged.

Children's perceptions of environmental protection indicate that many of them are concerned about environmental issues. The majority of children in the study were knowledgeable about the basic facts connected to pollution and conservation, only in and around their local community. These children expressed positive views with regard to their immediate environment. The children are aware that it is their responsibility to clean their homes, their classrooms, their school surroundings, their streets, take care of plants and protect animals, because the environment is the only place where they can live. This is a very critical finding from the perspective of environmental sustainability where the key issue is to learn to respect and preserve the present environment for future generations. This finding is in agreement with a previous study conducted by Cherif (1995), which revealed that children are concerned about the maintenance of nature, life, and the survival of the planet. Only a small portion of the sample took the view that it is the responsibility of the government and municipality to ensure that the environment is clean and free of hazards, even though they were not very sure about the role of the government in solving environmental problems.

The literature reviewed in this study has also covered the issue around the different environmental education programmes (field trips, camps, adventure activities and campaigns) that are aimed at developing children's affective relationship to the environment, environmental sensitivity as well as social relationships through personal experiences. The respondents in this study referred a great deal to school and community campaigns, that are led by the youth, and designed to control litter by cleaning up. The purpose of these outdoor activities should be seen as giving out-of-classroom educational experiences involving direct contact with various environments. These experiences are also intended to give children in-depth knowledge of environmental issues and to develop their self-confidence, environmental sensitivity, action skills, responsible action in nature and their social relationships.

According to the findings and themes in this study, the mission of Environmental Education should be to foster environmental sensitivity,

awareness, knowledge, readiness and personal responsibility. This is consistent with the findings of Chacko (1998) that environmental awareness and responsibility are key factors that should be taught in schools so that children can make the right decisions to protect the environment.

The results of this study suggest that these primary school children's knowledge about plants and animals is however inadequate. They are aware of certain types of plants: for example, trees, flowers, vegetables, fruit and grass. The children also appreciate the value of plants and this was shown in the way they presented the use of trees, grass and flowers (for shade, food, decoration and to send to our loved ones). As far as animals are concerned, children referred mostly to domestic animals and how useful they are to human beings (they give us meat, skin, feathers, wool, some guard our houses- like the dog). These findings are consistent with those mentioned by Paraskevopoulos and Padeliadu (1998) who remarked that children consider anything green that people use for food to be alive. These researchers also found that children know more about pets and mammals, but do not recognize many kinds of birds or other species. The implication from my study in comparison with these studies is that children may tend to perceive things from a self-centred or human-centred point of view and that they refer only to those entities and constructs that are linked to their everyday experience. In addition to the concern about the welfare of animals, the children emphasized the importance of protection of nature in general. Most of the value and concerns were based on personal feelings such as *'people must not cut trees because they provide shade* and *they must not kill animals because they also deserve to live'*

The meaning of the concept of recycling was not quite clear to the primary school children. However, these children were able to name a few things that could be recycled. In their understanding only materials such as paper, plastic, boxes, clothes and containers such as tins and bottles could be recycled. Almost all the children interviewed had learnt a standard list of 'everyday' recyclables-bottles, paper, plastic and cans. Interestingly, the children displayed an understanding that recycling is similar to re-using. The

children explained how they re-use plastic daily; they carry their books to school because they cannot afford school bags; they use plastics as shopping bags and that they use bottles to carry water to school. The children could not offer an explanation of why materials are recycled, that is the concept of reduction of waste or conservation of materials. Other gaps in the children's understanding were that they did not have an understanding of other recyclables other than material and containers; they were not aware that materials are treated differently; and that other methods of disposal are used for that which is not recycled. My analysis of the data provided insights into gaps and errors in children's thinking and examples of their incomplete knowledge. Only a small number of children articulated accounts of the actual recycling processes, which touched on reality. These respondents referred to the fact that paper is cleaned in big machines and re-starched to make new ones. One told of how plastic is melted before it can be made into something else. Generally speaking, levels of understanding about recycling did not extend to details of the processes but indicate that children have some kind of basic knowledge about recycling that can be taken as a starting point in learning in Environmental Education. This is consistent with the findings by Palmer (1995) that many of the incomplete answers and explanations given by children suggest key areas of knowledge and understanding that could well be focused upon in Environmental Education. My data also revealed a lack of involvement in the recycling process. The majority of the children see waste disposal and recycling as something that the municipality and the 'recycling people' should take care of.

Evidence collected suggests that children know that waste should not be left lying around; it should be placed in a bin or in a deep hole in the backyard. Explanations of this ranged from '*so our village looks tidy'* to '*so it does not harm us by causing diseases'.* The waste that was being referred to in this instance were; papers, bottles, tins, plastic, boxes, peels of fruit, animal excretions and human faeces. What emerged from this study was the fact that children mentioned very concrete environmental problems such as littering, but have difficulties in understanding the consequences of and connections to other global problems. Their knowledge of the problems is still on the local

level, still fragmentary and out of their context. These are facts to be taken into account when planning environmental issues education for primary schools. The results of this investigation indicate that children's understanding of the concept of pollution is satisfactory, as they were capable of discriminating between cause and effect. A significant finding from this study is that the majority of children regard land pollution as a more serious problem in their environment. Almost all the children in the study agreed that land pollution is harmful to human beings as well as animals. These findings fall in line with those of Chacko (1998) whose results confirmed that the majority of students understand that pollution is a threat to humankind and other species. According to the findings, even though they are concerned about pollution and acknowledge its harmful effects, some of the children feel that it is the responsibility of the government and their local municipality to take care and control pollution.

This study has established that children's understanding of water conservation is inadequate. This is based on the fact that children referred only to water for human, plant and animal consumption. However a majority of the children's responses indicate that water is an important resource. This was clearly reflected in children's understanding of the value of water-mainly for personal use and for hygienic purposes. These children displayed absolutely no knowledge about concepts such as water recycling. The children generally referred to water conservation as involving just taking pre-cautionary measures when handling water. Examples of these measures are; closing taps tightly after use and storing water in buckets, tanks and drums for household and future use. The children showed less knowledge regarding water sources, conservation processes and access to safe drinking water as a basic human right, but their ideas suggest that they are aware that conserving water plays a central role in the future if they are to survive and thrive within existing resource limitations. It remains the role of education in schools to teach children about water efficiency measures and water systems so that the existing water supplies can be far better and more effectively utilised. This is consistent with a conclusion made by Vickers (2002) that; by understanding where and how water is used and wasted, and then applying effective

efficiency technologies and practices, we can achieve substantial water savings and other benefits in our homes, factories and farms.

It has been shown that the ideas of the children in this particular study are well worth noting and making use of. The children' conceptions of the environment are varied and could be seen in the light of their experiences and the importance of the environment to them. The dimensions of the children's awareness contain important ideas and these are shaped by their experiences. If these multi-faceted ideas are taken seriously, it is necessary therefore, in the teaching and learning situation to take children's ideas into account.

5.4 LIMITATIONS OF THE STUDY

A few limitations of this study have been identified. These limitations do not in any way diminish the significance of this study but serve as parameters for future studies that might be undertaken on the same topic. The study looked at black schools only in a small area within the North West Province of South Africa. The research was conducted in three rural primary schools situated in the Moretele Area Project Office (formerly known as a circuit office). The project covered only three primary schools and is thus not a generalization of the situation in all schools in the whole North West Province or any other part of the country but just an indication of what children in certain schools know about the environment.

Secondly, only interviews were used for data collection because thick and rich descriptions of information were required. Nineteen questions were asked to respondents to get a picture of how children understand the environment. The research focused on the micro level of education, which is the schools and did not look at the macro level. School and government policies and other legislation on EE were not discussed in this study. Interviews conducted were limited only to twelve primary school learners. The findings and conclusions of this study relied completely on the information supplied by the children and no one else.

Irrespective of the limitations outlined above, the main questions of the study were researched and answered and the aims were also realised. The limitations thus, did not have any influence on the research as a whole but were necessary in outlining the scope and coverage of the research.

5.5 ASPECTS OF FUTURE RESEARCH

Further research is recommended to look deeper into children's knowledge and conceptions not only in three schools in a certain portion of a particular province but also across all provinces in South Africa. More schools could be included in future, depending on the scope and coverage of the research in question.

Not all role players were involved in this research as it was aimed at investigating children's knowledge. Principals, educators and parents could be consulted in future to shed some light into why children offer particular interpretations of the environment. They could be given opportunities to voice their opinions and views about the environment and Environmental Education. More questions could be asked to look into the process if interviews are still to be used for such a project. Other data collection techniques such as questionnaires, case studies and surveys could be used to acquire information from different people in different ways. This kind of study could be conducted also in urban schools, farm schools and township schools to complete the picture presented in my study.

5.6 RECOMMENDATIONS

From the findings of this study, it is important that Environmental Education be included in the school curriculum. Children's ideas on the environment should, however, be taken into account in the teaching-learning processes. Issues of environmental protection, action, and responsibility must be dealt with as components in the school curriculum. Successful implementation of EE in school activities and in the design of the curriculum requires the involvement

of educators, school managers and the curriculum implementers. The information taught at school should be aimed at increasing sensitivity and awareness about environmental issues and these must lead to a change of attitude and behaviour. Institutional policies should be put in place so as to assist in fostering environmental knowledge and awareness. The language used in teaching environmental education should also be clearly understood by all the children.

The educators must also play a significant role in helping learners acquire information about the environment. These educators should be familiar with EE so as to instil in children the ability to sustain the environment. It is important that these educators preach and practice environmental protection. The environmental educator should be in control of the teaching-learning situation that will take into consideration participation and involvement of all learners. Resources should also be made available in order to develop children's knowledge and conceptions about the environment. Schools should engage in more environmental campaigns and other EE related activities to help children learn more about the environment. Activities such as cleaning campaigns, recycling, tree planting, vegetable gardens should be organized in schools and communities. It is crucial that educators are trained in executing EE activities. This could be done through workshops, in service training and other related services to help speed up the implementation of EE within the school curriculum.

The above mentioned recommendations could serve as guidelines on how children could be assisted to become environmentally aware, sensitive, take action and know about environmental issues and concepts.

5.7 CONCLUSION

The interpretation of findings and discussion of themes which emerged from the literature and the study provided us with the long awaited answers to the research questions of this study on; what the children's knowledge and conceptions about the environment are; how these conceptions are developed; and how the knowledge and conceptions of some critical concepts shape the children's practices outside the classroom. It is hoped that the results and discussion of the findings presented in this study will have a practical application for education in two ways: Firstly, that this study could be seen as a basis for designing a range of activities which would help learners extend their levels of conceptual understanding of environmental issues. Secondly that commonly held gaps in knowledge, misconceptions and sources of false knowledge about environmental issues could be borne in mind when planning topics and activities. As a primary school teacher myself, the findings of this study have indeed been a revelation and should enhance my teaching of EE and interactions with the learners on the subject.

REFERENCES

Ambrose GV 2000. Sighted Children's Knowledge of Environmental Concepts and Ability to orient in an Unfamiliar Residential Environment. *Journal of Visual Impairment & Blindness*, 94 (8), 1-12.

Araboglou A 1993. An Interdisciplinary Approach to Teaching Elementary School Children about Water Management and Local Government. *Social Studies*, 84 (3), 133-135.

Barraza L & Walford RA 2002. Environmental Education: A comparison between English and Mexican school children. *Environmental Education Research,* 8 (2), 171-184.

Boyes E & Stannisstreet M 1998. High school students' perceptions of how major global environmental effects might cause skin cancer. *Journal of Environmental Education*, 29 (2), 1-7.

Bradley TM & Zajicek JM 1999. Relationship between Environmental Knowledge and Environmental Attitude of High School Students. *Journal of Environmental Education*, 30 (3), 1-9.

Burton D & Bartlett S 2005. Practitioner Research for Teachers. Paul Chapman Publishing, SAGE Publications. Thousand Oaks, Carlifornia.

Chacko C 1998. An understanding of environmental concepts and issues among Grade 10 – 12 students from urban and rural schools. *South African Journal of Environmental Education*, 18 54-60.

Cherif AH 1995. Toward a rationale for recycling in schools. *Journal of Environmental Education*, 26 (4), 5-11.

Connell S, Fien J, Lee J, Sykes H & Yencken D 1999. 'If It does'nt Directly Affect You Don't Think About It': a qualitative study of young people's environmental attitudes in two Australian Cities. *Environmental Education Research*, 5 (1), 95-113.

Creswell JW 2003. Research Design: Qualitative, Quantitative and Mixed Methods Approaches. Second Edition. University of Nebraska, Lincoln. SAGE publications.

Department of Education 2002. Revised National Curriculum Statement: Grades R-9 (schools) Policy. Pretoria: Department of Education.

Department of Education 1998. Policy Handbook for Educators: National Norms and Standards for School Funding. Education Labour relations Council, Pretoria: Department of Education.

Dlamini D 1995. Environmental awareness among North West Province high school pupils. *Environmental Education Bulletin,* (10), 10-14.

Fisman L 2005. The Effect of Local Learning on Environmental Awareness in Children: An Empirical Investigation. *The Journal of Environmental Education.* 36 (1) 39-40.

Frick J & Kaiser FG et al 2004. Environmental knowledge and conservation behaviour: Exploring prevalence and structure in a representative sample. *Swiss Federal Research Institute,* 19 (4) 1-19.

Gambro JS & Switzky HN. 1996. The national survey of high school students' environmental knowledge. *Journal of*

Environmental Education, 27 (3), 28-34.

Garbers JG 1996. Effective Research in the Human Sciences: Research Management for researchers, supervisors and masters and doctoral candidates. Van Schaik, Pretoria.

Gay LR & Airasian P 2003. Educational Research: Competencies for Analysis and Applications. Seventh edition. Merill Prentice Hall, New Jersey.

Geelan DR 1997. Prior Knowledge, Prior Constructs: What Do Constructivists Really Mean, And Are They Practising What They Preach? *Australian Science Teachers Journal*, 43 (3), 1-5.

Hellden G 1995. Environmental Education and pupils' conception of matter. *Environmental Education research*, 1 (3), 267-275.

Henning E, Van Rensburg W & Smit B 2004. Finding your way in qualitative research. Van Schaik Publishers, Pretoria.

Hugo LM 2004. Environmental Management: An ecological guide to Sustainable living in Southern Africa. Ecoplan.

Isbell R & Exelby B 2001. Early Learning Environments that work. Gryphon house, inc. Bertsville, MD.

Jeronen E & Kaikkonen M 2002. Thoughts of Children and Adults about the Environment and Environmental Education. *International Research in Geographical and Environmental Education,* 11 (4), 341-350.

John J et al 2004. Our children in day care: reducing exposure to environmental lead in day care centres. *South African Journal of Science,* (100), 135-138.

Klein ES & Merriett E 1994. Environmental Education As A Model For Constructivist Teaching. *Journal of Environmental Education.* 25 (3), 14-22.

Kola-Olusanya A 2005. Free Choice Environmental Education: Understanding where children learn outside of school. *Environmental Education Research*, 11 (3), 297-307.

Leedy PD 2001. Practical Research: Planning and Design. Merrill Prentice Hall, New Jersey.

Lengwati MD 1995. The Politics of Environmental Destruction and the Use of Nature as Teacher and Site of Learning. Convergence, 28 (4), 1-5.

Le Roux K 2001. Environmental Education Processes. Active Learning in Schools. 2nd Edition. University of Natal Press. Pietermaritzburg.

Loughland T, Reid A, Walker K & Petocz P 2003. Factors influencing young people's conceptions of the environment. *Environmental Education Research*, 9 (1), 3-14.
Loughland T Reid, A & Petocz P 2002. Young people's conceptions of Environment: A phenomenographic analysis. *Environmental Education Research*, 8 (2), 187-196.

Magadlela D & Mdzeke N 2004. Social benefits in the Working for Water programme as a public works initiative. *South African Journal of Science,* (100), 94-97.

Makki MH Boujaoude S & Abd-El-Khalick F 2003. Lebanese secondary school students' environmental knowledge and attitudes. *Environmental Education Research*, 9 (1), 21-32.

McMillan JH & Schumacher S 2001. Research in Education: A conceptual Introduction. Fifth Edition. Longman. United States.

Merriam SB 1998. Qualitative Research and Case Study Applications in Education. *Revised and Expanded from Case Study Research in Education*. Jossey-Bass Publishers, San Francisco. 2nd edition.

Murdoch K 1993. Ideas for Environmental Education. ITP Nelson. Australia.

Mussler LM and Malkus AJ 1994. The Children's Attitudes Toward the Environmental Scale. *Journal of Environmental Education*, 25 (3), 1-9.

Ozay EOH 2003. Secondary students' interpretation of photosynthesis and plant nutrition. *Journal of Biological Education*, 37 (2), 1-5.

Padeliadu S & Pareskevopoulos S 1998. Environmental knowledge of elementary students in Greece. *Journal of Environmental Education*, 29 (3), 1-8.

Palmer JA 1995. Environmental thinking in the early years: Understanding and misunderstanding the concepts related to waste management. *Environmental Education Research*, 1 (1), 35-42.

Palmer JA & Suggate J 2004. The development of children's understanding of distant places and environmental issues: report of a UK longitudinal study of the development of ideas between the ages of 4 and 10 years. The University of Durkham, UK. *Research Papers in Education.* 19 (2) 205-236.

Punch KF 2005. Introduction to Social Research: Quantitative and Qualitative Approaches. Second Edition. SAGE Publications. London.

Richardson MSD 1996. Recommended Competencies for Outdoor Educators. *Eric Digest*.

SACOL 1999. Teacher Education: Routes to Competency, Human and Social Sciences in the Classroom. An Introduction to the Teaching of Human and Social Sciences in South African Schools. Francolin Publishers, Cape Town.

Sobel D 1996. Map making with children. Sense of place education for elementary years. Portsmouth, NH: Heineman.

Stevens FI 1999. Case Studies of Teachers Learning and Applying Opportunities to Learn Assessment Strategies in Two Urban Elementary Schools. *Educational Research and Improvement.*

Taber KS 2001. The Mismatch between Assumed Prior Knowledge and the Learner's Conceptions: A Typology of Learning Impediments. *Educational Studies*. 27 (2), 1-12.

Tice TN 1995. Constructivist views. *Education Digest*, 60 (7), 1-2.

Tunnicliffe SD & Reiss MJ 2000. Building a model of the environment: How do children see plants? *Journal of Biological Education.* 34 (4), 172-184.

Vickers A 2002. Conserving Our Finite Water Supplies in an Era of Chronic Drought: Practical Steps. *Electronic Green Journal*, 1-7.

Wilke JR 1997. Environmental Education. Teachers Resource Handbook. A practical guide for K12 Environmental Education Corwin Press. Carlifornia.

INTERVIEW SCHEDULE

1. What do you understand by environment?
2. What does the environment consist of?
3. What do you understand by pollution?
4. What causes pollution?
5. How does pollution take place?
6. What do you understand by recycling?
7. What are the things that can be recycled?
8. How can recycling take place?
9. How can we encourage recycling?
10. How can we save water?
11. Why should we save water?
12. How can we protect and take care of animals?
13. Why should we protect and take care of animals?
14. Which types of plants do you know?
15. How can we protect and take care of plants?
16. Why should we protect and take care of plants?
17. What can we do to take care of the environment?
18. Why is it important to take care of the environment?
19. How would you contribute towards environmental protection?

INFORMED CONSENT

CHILDREN'S KNOWLEDGE AND CONCEPTIONS ABOUT THE ENVIRONMENT

13 March 2006

Dear participant

You are invited to participate in a research project aimed at providing information about the ways in which children understand the environment.

Your participation in this research project is voluntary and confidential. You will not be asked to reveal any information that will allow your identity to be established unless you are willing to be contacted for individual follow-up interviews. Should you declare yourself willing to participate in an individual interview, confidentiality will be guaranteed and you may decide to withdraw at any stage should you not wish to continue with the interview.

The results from this study will assist those who have responsibilities for Environmental Education within schools and for those who develop support programs for the protection, restoration and enhancement of the quality of the environment.

If you are willing to participate in this study, please sign this letter as a declaration of your consent, that is, you participate in this project willingly and that you understand that you may withdraw from the research project at any time. Participation in this phase of the project does not obligate you to participate in follow-up individual interviews, however, should you decide to participate in follow-up interviews, your participation is still voluntary and you may withdraw at any time. Under no circumstances will the identity of interview participants be made known to any party/organisation that may be involved in the research process and/or which has some form of power over participants.

Parent's signature…….. Date……..

Researcher's signature…… Date……

Yours sincerely

Sethusha M J (Mrs)

CONSENT FORM

I understand that I am being asked to participate in a research project designed to gain insight into knowledge and conceptions of children about the environment.

My participation will include a face-to-face interview (during which time I will be asked to explain some concepts in the environment).

The interview will last for one hour and will be scheduled at my school at a time of my convenience.
I understand that a tape recorder will be used to make an accurate record our discussions. I also understand that anything I share will be held strictly confidential. Any excerpts from our interviews that are transcribed for publication will be assigned a fictitious name, and will be disguised additionally, if necessary to protect my anonymity.

Finally I understand that my participation in this study is completely voluntary and that I may withdraw at any time should I feel the need to do so for any reason. I understand that I am free to ask questions about the study that may be helpful or otherwise of interest to me.

Participant's signature……. Date…….

Parent's signature…….. Date…….