AN INVESTIGATION OF SCHOOL GARDENS IN THE CURRICULUM:
CONTEXTUALISING THE BIODIVERSITY DISCOURSE IN THE NATIONAL
CURRICULUM STATEMENT- A CASE STUDY OF MOUNT ZION JUNIOR
SECONDARY SCHOOL

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by

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ABSTRACT

With the dawning of a new era in South African politics in 1994 it became evident that education was going to be re-organised along with other government structures in South Africa. I begin the study by reviewing this curriculum change in South Africa that has taken place since 1995. This involved the development Curriculum 2005 (C2005) and the subsequent revision of C2005, which is now the National Curriculum Statement (NCS). This curriculum introduced an environmental focus into all the Learning Areas, which gave teachers a mandate not only to teach about environmental concepts and issues (such as biodiversity) at schools but to also address them in the communities outside the schools. This study considers biodiversity issues as biodiversity is a new focus in South African policy more broadly, and particularly in the Natural Science Learning Area. Our school has received vegetable and indigenous plant gardens from the South African National Biodiversity Institute, which provides a rich new resource for teaching about biodiversity, particularly in the Natural Sciences.

My interest in the study was to investigate how schools (teachers) can use school gardens in the recontextualisation of the National Curriculum Statements focusing on the Natural Science Learning Area in Grade 7 at my school. I used Bernstein’s (1990) concepts of delocation, relocation, ideological transformation and selective appropriation and Cornbleth’s (1990) theory of curriculum contextualization to understand and interpret the recontextualisation process in the four lessons studied. In this research I was involved in the planning of the lessons with the Grade 7 Natural Science teacher. I taught one lesson as a demonstration and then observed while the teacher taught the other three lessons. I conducted this study as an action research case study. I used focus group interviews, classroom observations, document analysis and interviews as methods of data collection.

The study found that the use of school gardens for teaching biodiversity can help with the recontextualisation of NCS in schools, and for the teaching of biodiversity, but that there is a need to understand and address various recontextualisation issues if this is to be done effectively. The study revealed that use of the school gardens for learning about biodiversity in the NS Learning Area is influenced by teachers’ knowledge, experience, teaching styles and available resources, as well as management issues and the complexity of the NCS discourse itself. The study also revealed that socio-cultural and structural factors (e.g. language and class size) also affect how biodiversity is taught in schools, and thus how the recontextualisation of the
NCS takes place. The study concludes by making recommendations for taking this work forward in the context of our school as it addresses the gap that exists between policy and practice.
DEDICATION

This thesis is dedicated to my uncle SoMnguni who not only raised me, nurtured me through hard and trying times in both our lives but also made sure that I received the love and education that would help me to see the light. I am grateful that I am able to use the education that he helped me to acquire as a foundation for my future endeavours.
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I want to thank the Rhodes University staff especially in the E.E section for their unwavering support and patience in ensuring that we, the students, acquired the necessary knowledge and skills that would make us not only knowledgeable but also competent in our chosen field of study. Special thanks go to my supervisor, Heila Lotz-Sisitka, who did not only supervise my work but also proved to be my mentor and a critical friend. I thank her for the time she spent with me and all the kindness she has shown to me.

I also want to thank the following schools, Lindokuhle J. S. S and Mt Zion J. S. S., for allowing me to work with their teachers, support staff and learners and to take photographs. The principal, Ms Sidaki, Maureen and the SMT of Lindokuhle J. S. S. were very supportive and friendly even during the time of nagging interviews I held with them. The Mt Zion J. S. S SMT, the teaching staff and the learners alike supported me in my work, and in this regard special thanks go to the grade seven NS teacher, Ms V. V. Melane, who put everything else aside to sit for my interviews and also prepared and taught lessons that I later used for my work.

In addition I want to thank SANBI and Ms Malta Qwatekana, the national director of SANBI, for sponsoring my studies at Rhodes University, transporting me to and from the university, paying for my accommodation at Frontier Hotel and also making sure that I received the necessary material support that I needed from their offices in Bizana. The knowledge gained from SANBI’s project of Greening the Nation that was introduced in Bizana schools helped a lot in my work.

Special thanks also go to a family friend, Nonkululeko Rina Vato, who not only taught me how to use a computer but also spent a tremendous amount of her time typing my work, arranging and rearranging it and giving advise here and there. She also proved to be a critical friend throughout my period of study. This was great indeed. Lastly but by no means the least, I want to thank my family for standing by my side through hard and trying times in my study and for being supportive even if my studies took me away from them.
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<tr>
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<th>Description</th>
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<tbody>
<tr>
<td>ACE</td>
<td>Advanced Certificate in Education (Science)</td>
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<tr>
<td>AS</td>
<td>Assessment Standard</td>
</tr>
<tr>
<td>C.A.P.E</td>
<td>Cape Action For People And Environment</td>
</tr>
<tr>
<td>C.F.K</td>
<td>Cape Floral Kingdom</td>
</tr>
<tr>
<td>CBD</td>
<td>Convention on Biological Diversity</td>
</tr>
<tr>
<td>CFR</td>
<td>Cape Florist Region</td>
</tr>
<tr>
<td>DEAT</td>
<td>Department of Environmental Affairs and Tourism</td>
</tr>
<tr>
<td>DNA</td>
<td>Deoxyribose Nucleic Acid</td>
</tr>
<tr>
<td>DoE</td>
<td>Department of Education</td>
</tr>
<tr>
<td>FOR</td>
<td>Field Of Recontextualisation</td>
</tr>
<tr>
<td>I.P.C.C</td>
<td>Intergovernmental Panel on Climate Change</td>
</tr>
<tr>
<td>J.S.S</td>
<td>Junior Secondary School</td>
</tr>
<tr>
<td>LA</td>
<td>Learning Area</td>
</tr>
<tr>
<td>LO</td>
<td>Learning Outcome</td>
</tr>
<tr>
<td>LTSM</td>
<td>Learning Teaching Support Material</td>
</tr>
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<td>NCS</td>
<td>National Curriculum Statement</td>
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<tr>
<td>NEEP-GET</td>
<td>National Environmental Education Project for General Education</td>
</tr>
<tr>
<td>NEMA</td>
<td>National Environmental Management Act</td>
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<tr>
<td>NS</td>
<td>Natural Sciences</td>
</tr>
<tr>
<td>OBE</td>
<td>Outcomes-Based Education</td>
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<tr>
<td>OPD</td>
<td>Official Pedagogic Discourse</td>
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<tr>
<td>RNCS</td>
<td>Revised National Curriculum Statement</td>
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<tr>
<td>SANBI</td>
<td>South African National Biodiversity Institute</td>
</tr>
<tr>
<td>SARDC</td>
<td>Southern African Research and Documentation Center</td>
</tr>
<tr>
<td>SMT</td>
<td>School Management Team</td>
</tr>
<tr>
<td>SPTD</td>
<td>Senior Primary Teachers Diploma</td>
</tr>
<tr>
<td>TEM</td>
<td>Transworld Energy and Mineral Resources</td>
</tr>
<tr>
<td>UNEP</td>
<td>United Nations Environmental Programme</td>
</tr>
<tr>
<td>UNESCO</td>
<td>United Nations Educational, Scientific And Cultural Organization</td>
</tr>
<tr>
<td>UNFCC</td>
<td>United Nations Framework Convention on Climate Change</td>
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CHAPTER 1: OVERVIEW OF THE STUDY

1.1 INTRODUCTION

This chapter introduces the focus of the research and also provides background to the study. This study focuses on the use of school gardens in the recontextualisation of the Official Pedagogic Discourse (OPD) represented in the National Curriculum Statement (NCS), with particular reference to the Natural Sciences (NS) Learning Area and teaching, learning and assessment in Grade 7. This study investigates, reports on and analyses how NS teachers utilise the school gardens or the greened areas of the school in recontextualising the NCS in the Field of Reproduction (i.e. in my school).

I start the chapter by describing the rural setting of my school in which the research is conducted. I discuss, though briefly, the organizational and structural setting of my school to enable the reader to understand this study. I also discuss my role in the school and in the community where I work. My interest in the research is also discussed, along with the aims of the research. This chapter also gives an overview of the study by briefly describing what each chapter contains. The chapter also clarifies concepts that are used in this study.

1.2 BACKGROUND AND CONTEXT OF THE STUDY

The study is located in my school, Mt Zion Junior Secondary School where I work as a principal. Mount Zion Junior Secondary School (in short Mt Zion J.S.S) in Bizana (now often called Mbizana), is situated in the former homeland area known as the Transkei. The school is one of many schools situated in a poor rural area, which was previously disadvantaged by apartheid education and the homeland policies (Nelson Mandela Foundation, 2005).

The area is characterized by high levels of rural poverty, with hunger and famine affecting some of the learners in the school. People in the area rely heavily on what the environment can offer them in terms of what is naturally there such as food and other resources provided for food production and energy resources. In most cases people rely on these ecosystem services and on purchasing food supplies and few produce food for themselves. Dependence on ecosystem services affects many people in rural areas in southern Africa; where over 70% of people rely heavily on the environment for subsistence and livelihoods (Lotz-Sisitka, 2004; UNEP, 2006).

As in many similar situations, there is a phenomenon of increased environmental degradation in the area (ibid). There is also a lack of adequate knowledge of environmental issues and risks among the community members and teachers alike. This may be attributed to a number of factors some of which are:
- Marginalisation of poor rural communities in former homelands by the previous government, which divided the country along racial lines.
- A fragmented, narrow, inferior and poor quality form of education known as Bantu Education, offered in these areas to black people.
- An authoritarian form of curriculum that limited teachers' engagement with local issues and new knowledge of environmental issues such as biodiversity loss (Nelson Mandela Foundation, 2005; NEEP-GET, 2005).

Being a black South African who was born and bred in this country, I underwent the hardships mentioned above. I received all my education up to this level, including my teacher training here in South Africa under the Bantu Education System. I have served the Department of Education for over twenty-five years now and I have been at Mt Zion J.S.S for twenty years. This makes it a bit easier for me to talk about some of the things that are taking place in the school area.

The school itself starts from Grade R and offers classes up to Grade 9. The learner population continues to increase although there are other neighbouring schools that are in the radius of 6km from my school. In most cases learners migrate from one school to another. This happens even if their homes are near the school. They walk all the way to a school of their choice. Although there is nothing wrong with their choices, the constant changing affects them in the long run as they have to endure all the hardships that come with a lack of continuity in their schooling.

The school has no permanent structure. It has two pre-fabricated blocks consisting of eight classrooms. Each classroom is able to accommodate forty learners at the most. One of these classrooms is being used as a principal's and deputy principal's office and for administration purposes. Due to a shortage of accommodation the community built iron shacks to accommodate learners. The temperature in these shacks changes according to the weather conditions. When the weather is too hot, teaching takes places outside under the tree. Sometimes learners have to be sent home if the conditions become too bad.

There is also a mud and iron structure that the community managed to erect. The school has an enrolment of eight hundred and eighty seven learners. Some of these learners come from feeder schools that are in the neighbourhood. They walk to school. The school has toilet facilities that were built in 1999 and in 2005.
The community hall is inside the school premises. The school agreed that it could be erected inside so that the school could benefit by using it. The school now uses the hall as it has no hall of its own. It is used for gatherings, sometimes as a classroom and for other activities that require a big space.

There is a 1.2 metre high fence along the perimeter of the school beyond which there are homesteads, just a few metres from the fence. One of these homesteads is used to accommodate one of the two Grade 1 classes. Some of the school furniture is also kept in this homestead since there is a lack of space at the school.

This study is influenced by my work as the Principal of the school. A principal is a key person in both the Department of Education structures and in the community as a whole. In the eyes of the community the principal is synonymous with his or her school, its organisation and administration. It is easy for the principal to be held either in high esteem or in complete disdain.

As the Principal of the school I am expected to see to it that teaching and learning activities run smoothly. I also ensure that teachers receive professional development to cope with the demands of the curriculum. I also work on building the school's reputation and maintain its image. These are just some of the duties that I have to fulfill as the Principal. In 1997 the Democratic Government of South Africa introduced a new curriculum so as to guide the transformation of South African education. This curriculum has since been reviewed, streamlined and strengthened and in 2002 the revised National Curriculum Statement (NCS) (DoE, 2002) was released. This curriculum is aimed at addressing past inequalities. It also ensures that all schools have the same curriculum to implement, thereby creating a basis for equality of opportunities for learning.

This curriculum introduces a new situation, with new challenges for improving education, particularly in resource-poor areas such as Bizana. The NCS is intended to provide a unifying factor for all schools in South Africa. It places emphasis on the kind of learner envisaged and sets common standards, which are articulated as Learning Outcomes and Assessment Standards. These can be regarded as the 'yardsticks' by which a learner's conceptual and development skills can be measured. The curriculum also lists a number of Critical and Developmental Outcomes, which the envisaged learner should demonstrate as he or she progresses through his or her education.

The curriculum and its implementation or recontextualisation is guided by a set of principles, which include the relationship between human rights, a healthy environment, social justice and
inclusivity. This means that concern for a healthy environment is integral to all learning areas (NEEP-GET, 2004). Other principles of significance to this study are the principles of high knowledge and high skills and progression of learning as these curriculum principles focus on quality, scope and depth in curriculum implementation (ibid).

The type of learner, which the curriculum seeks to create, is a learner who has ‘respect for the environment, is multi-skilled, is able to participate in a society as a critical and active citizen’ (DoE, 2002:11) to name but a few features. This provides useful guidance for a principal (like myself) and teachers who are responsible for implementing the curriculum, as it indicates that education should support citizenship and participation in society, and that respect for the environment is an important value being introduced by the curriculum.

This study seeks to strengthen the implementation of the Outcomes-Based Education (OBE) approach in my school (DoE, 2002). According to the DoE (2002) this approach aims to ensure that learners benefit fully from the education that they are afforded. OBE as an approach is a key principle of the NCS (DoE, 2002). The Natural Science Learning Area for Grade 7, which is the focus of this study, has a number of Learning Outcomes, guided by the Critical and Developmental Outcomes and the principles outlined above. In this study, I will be working with these Learning Outcomes (Lo’s) and their Assessment Standards (As’s) with specific reference to biodiversity in the Natural Sciences Learning Area. Biodiversity is a new knowledge area and concept that has been introduced into the NCS in the Natural Science Learning Area (DoE, 2002). My interest is to develop a deeper understanding of this curriculum and its implementation, particularly since we have only recently been oriented on how to work with this curriculum in the 2006 Department of Education NCS Orientation training programmes (DoE, 2006).

The central concept that I will be dealing with in this study is biodiversity. This I aim to explore with one teacher, who like me, is a Natural Science teacher at my school and also with learners in my school. In this case the school will be used as a microcosm of the bigger world to which learners will be exposed. Both of us, myself and the Natural Science teacher, like many other teachers in South Africa at the moment, are only beginning to learn how to teach the National Curriculum Statement in our schools (the NCS for Grade 7 was only implemented for the first time in 2006), and this study is also a learning process for both of us, and for me as a school principal who has an interest in providing curriculum leadership in my school.
The Department of Environmental Affairs and Tourism (DEAT) through the South African National Biodiversity Institute (SANBI) have recently developed my school gardens, through a poverty relief programme called ‘Greening the Nation’. This provides me with a favourable context in which I can work with the teachers and learners to explore biodiversity in the locality. The school also has a food garden, which is used to produce vegetables that are either consumed by teachers or sold for monetary gain. This activity does not happen on a big scale. The government’s Nutrition Scheme at schools, however, is encouraging the use of the garden produce in schools, as it can help to feed learners who come to school hungry.

As the Natural Science Learning Outcomes emphasise investigation processes, the focus on investigation introduces what O’Donoghue and Lotz-Sisitka (2006, drawing on Vygotsky and other learning theorists) describe as situated learning, where learners learn by doing things in social and historical contexts. Learners are also thus able to make links between what they are doing at school and what they can do at home.

Other school-based studies undertaken by Mvula-Jamela (2007) and Ncula (2007), which focused, among other things, on using the school vegetable garden as a learning opportunity within the Outcomes-Based Curriculum have informed and inspired my work (see Chapter 2) and I drew inspiration and courage from these studies as they demonstrated that such research is possible in schools.

1.3 THE RESEARCH QUESTION

The research question that was developed to help guide this study is:

How can the school curriculum be used in relation to school gardens so that the biodiversity discourse in the NCS can be recontextualised in the school?

I further developed the following goals for the study:

- To investigate with teachers how the school garden can be used for biodiversity activities in the Natural Sciences Learning Area in Grade 7.
- To investigate lesson planning, teaching and assessment process with teachers that addresses the Grade 7 requirements of the NCS in the Natural Science Learning Area, with specific reference to biodiversity.
- Through the above mentioned goals, to investigate the process of curriculum recontextualisation using the school garden in the Natural Science Learning Area, and the structural factors that influence recontextualisation.
1.4 CLARIFICATION OF KEY TERMS USED IN THIS THESIS

1.4.1 Discourse

Heck (2003, as cited by Ramsarup, 2005:5) describes discourse as the “systems of meaning that we describe as texts”. A text as indicated in Ramsarup (2005), can be assigned meaning in three distinct ways, namely:

- Review a piece of text that is read to identify the different discourses as evidenced by the words used. The Natural Science Learning Area Statement provides reference to environment under the main content heading called ‘Life and Living’ that focuses on life processes and healthy living, on understanding balance and change in environment, and on the importance of biodiversity (DoE: 2002).

- Analyse the process through which the text is developed and interpreted to examine the development of particular words, ideas or images. The Constitution of South Africa (Act No 108 of 1996), in its Bill of Rights, provides access to a clean and environment that is not harmful, as one of the Rights of the people of South Africa. Curriculum developers put environment in the design features of NCS and these design features are Critical and Developmental Outcomes, Learning Outcomes and Assessment Standards. Teachers as implementers of curriculum, attend workshops that provide orientation programmes on the implementation of the NCS at schools where they teach. These orientation programmes are Learning Area-based.

- Review the social and historical location of the production and the use of the text and the regulated practice that takes place within particular social situations (ibid). The NCS was finally developed in 2006 after revising the RNCS that had been developed earlier on after South Africa obtained its democratic form of government in 1994. Teachers are guided by the design features that characterise the NCS and the various Learning Area manuals in trying to interpret what the NCS is all about.

The way in which discourse has been used in this study touches on all these different approaches, and it focuses specifically on the environmental discourse in Official Pedagogic Discourse (the Natural Science Learning Statement). Bernstein’s (1990) way of describing discourse has been adopted in this study as this work draws on his sociological approach to examine recontextualisation of the biodiversity content and Learning Outcomes of the NS Grade 7 curriculum in lessons in my school. It also helped me to develop a deeper understanding of the National Curriculum Statement text, its purpose and function in the education system.
1.4.2 Recontextualisation
Recontextualisation refers to the way in which the Official Pedagogic Discourse (OPD) is delocated from the Field of Production (FoP) and relocated in the Field of Reproduction (FoR). This is based on Bernstein’s (1990) approach of understanding and conceptualising how the curriculum plays out at school level. Bernstein explains that recontextualisation involves processes of selective appropriation (where people in official and recontextualising fields such as departmental officials and teachers select and use aspects of the discourse in particular ways), and ideological transformations (where people transform the discourse based on their values, beliefs and ideologies). Wilmot (2005) also indicated that teachers are recontextualisers of the discourse in the Field of Reproduction (FoR) (i.e. the school). These processes affect the way that Official Pedagogic Discourse (as stated in the NCS) is changed and used in the Official and Pedagogic Recontextualising Fields (ORF and PRF) (where teacher educators, subject advisors and textbook writers change the discourse) and in the Field of Reproduction (FoR) (the school).

1.4.3 Official Pedagogic Discourse (OPD)
Official pedagogic discourse as used by Bernstein (1990:193-194) refers to the curriculum that is produced or developed by a country and is to be implemented or recontextualised according to the set rules and regulations that are embedded in the discourse.

1.4.4 Praxis
‘Praxis’ as used by Grundy (1987) and cited by Combleth (1990) in her description of what curriculum is, means that: curriculum is developed through the dynamic interaction of action and reflection. This also means that curriculum is realised through an active process of planning, acting and evaluating. It is something that is dynamic in its constitution and implementation. This concept was an important concept in the context of the action research process used in this study to examine the recontextualisation of the OPD.

1.5 OVERVIEW OF THE CHAPTERS
Chapter 1 provides an overview of the study as a whole. The context and the background of the study are discussed. I also introduce my role in the research process, and my interest in the study.

Chapter 2 deals with the theoretical framework of the study. It presents a line of argument motivating why this study is relevant. It provides information on biodiversity issues, and insight into the curriculum change process in South Africa. It also discusses curriculum praxis and what is expected in terms of implementing the curriculum. This chapter looks briefly into the
curriculum transformation that has taken place in the past decade after 1994. Drawing on Bernstein (1990), the chapter explains the curriculum recontextualisation process, and looks at other research works that are concerned with the recontextualisation of the curriculum.

Chapter 3 deals with the methodology applied in the study and also the accompanying methods of data generation. It describes how an action research design was used to guide the research process. This chapter also provides insight into how I managed to ensure a sound and professional research ethic and how I tried to ensure trustworthiness of the study. It also explains the data analysis process.

Chapter 4 presents the data by firstly reporting on the features of the OPD and secondly going on to explain the recontextualisation process in the classroom situation. It shows how we (the Natural Science teacher and I) were involved in the planning, teaching and assessment stages of the lessons. It also shows how the learners responded to what the curriculum recontextualisation processes demanded of them. Photographs and learners' work are also presented. By describing four lessons in detail, this chapter provides insights into what took place in the recontextualising process.

Chapter 5 provides a deeper analysis of the findings reported in Chapter Four. It provides a deeper understanding of the relationship between the use of gardens and the OPD of the NS. It extends what was reported in Chapter Four, and also shows how the study addressed the research question and goals.

Chapter 6 reflects on the research process as a whole and provides a concluding summary of the study undertaken. It also provides recommendations for the teaching of NS using school gardens within the context of the case, and a short reflection on the research process.

1.6 CONCLUSION

In this chapter I have provided insight into the context and background of the study. I also introduced myself and the school where I work to locate the study and its intentions. The research question and goals that guide this study were described, along with concept clarifications for some key concepts used in this study. In the next chapter I provide the theoretical framework and historical context of the study.
CHAPTER 2: CONTEXT AND THEORETICAL FRAMING OF THE STUDY

2.1 INTRODUCTION
This chapter begins with a discussion on biodiversity issues, as this is the focus of the Natural Science teaching in this study. The chapter then goes on to provide an historical description of the NCS. It then reviews current expectations associated with NCS implementation. Drawing on Bernstein (1990) and other curriculum theorists such as Grundy (1987) and Cornbleth (1990), I discuss some theoretical concepts that are useful for understanding what happens when National Curricula (the OPD) is used in schools (i.e. the recontextualisation process).

2.2 BIODIVERSITY
2.2.1 Defining Biodiversity
Each time the term biodiversity is mentioned numerous definitions or explanations of the word are possible. But many environmentalists in the world agree that biodiversity refers to a variety of life forms be they plants, animals and micro-organisms that make up the ecosystems of the earth, (C.A.P.E, no date; Huntley, 1989; Biodiversity Hotspots, 2007). Also, according to the same sources biodiversity embodies both the genetic and biotic diversity of the DNA code that organisms contain. Bond (1989:2) even considers the geographical distribution and processes that maintain biodiversity to be important when talking about biodiversity.

According to EnviroTeach (1997:4) biodiversity is made up of three related concepts: genetic diversity, species diversity and ecological diversity:

- Genetic diversity is the variability of genes within a single species.
- Species diversity is the variety of species on earth located in different parts of the planet.
- Ecological diversity is the variety of biological communities that interact with one another and with their environments (ibid).

The Species Survival Commission (cited by Huntley, 1989: ix in Enviro Facts 3, 2001) describes biotic diversity as:

the variety and variability of all living organisms. This includes the genetic variability’s within species and their population, the variety of species and their life forms, the diversity of the complexes of associated species and of their interactions, and of the ecological processes, which they influence or perform.
Although concern for biodiversity is an international issue my study will be limited to the Bizana area that is located in one South Africa’s biodiversity hotspots named the Maputaland-Pondoland-Albany hotspot. No country is without its form of biodiversity, but some parts of the world have very rich biodiversity that is under threat to such an extent that these areas are named biodiversity hotspots like Maputaland-Pondoland-Albany and the Cape Florist Region, which are found in South Africa (Conservation International, 2006).

2.3 BIODIVERSITY ISSUES

2.3.1 Biodiversity issues in southern Africa

As indicated earlier, the scope of my review of biodiversity issues will be on what is happening in the southern African region and especially in South Africa where for instance there are biodiversity hotspots namely the Cape Floristic Region (CFR) and Maputaland-Pondoland-Albany regions, as indicated above. The main focus will be in the latter region. According to the Africa Environment Outlook, southern Africa is rich in biological resources in a variety of ecosystems (UNEP 2002:75). According to the same source, these resources range from moist tropical forests in Angola and Zambia and semi-deserts and mangroves, deserts and semi-deserts to the extraordinary diversity of plant life in the Cape Floristic Region of South Africa in the southwest.

The issues that affect biodiversity and ecosystems in southern Africa are diverse in nature (Stedman-Edwards et. al., 2000:34). These issues range from human activities that the people in the society engage in as they interact with the environment either directly or indirectly to those that nature itself creates. The C.A.P.E (2006:40) argues that substantial portions of natural habitat have been altered due to human activities such as agriculture, urban development, forestry, mining and dams. The same source argues that this human interference with biodiversity and ecosystems has led to habitat loss, degradation and overexploitation of species, introduction of exotic species and pollution of air, soil and water (ibid:4). Human activities that result in land being transformed from its natural state in southern Africa also include grazing, afforestation and the introduction of invasive alien plants species (C.A.P.E, 2006:9).

Macdonald (1989) is of the opinion that Southern Africa as a whole is well endowed with indigenous forests that lend themselves readily to commercial timber exploitation. (EnviroFacts, 1989:56). This, according to the same source, has led to vast land areas being transformed intentionally by planting woodlots and shelter beds. He also indicates that through human activity, the spreading and introduction of some invasive plants species have transformed vast landscapes. This was done through the intentionality of planting woodlots and shelter beds and their widespread use in gardens, both rural and urban (p.56). These activities have led to major
changes in the ecosystems in the sub-Saharan region. In countries like Zimbabwe and the Karoo region Macdonald (1989:55) for instance cites poor cultivation practices as compounding the land transformation that has been going on for a long time in the sub-continent of Africa. These practices by people have resulted in soil loss due to soil erosion and loss or alteration of natural vegetation in the area (Macdonald 1989:58). Similarly, anthropogenic causes are resulting in climate changes that are adversely affecting areas where deforestation and inappropriate management of land and water is common (UNEP 2002:28).

According to UNEP (2006), the conditions associated with climate mentioned will contribute to possible shifts in health problems with vector-borne diseases being spread in some areas. The Intergovernmental Panel on Climate change (IPCC, 2006) as cited by UNEP (2006:36) indicates that climate change will lead to unpredictable conditions such unpredictable conditions that will affect many aspects of the natural world, including biodiversity.

Besides the plant biodiversity described above in the context of the two biodiversity hotspots, southern Africa is one of the regions that is rich in marine ecosystems. According to the SARDC (1994:207) the region’s marine areas are ‘home to a wide variety of Natural resources, including plants, animals and fish’. According to the same source southern Africa has four main marine ecological zones. These ecozones are defined according to water temperatures and ocean currents, which have a direct bearing on plant and animal life found in those areas. The ecozone that is near Bizana (The Pondoland coastline) is described as the far east coast that includes Tanzania, Mozambique, and KwaZulu Natal in South Africa. This area is found in the Indian Ocean and is rich in many faunal and floral species that thrive in these warm waters. The seawater temperatures vary from 22-29°C. A biodiversity of marine life thrives in these waters but some of these resources in this ecological zone are overexploited, such as the abalone species that is a popular resource for income generation as it has a high economic value.

2.3.2 Biodiversity condition, issues and threats in South Africa

South Africa has a long history that dates back to before the years when the first non-African man settled in South Africa in 1652. The more recent history of the Apartheid Era (1948-1994) left a somewhat indelible mark on the lives of so many people of South Africa and the country as a whole. During this time South Africa experienced socially unjust laws, creating unequal access to natural resources amongst the broader population. The majority of people was denied access to fertile land and was disproportionately affected by environmental degradation for example, soil erosion in the former homelands, or air pollution from coal mines (C.A.P.E. no date).
SARDC in its 1994 report on the state of environment in South Africa comments “... the institution of a stratified apartheid society based on colour advocated territorial segregation that resulted in the creation of homelands or Bantustans for the rural African population” (ibid: 33). This political system ‘... exacted profound social and cultural consequences on the environment as a result of overpopulation and overcrowding in those areas’ (ibid:33). The legacy of decades of apartheid can still be felt and will be felt even in the years to come (ibid.). An example is given of Qwaqwa in South Africa’s Orange Free State (now Free State) where forests have disappeared entirely because of this kind of settlement. Due to poverty and lack of alternatives, in areas such as this, people are forced to subsist and use the natural resources available for their livelihoods and this has a direct impact in the environment in such areas. The sorry state of the effects of apartheid, which affected both society and environment through its policies, can also be felt in countries that border South Africa. Able-bodied men from countries like Botswana, Mozambique, and Lesotho migrated to South Africa to seek work. This disrupted families and traditional communities and resulted in the deterioration in the standard of living, which in turn affected the environment in their areas in a variety of ways. A similar issue is found in Bizana where able-bodied men migrated to the cities to look for work in the mines, leaving woman and children to fend for themselves in the rural areas, which has affected the environment in a variety of ways.

As indicated in Chapter 1 Bizana is in the former Transkei, and has been affected by those policies. During the Apartheid Era the environment was not ignored, but the Government concentrated on preservation of animal and plant species in parks as shown in the following quotation from Khan (cited in Ramsarup 2005:14):

Conservation has been on an approach bequeathed by the late nineteenth century, i.e. a wildlife-centred, preservationist approach which appealed almost exclusively to the affluent, educated mainly white minority. Single species campaigns, such as the Save the Rhino Campaign, promoted by the mainstream environmental movement in the midst of black poverty have added to a widely held perception about black communities, that conservationists rate the needs of wild animals above those of the poor.

Ramsarup (2005:14) stresses the fact that environment discourse during the Apartheid Era lacked social justice. The people and their needs were not recognised. Ramphele (1991:6) provides an even clearer picture of the apartheid government’s approach towards environment when she said:
Historically the approach to ecological concerns was fragmented and conservative reflecting the interests of the privileged white sector of South African society. Government and non-government organisations were largely concerned with establishing and maintaining nature parks and saving endangered species, such as the rhinoceros. Little attention was paid to the negative impact of conservation programmes on poor blacks living in the affected areas.

Today biodiversity issues are considered in integrated development planning under the Municipal Systems Act and are integrated into a people-centred approach to development and are not only isolated to parks. According to information provided by Gerber (2005) on biodiversity risk assessments in South Africa’s municipalities, South Africa hosts a variety of habitats resulting from its rich biodiversity. This according to Gerber (2005) is due to the country’s size and great range of topography and climates presenting different biodiversity management challenges across the country.

Although relatively small, southern Africa contains some 20,300 species of vascular plants, or about 8% of the world’s vascular flora (Siegfried & Huntley, 1989:186). According to EnviroFacts (January, 2001) South Africa ranks as the third most biologically diverse country in the world, and is thus of major global importance for biodiversity conservation. A mix of tropical and temperate climates and habitats in the country gives rise to extraordinary plant richness. Some 18,000 vascular plant species occur in South Africa and of these 80% are endemic to one region.

In addition to this South Africa has a wealth of animal life, both in numbers and variety (EnviroFacts, 2001), and according to the same source 155 of South Africa’s plant species, 14% of bird, 24% of reptile, 18% of amphibian, 37% of reptile and 22% of butterfly species are listed as threatened in the South African red data books. This is in addition to many ecosystems that have been degraded and ecological processes disturbed. All is due to anthropogenic activities or interference by people’s activities.
Table 2.1 South Africa’s species richness (according to EnviroFacts, January 2001)

<table>
<thead>
<tr>
<th>Total species</th>
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<tbody>
<tr>
<td>Mammals</td>
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<tr>
<td>Birds</td>
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<td>Amphibians</td>
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<tr>
<td>Reptiles</td>
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<tr>
<td>Freshwater fish</td>
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<td>Marine fish</td>
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<tr>
<td>Invertebrates</td>
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<tr>
<td>Vascular plants</td>
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</tbody>
</table>

As mentioned before South Africa has two of the world’s hottest hotspots as far as biodiversity is concerned. These are the Cape Floral Kingdom in the Cape (CFK) and the Maputoland-Pondoland-Albany region along the eastern part of the country, where this study is located.

2.3.3 Biodiversity issues in the Maputoland-Albany-Pondoland bioregion

The Maputoland-Albany-Pondoland bioregion lies along the east coast of southern Africa, below the Great Escarpment. It extends from southern Mozambique, that is south of Limpopo River, through Mpumalanga Province in South Africa through Swaziland to the Eastern Cape Province in South Africa (Conservation International, Biodiversity Hotspots, 2006). According to the same source this region is an important centre of endemism. This region has warm temperate forests that are home to nearly 600 tree species. The report further notes that 600 is the highest tree richness of any temperate forest in the whole world. The famous bird-of-paradise flower (Strelitzia) is distinctively endemic in this hotspot or region.

A success story of biodiversity conservation in this region includes the rescuing of white rhinoceros from extinction. This same region encompasses the once expansive grasslands and forests wherein many fauna species are found. Regrettable though, these grasslands are under massive threat from industrial and local farming and also from the expansion of grazing lands.

The following table adapted from Conservation International (2006) summarizes the biodiversity status of the Maputoland- Pondoland-Albany bioregion.
Table 2.2. Biodiversity Status of the Maputoland- Pondoland-Albany bioregion

<table>
<thead>
<tr>
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<th>Value</th>
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<tbody>
<tr>
<td>Hotspot original extent (km$^2$)</td>
<td>274 136</td>
</tr>
<tr>
<td>Hotspot vegetation remaining (km$^2$)</td>
<td>67 163</td>
</tr>
<tr>
<td>Endemic threatened plant species</td>
<td>19 00</td>
</tr>
<tr>
<td>Endemic threatened birds</td>
<td>0</td>
</tr>
<tr>
<td>Endemic threatened mammals</td>
<td>2</td>
</tr>
<tr>
<td>Endemic threatened amphibians</td>
<td>6</td>
</tr>
<tr>
<td>Extinct species</td>
<td>0</td>
</tr>
<tr>
<td>Human population density (people/km$^2$)</td>
<td>70</td>
</tr>
<tr>
<td>Area protected (km$^2$)</td>
<td>23 051</td>
</tr>
<tr>
<td>Area protected (km$^2$) in categories</td>
<td>20 322</td>
</tr>
</tbody>
</table>

This region is formed by three areas of high endemism namely Maputoland (Tonga land) in the North, Pondoland further south and Albany in the southwest (near Grahamstown) in South Africa. This area is described as floristically, climatologically and geologically complex. The Eastern Cape Province falls geographically within this Maputoland-Pondoland-Albany bioregion. The Eastern Cape Province comprises seven biomes.

According to the Eastern Cape State of the Environment Report compiled by Department of Environmental Affairs and Tourism (DEAT, 2004) the Mbizana municipality has the least percentage area conserved per municipality in the Eastern Cape Province (DEAT, 2004 as only 260 hectares out of 24 1188 hectares of land is conserved. This leaves much to be desired in the province as far as biodiversity is concerned. The three centres of endemism in the Eastern Cape Province are the Albany centre, covering a large area in the centre of the province, where most plant extinctions have occurred; The Drakensberg centre covering the Senqqu and Elundini municipalities in north east; and the Pondoland centre covering the Port St. Johns and Mbizana municipalities in the east (DEAT, 2004). It is in the latter that my school is located.

The same report by the DEAT (2004) provides details of the state of biodiversity in the province, including the related aspects such as endemism and the issues that work against or threaten the environment in the province. These issues are no different from those that are found elsewhere in other parts of South Africa and southern Africa. These include threats like agriculture, overgrazing, alien invader plants, urbanisation (DEAT, 2004), poor land use practices (Cowling & Hilton-Taylor, 1994) and transformed land (DEAT, 2004).
The challenge that faces the environment and its biodiversity in this province is that the records containing information on biodiversity in the province are uneven, and some of the centres of endemism are under-represented in the province’s protected area network (DEAT, 2004) or that “no data are available on some alien species for the Eastern Cape province” (DEAT 2004). There is no denying the fact that the Eastern Cape Province is high in cases of endemism. Cowling & Hilton-Taylor (1994) cited 33 species with red data status in the Pondoland area alone. The Pondoland area, of which Mbizana is part, has been described as being rich in woody endemics, with more than 30 endemic species of robust creepers, shrubs and trees (ibid). The area is also a centre of diversity for mosses, grasses and forest species. The Pondoland centre of endemism is the only region outside the Cape Floristic Region that contains the members of the family Bruniacae and the genus Leucadendron (Cowling & Hilton-Taylor, 1994).

2.3.4 Biodiversity in Mbizana (Bizana) and Mount Zion

As mentioned before in section 2.1. the scope and focus of the research is my school in Bizana. The Mbizana local municipality is one of the seven municipalities that form part of the O.R. Tambo District Municipality, situated in the north eastern part of the Eastern Cape Province. The district incorporates large portions of the former Transkei homeland, covering both inland and coastal areas. It is partly separated from the province of KwaZulu-Natal by the Umtamvuna River. The Eastern Cape Province gets its rainfall in summer as it lies along the Indian Ocean.

As mentioned in Chapter 1, Mt Zion Junior Secondary School, the school where I teach, is in the Eastern Cape Province in the Mbizana district which is in a biodiversity hotspot. The community is densely populated with more than 600 homes in a fairly small area. This number is growing steadily as the population grows and new homes are built. The community of Mt Zion is comprised of people who are both literate and illiterate with the latter being in the majority. The older generation is largely illiterate but this affects the younger generation too as the majority of them have dropped out of school at some stage. When one looks at the educated group of people in the community, one will often find that most have relocated to other parts of South Africa, as educated people migrate for better residential places in the cities. Some have bought residential places in the nearby affluent province of KwaZulu-Natal.

The majority of people at Mt Zion still earn their living through migrant labour and government grants. Those that receive government grants are mainly the older generation, the newborn through the child support grant allocated to their mothers and the orphans. Famine and disease are prevalent in this area with many deaths attributed to diseases such as HIV-AIDS, typhoid...
fever and other infectious diseases. The school children at Mt Zion J.S.S. benefit from the governments’ nutrition scheme.

Human activity that is generally undertaken by people of this area is subsistence farming where people till land to grow mealies and vegetables. To do this land is ploughed. People also harvest natural resources. For example they chop wood from the nearby municipal forests. These trees are used for fencing their gardens and for building material and to sell in order to get money. Few people are concerned about how this affects biodiversity in the area. Ox-drawn sledges are used as transport in these cases.

There is also a prevalence of veldt fires that occur as a result of an old idea that older grass must make way for new grass. This is common during drier seasons (winter). Population expansion is leading to the erection of new homes that requires land clearing. People also raise stock in the ever-diminishing lands around their homes, leading to over-grazing and loss of biodiversity. There are forests controlled by the local municipality that are used for commercial purposes. Other practices undertaken by people are the digging up of plant roots, cutting of plants, de-barking of trees for medicinal purposes, hunting and killing of animals and fishing.

Generally the soil is good and it ranges from loam to sandy. As mentioned in Chapter 1, the school has vegetable gardens where it grows its own vegetables that allow for biodiversity activities. Teachers mainly use these for fundraising so as to augment the school funds and for consumption. The area gets its rain in summer. Soil erosion is evident in areas where the settlement is dense and in some mealie fields. Another factor that is also worth mentioning is the construction and the maintenance of roads (gravel roads) where deep furrows or terraces are dug as waterways. Some near the school go as deep as 1.5m. This adds to the soil erosion in the area.

Some of the forests and trees that were visible in the area between 1960 and the early 1980’s (in my lifetime) have virtually vanished showing a loss of biodiversity. Some have made way for the ever-growing human population while some have vanished due to other practices like overgrazing in a small area on restricted land, indicating some of the threats to biodiversity in the area.

The scenario painted above is generally what is happening in most if not all the areas of the Mbizana Municipality and the relationship to biodiversity. As the situation in our areas stands, one would have thought that people living in these areas would have realised that things were
getting worse than they were before. People continue to act irresponsibly, often unknowingly causing further damage towards the environment and biodiversity.

In 2005 the Department of Environmental Affairs and Tourism (DEAT), through the South African National Biodiversity Institution (SANBI) started a programme called “Greening The Nation”. More than 30 schools in Mbizana were greened using indigenous plants and vegetable gardens were either developed or schools were encouraged to develop them. This was a national programme. Municipalities were also greened and a garden has been planted at the Mbizana Community Centre in town. As indicated in Chapter 1, Mt Zion J.S.S was among the schools that benefited from this outreach greening programme. According to SANBI this programme is aimed at developing ecological awareness that can lead to an understanding of the relationship between people and their environment (SANBI, 2005). This programme also aims to support application of classroom-based knowledge about the environment in the outside world (ibid). SANBI, with its mandate to protect South Africa’s biodiversity, has an interest in developing environmental education programmes in this biodiversity hotspot with its high levels of endemism and to strengthen community knowledge of biodiversity, hence the SANBI Greening of the Nation Programme activities in this area. An important part of the SANBI strategy is to strengthen environmental learning in schools, which I discuss next.

2.4 BIODIVERSITY AND CURRICULUM

As indicated above, SANBI has invested in establishing a number of school gardens to facilitate environmental education in the Mbizana area. These gardens have a range of biodiversity, particularly plants, birds and insects that can be used for teaching the concepts of biodiversity. To maximize this as an educational resource, SANBI is encouraging research in using these gardens within the curriculum (i.e. this study and a number of others). This section will consider how biodiversity can be or has been linked to the school curriculum especially in South Africa. Some of the policies that have been put in place internationally in this regard will be addressed, though briefly. While some of these policies might seem too broad and general as far as dealing with environmental issues is concerned in the curriculum, these policies, principles and laws cover all aspects of the environment and have influenced the construction of the National Curriculum Statements or South Africa’s Official Pedagogic Discourse (OPD) in Bernstein’s (1990) terms.

2.4.1 International policies

Some of the policies that have been developed with regard to environmental education aspects and sustainability involve many countries of the world. Most of these policies have been designed in such a way that they all have some focus on educational aspects (UNESCO, 2005).
Some of these policies are based on the principle of multilateral agreements to be signed by different countries such as the (UNESCO, 2005):

- Agenda 21 which was the agreed upon plan of action from the Rio Earth Summit hosted by the United Nations in 1992, which included a chapter on education, training and public awareness.
- The Biodiversity Convention signed at the Rio Earth Summit in 1992, which also emphasises the important role of education in addressing biodiversity issues.
- The Millennium Declaration signed by countries operating within the framework of the United Nations in 2000, which led to the Millennium Development Goals which include goals for access to education and goals for ecological sustainability.
- The Johannesburg Implementation Scheme which is the agreed upon plan of action emanating from the World Summit on Sustainable Development.
- The United Nations Decade on Education for Sustainable Development which declared 2005-2015 a decade in which the role of education in enabling a sustainable society should be emphasised by all nation states participating in the United Nations framework.

Many African governments, including the South African government are signatories to these global action plans, and these international events have therefore influenced regional policy making and national policy making in the UN member states. In particular, African countries are all working towards achievement of the Millennium Development Goals, and it has recently been reported that the Millennium Development Goal 7, which aims to ensure environmental sustainability is one of the most neglected goals (UNEP, 2006). With this goal Africa is focussing on integrating the principles of sustainable development into the policies and programmes of various countries so as to reverse the damage and loss of environmental resources (Hugo & Maloka, 2004:34). UNEP (2006) reports that biological resources are the backbone of the African economy as well as the life support system for most of Africa’s people, making biodiversity a key issue to be considered in education. UNESCO (2005) notes that education for sustainable development should assist people to consider critically how their patterns of consumption impact on biodiversity.

In South Africa the government has responded by ensuring that environmental concerns are enshrined in the Constitution of the country in the Bill of Rights, and that the school curriculum is used as a means to reach out to the majority if not all the people of the country especially the youth, who just like in any other country in the world, are regarded as future custodians of the country. With this the South African government is trying to work towards what UNESCO (1997)
describes as a ‘common ethic’ of concern for people and the environment, best illustrated through the United Nations agreements signed by countries to mobilise international cooperation to address issues such as environmental degradation which require both national and international responses.

This process that operates at a national - international interface encourages countries to work towards a common goal as far as caring for the environment and educating people for sustainable future is concerned. As explained by Ketlhoiwe (2007), such national-international policy processes are not without their complications, and he describes a problem of inadequate policy readiness in Botswana’s education system to accommodate the ambitious objectives of these international agreements to which countries agree and sign up for at international level, The SADC REEP identified a problem of poor policy synergy at a local level in southern African countries which is partly the result of the many policy frameworks that countries sign up for, and have to implement at a local level without adequate resources and capacity (Lotz-Sisitka et al., 2006).

2.4.2 National Policies: South Africa

South Africa is a signatory to 16 international agreements related to the environment (EnviroFacts, 2001). All these deal with environmental issues in South Africa. Some of the agreements that South Africa entered into with the international community are the:

- Basel Convention: which controls trans-boundary movements of Hazardous Wastes and other waste disposal issues
- Convention on Biological Diversity (CBD)
- United Nations Framework Convention on Climate Change (UNFCC).
- Bonn Convention, which deals with migratory Species of Wild Animals.
- World Heritage Convention, which deals with the protection of the World Cultural and Natural Heritage.
- Agenda 21 which is an agreement on sustainable development

Over and above these South Africa has a Constitutional obligation to protect and manage the environment for future generations, as articulated in section 152(i) (d) of the Constitution that gives every citizen in the country a right to a healthy environment (Bill of Rights section 21 of RSA, Act 108 of 1996). To enact this, the post-apartheid government has passed a number of laws and policies or acts which deal with environmental issues. Some of these are:
• The National Environmental Management Act (NEMA) of 1998. This Act deals with the need for development that is socially, environmentally and economically sustainable (C.A.P.E 2006.13; Burger 2006/2007:217)
• The National Biodiversity Conservation Act of 2004. This Act deals with the management, conservation and the protection of South Africa’s biological resources and ecosystems under threat. This Act also provided for the establishment of the South African National Biodiversity Institute (SANBI) in 2004 (C.A.P.E 2006:3).
• The National Curriculum Statement (NCS). Through the NCS education is used to support sustainable use of biological resources for the benefit of all South Africa (C.A.P.E., no date) and to create knowledge, skills and values for a healthy environment.

Besides having passed all these and other legislative frameworks, the government of South Africa also has among its departments the Department of Environmental Affairs and Tourism (DEAT). This Department is responsible for the care and improvement of environment and promoting tourism in South Africa through using the wildlife and biodiversity potential of the country. This Department is responsible for two key parastatal organisations that assist it with the mandate of looking after the country’s biodiversity, namely the South African National Parks Board, and the South African National Biodiversity Institute (SANBI).

The influence of these organisations on education can be seen in the inclusion of a biodiversity focus in the Natural Sciences Learning Area (DoE, 2002), and in the wider attention given to environmental concerns in the National Curriculum. An historical report on how environment became embedded in the National Curriculum Statements by Lotz-Sisitka (2002) reveals how these national players influenced the curriculum formation process through a state-civil society alliance called the Environmental Education Policy Initiative which was led by the DEAT and the Environmental Education Association of South Africa. This report shows how official policy discourse (OPD) is constructed as a result of these broader policy influences at international level interacting with national level policy concerns. The National Environmental Education Project for General Education and Training, implemented by the Ministry of Education between 2000-2006 reflects on the way that the National Curriculum Statement today includes environmental concerns when it states that:

… the curriculum aims to be sensitive to issues such as over-exploitation of resources for the benefit of a few, unequal distribution and use of resources; ways in which access to
resources (e.g. water, soil, land) contribute to the quality of life of people; and how human actions degrade and impact on the environment in ways that threaten life, and our natural and cultural heritage and the future of the planet. In this context, learners are encouraged to think not only of their own lives, but also the lives and livelihoods of future generations. (NEEP-GET, 2004:8)

This emphasis can also been seen in the Natural Sciences Learning Area statement, which, through an emphasis on investigation skills, encourages learners to investigate ecosystems and biodiversity studies, and to develop a good understanding of the threats to biodiversity, and why biodiversity is an important dimension of ecosystem maintenance. This includes developing an understanding of human activities such as the introduction of alien species, population growth, habitat destruction, pollution and other factors that contribute to a loss of biodiversity (NEEP-GET, 2004:14)

2.4.3 South African National Biodiversity Institute’s projects in Mbizana
The Department of Environment Affairs and Tourism in South Africa is generally responsible for the welfare of the environment. As mentioned above, one of their parastatal institution is the South African National Biodiversity Institute (SANBI) who has a mandate to deal with biodiversity issues country wide (Burger 2006/07 : 217-218). This is evident in SANBI’s vision and mission statement. Within its mandate, SANBI was able to set up environmental programmes in Bizana in 2004 that aimed to educate people about the environmental issues in their areas and the country (SANBI, 2005). This local initiative by SANBI can be seen as supporting goal 7 of the Millennium Development Goals which aims to ensure environmental sustainability, and to integrate principles of sustainable development into country policies and programmes in order to reverse the loss of environmental resources.

The SANBI programme in Bizana targeted mainly schools and the municipality as vehicles for education and school principals (like myself) were identified as key change agents by SANBI together with two other teachers from a total of 33 schools in Mbizana district. These teachers were involved in workshops run by SANBI and were convinced that if programmes dealing with the environment were started at schools a lot could be achieved in terms of addressing and reversing the effects of environmental issues in the area, through an educated populace.

The idea was that principals, as custodians of education in their schools, would ensure that these programmes were sustained in their various schools and that the gardens would be used for educational purposes. This in turn would ensure that learners as future leaders of the country
and as custodians of our heritage grow up appreciating the environment and therefore benefit from it sustainably (SANBI, 2005).

SANBI is working hand in hand with the Department of Education (DoE) in South Africa, and at district level, subject advisors are also involved in the programme. The DoE in South Africa is the custodian of education, therefore every programme that is implemented in schools needs to be relevant to educational objectives of the department, hence SANBI’s interest in the links between the gardens and the curriculum, which I discuss in more detail next.

2.5 CURRICULUM DEVELOPMENT: RECONTEXTUALISATION PROCESSES
2.5.1 Influences in the South African curriculum process
Since 1994 there have been many changes in South Africa. One of the many most important changes in the national set up has been the development of, and the subsequent revision of a national curriculum. This change is significant as it has moved South African schools away from a fragmented, racially defined and ideologically biased curriculum that entrenched inequality (DoE, 2006:12).

The South African Curriculum before 1994 can be likened to what Doll (1993) calls a technocentric curriculum. This type of curriculum embodied technical rationality and had a tendency to mechanise through processes that emphasised the implementation of means over ends and which negated the real world of lived practice.

The type of curriculum indicated did not consider what Grundy (1987) and Cornbleth (1990) argue for in a curriculum. They propose that a curriculum should be a contextualised social process that should take into account the cultural, social and historical dimensions rather than the objectives only. This kind of curriculum according to Grundy (1987) and Cornbleth (1990) would be more concerned with the learners’ experiences rather than just the “outcomes” or products of the curriculum. The South African curriculum before 1994 was teacher-centred. The teacher played a leading role and the learner was expected to accept what the teacher was saying and learners were only expected to regurgitate it at a later stage in examinations that were based mainly on their ability to memorise what the teacher and textbook had to say.

The South African curriculum prior to 1994 was based on deeply ideologically oriented inequalities. Different racial groups had different curricula. There was neither equality nor uniformity in all the aspects of the curricula, and there was therefore no ‘national’ curriculum at all, but rather different curricula for different race groups, that were aimed at privileging some more than others in the academic arena, and in the processes of gaining access to the modern
world order, and economic benefits. This was a major issue for the new government and in 1994 an extensive effort to establish a national curriculum that was to be based on principles of equity, redress and access was put in place.

In 1998 a new curriculum known as Curriculum 2005 (C2005) was introduced in the democratic South Africa (DoE, 2006). This new curriculum was underpinned by principles of constructivism, and was characterised by flexibility in implementation as it tried (ambitiously) to create a platform for principles similar to those advocated for by Cornbleth (1990) when she said a curriculum should be taught according to context and milieu or setting, and should allow for learner participation and contextual relevance to be accounted for in the curriculum process. In referring to relevance of context, Cornbleth refers to the need to take account of both structural and socio-cultural factors in the curriculum process. According to Cornbleth (1990) curriculum is a social process that takes place between teacher and learner and between learner and learner. In C2005 in South Africa, this social interaction was to be guided by a complex Outcomes-Based curriculum framework guided by Critical and Developmental Outcomes, Specific Outcomes, Assessment Criteria, Performance Criteria, Phase Organisers and other curriculum dynamics (Curriculum Review, 2000).

By structure Cornbleth (1990) does not only refer to the structure of the curriculum documents, but also to established roles and relationships, including operating procedures, shared beliefs and norms. This refers to the timing that is associated with formal teaching and the facilities that are available in order for education to be carried out successfully such as learning teaching support material (LTSMs) availability, the structure of the school itself and the education system.

The socio-cultural context refers to the environment beyond the education system itself such as demographics, history, economic conditions, ideologies, beliefs and other cultural dynamics such as languages used and the cultures and belief systems of the community, and other aspects like learners who come to school hungry.

It was a combination of these factors (i.e. the complex structure of the curriculum, as well as the realities on the ground in terms of structural constraints and socio-cultural conditions of learners) that led to the first failure of C2005, and for the former Minister of Education’s request for the curriculum to be revised, streamlined and strengthened, before it had even been completely implemented in schools. The Curriculum Review Report (Curriculum Review, 2000) shows that Cornbleth’s (1990) ideas of socio-cultural and structural factors in curriculum processes influence the relocation of the curriculum discourse, and that these factors affect the quality and nature of education provided. Cornbleth’s (1990) socio-cultural and structural dimensions help to
provide insight into what happens in the recontextualising process, and Bernstein (1990) presents a detailed and sophisticated theory of the recontextualisation process and what he calls ‘pedagogic device’. In this study I use only aspects of his broader theory, given the limited scope of the study. I have, nonetheless, found them useful to help me explain what happens with the National Curriculum Statements at school level (i.e. how the curriculum is recontextualised), just as I have found Cornbleth’s (1990) description of the socio-cultural and structural factors influencing the social processes of curriculum useful to interpret curriculum processes in my school (see Chapters 4, 5 and 6).

2.5.2 Recontextualising context: Relocation of discourse
The recontextualising context, according to Bernstein (1990) involves the recontextualising of Official Pedagogic Discourse (OPD) in the Official Pedagogic Recontextualising Field (where the Department of Education officials work) and the pedagogic recontextualising field (where textbook writers and teacher educators work). The first field refers to the different levels in Government or Department of Education. Under this field there are planners of the curriculum, researchers and education inspectors or subject advisors. In our context we have curriculum advisors working in the district offices that offer teacher education, for example they provided us with orientation on how to plan for Outcomes-Based Education (OBE).

In the Pedagogic Recontextualising field (PRF) there are institutions like universities, colleges of education and producers and publishers of educational material. In our context we have textbooks and other learning and teaching support materials (LTSM) produced by these recontextualisers that we use in our school. The major activity of these recontextualising fields according to Bernstein (1990) is to constitute the content (what) and the method (how) of the pedagogic discourse. The ‘what’ refers to the various specialised fields like languages, history, mathematics and so on. The ‘how’ refers to the various methods that are applied during the process of recontextualising. In our context we have received the National Curriculum Statement (R-9) Policy documents (DoE, 2002), with a set of Teacher’s Guides for the Development of Learning Programmes (DoE, 2003) and NCS Orientation training materials produced by the DoE (DoE, 2006). These describe what needs to be taught and how and also how we should plan and assess learning. We also have resources in the form of textbooks, and the school garden that are provided by agents working in the professional recontextualising field such as SANBI.

In trying to put the two models presented by Cornbleth (1990) and Bernstein (1990) into perspective, in relation to the OBE Curriculum in South Africa, the following can be said about curriculum development and its implementation. According to Cornbleth (1990) a curriculum is not just a blueprint or prescriptive document. Curriculum is socially and culturally constructed in
relation to its relevance in society. The South African Curriculum Statement has got features of what Cornbleth (1990) is talking about as it aims to address social priorities relevant in South Africa. This curriculum can also be recontextualised according to the social setting at a local level, and the DoE recontextualising materials produced in the official recontextualising field mentioned above, are meant to help teachers to do this work.

According to Bernstein (1990) the curriculum represents various ideas (or discourses from various spheres) as it is developed. The South African curriculum is linked to the Constitution of the country in that it takes into account the ‘social’ needs for transforming the country after apartheid and as such it includes human rights discourses as well as other global discourses such as environmental management discourse (DoE, 2002). Bernstein (1990) refers to the curriculum development process, as the social construction of pedagogic discourse. The South African Curriculum is constituted from a range of discourses that make up the National Curriculum Statement (NCS), which include:

- It is outcomes–based in approach (OBE),
- It has an environmental focus, within a rights-based approach,
- It is standards–based, and sets national standards for learning and assessment,
- It is learner-centred, signalling a new role for teachers,
- It is rights-based and the principles of social justice are emphasised,
- It is a policy-guided discourse, as it explicitly takes its lead from the Constitution and South Africa’s many new policies (such as the National Environmental Management Act, the country’s language policy etc.),
- It supports a problem-based approach to learning, especially in the Natural Sciences which is oriented mostly towards investigations,
- It supports a cultural contextual approach to lesson planning because it encourages teachers to consider learners needs as well as the curriculum requirements when planning lessons, and
- Learners are encouraged to develop individual and collective skills, and it views learners as individuals in society (DoE, 2002; see chapter 4 for a more detailed analysis of these discourses).

This complex range of discourses makes a recontextualising process quite challenging, especially for teachers who previously were not involved much in curriculum recontextualising processes. In the OBE curriculum however, teachers are expected to design learning programmes at school level, and this introduces a more active recontextualising role for teachers.
(DoE, 2002). Wilmot (2005) indicated in her study that it is possible for teachers to be recontextualisers of the curriculum (i.e. to define what is taught and how it might be taught), but her research was conducted in two of South Africa’s most privileged and well resourced schools. Bernstein (1990) however, sees teachers more as reproducers of curriculum discourse in the Field of Reproduction (i.e. the schools). Because teachers work with the Official Pedagogic Discourse in the schools they are involved in changing it. According to Bernstein (1990), this process can be described as a process of ‘delocation’ and ‘relocation’. Evidence of delocation of curriculum can be found when interviews with teachers are conducted or when one examines Lesson Plans (see Chapter 4). When teachers teach, relocation of OPD occurs in various ways. In this process, curriculum is open to ideological transformation by various people in the recontextualising field and this also happens as teachers plan and teach as shown by what they emphasise in a lesson (see Chapter 4). For example teachers might either ignore or emphasise environmental discourse. Ramsarup (2005), for example, identified how a teacher’s concern for the poverty issues faced by his learners, led him/her to emphasise economic aspects of the curriculum discourse over the environmental discourse in the Technology Learning Area. During relocation selective appropriation occurs, as teachers select and identify aspects that they think learners need to cover. This is an important and natural aspect of teaching which teachers do to address learner needs and contextual circumstances. The skill, however, as discussed by Ramsarup (2005) is to ensure that the curriculum is covered at the same time.

At a broader level, Bernstein (1990) talks about what he calls the Pedagogic Device. The Pedagogic Device refers to the ‘rules’ that curriculum implementers and or teachers follow in implementing the curriculum or in its recontextualisation. Bernstein (1990) divides these rules into three groups namely: distributive rules, recontextualising rules and the rules of evaluation. The distributive rules refer to the hierarchy that exists in the Department of Education and other power structures influencing education in the country. These rules also refer to the power relations that exist and the control that must be exercised by the curriculum developer for instance. Recontextualising rules refer to how the curriculum is transformed in the specialisation field as subject specialists shape and influence how subjects such as science subjects, history, geography and so on are taught in the ORF and PRF. As indicated above, this involves Department of Education officials, curriculum experts and textbook writers, and as Wilmot (2005) and Ramsarup (2005) have shown, teachers themselves. Evaluation rules on the other hand refer to the evaluation procedures that characterise the curriculum of NCS. These test or evaluate the effectiveness of the methods employed in implementing or in the recontextualisation of the curriculum in its various forms. This study is focused more on the recontextualising processes in a school, and does not deal with the full scope of Bernstein’s theories, due to the limited scope of the study. To understand this recontextualising process
better, I now review dimensions of the Official Pedagogic Discourse, to identify what it expects of teachers.

2.6 OFFICIAL PEDAGOGIC DISCOURSE: WHAT DOES THE CURRICULUM EXPECT?

2.6.1 Contextualisation and recontextualisation

As indicated above, our school has been provided with various guidelines and recontextualisation resources from the DoE. We have been given copies of the NCS (R-9) Policy that represents the OPD. In addition, we have been given guidelines for school-based recontextualising processes by the DoE in the form of materials and training in the NCS Orientation training programme (for Grade 8 and 9) which provides guidelines on planning, teaching and learning, and assessment (DoE, 2006). In this section I discuss these in more detail, and summarise some of information provided in these guidelines as they have influenced what we are doing in the school (i.e. the recontextualising process). This is provided here for background to the recontextualising processes reported on in Chapter 4 and 5.

As indicated in Chapter 1 and in Section 2.3.4 above, SANBI (working in the professional recontextualising field (PRF) to support schools) have also provided us with recontextualising resources in the form of school gardens, and this research project is trying to see how we can use the recontextualising resources from the DoE and SANBI to recontextualise the curriculum in our school.

2.6.2 Recontextualisation guidance from the official recontextualising field (the DoE)

2.6.2.1 The Official Pedagogic Discourse

The official pedagogic discourse of the NCS as outlined above has been influenced by international and national policies on the environment. It has, however, also been influenced by other international trends, such as Outcomes-Based education, which was introduced to South Africa by the labour movement’s interest in portability and skills development through a National Qualifications Framework (Lotz-Sisitka, 2002; DoE, 2002). It has also been influenced by learner-centred education approaches (Harley & Wedekind, 2005), which is reflected in the emphasis on investigation in the Natural Sciences Learning Area. The Official Pedagogic Discourse in the Natural Sciences Learning Area is reflected in the policy statement, NCS (R-9) and the DoE (2003) explains the structure of the OPD in the Natural Sciences Learning Area statement as follows:

The main features of the Learning Area Statement are the Learning Outcomes, the Assessment Standards that embody the knowledge, skills, values and attitudes required
to achieve the Learning Outcomes and the ‘statements’ of Core Knowledge and Concepts (DoE, 2003:19).

At the heart of the OPD are the Learning Outcomes and Assessment Standards. The Natural Sciences Learning Area has three Learning Outcomes that are as follows:

- **Learning Outcome 1** (Scientific Investigations): The learner will be able to act confidently on curiosity about natural phenomena; and to investigate relationships and solve problems in scientific, technological and environmental contexts.
- **Learning Outcome 2** (Constructing Science Knowledge): The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.
- **Learning Outcome 3** (Science, Society and the Environment): The learner will be able to demonstrate an understanding of the interrelationships between science and technology, society, and the environment.

The DoE (2003:21) states further that the Learning Outcomes in the Natural Sciences Learning Area ‘…are not simple, but compound performances because they integrate several responses by the learner.’ … and that ‘Assessment Standards enable us to see particular aspects of a compound competence that the Learning Outcome is describing.’ (ibid.:21) The complex nature of this OPD is analysed in more detail in Chapter 4. What is of concern in this chapter, is how the DoE are orienting and supporting teachers to work with this OPD, as shown in their recontextualising support processes and materials, which provide guidance on planning, assessment and teaching and learning.

**2.6.2.2 Planning**

Grundy (1987) describes curriculum as the dynamic interaction of action and reflection. In this instance curriculum is seen as an active process in which planning, acting and evaluating are all reciprocally related and integrated into the process (Lotz-Sisitka, 2002; 2004). The DoE, in their recontextualising resources and OBE training, call for careful planning before any teaching activity can be embarked on. They suggest that all the aspects that are involved in teaching-learning activities must be planned for. These include, among other things, the LTSM to be used, planning for assessment or evaluation of work done, as well as activities, Learning Outcomes to be achieved and progression, amongst other factors (DoE, 2003).

The DoE (2002) indicates that the Natural Science Learning Area has its own unique features and scope, which need to be covered by the end of each lesson or teaching cycle. These should
be oriented towards achievement of the desired Learning Outcomes and in turn must lead to the desired Critical and Development Outcomes that the learner must demonstrate. For this, teachers need to plan, to ensure that their teaching will meet these intended Outcomes. Among the things, which a teacher has to consider when planning for teaching, are:

- What the NCS expects of teaching and learning?
- How to mediate teaching using different strategies?
- How to use LTSM to support learning?
- How different learning styles influence teaching practice?
- How different barriers to learning influence teaching practice?
- How policies influence and shape classroom practice? (DoE, 2006)

The DoE (2006) explains that all these influence how teaching will take place. For instance the choice of LTSM will determine whether the LTSM is accessible to all learners or not (DoE, 2005:49). Another aspect that teachers have to understand is the learner-centred approach in the OBE framework, which denotes a paradigm shift for most teachers as the new curriculum is driven by OBE principles, and not by technocratic approaches to knowledge transfer as explained above.

The DoE (2006:118) describes planning as ‘designing something or to arrange something before it happens’. The NCS and the Norms and Standards for Educators’ policy (DoE, 2000) requires that teachers develop:

- Learning Programmes (This is a phase plan which also shows how a Learning Area integrates with other Learning Areas)
- Work Schedules (This is usually a year-long grade plan)
- Lesson Plan (This is a grade teacher’s individual classroom plan. It is for one or more period. It shows among other things the topic to be taught, time allocated, Learning Outcome and Assessment Standards involved, activities to engage in and possible barriers to teaching and learning expected).

These represent the different levels of planning that are required before teaching can take place. The DoE argues that good planning is important to ensuring that successful learning can take place (DoE 2006:118). When planning the DoE (2006:119-139) requires teachers to consider the following aspects when planning the teaching and learning activities:
• The context and content of learning. Here they warn teachers that learning content should not be confused with context, and that it is important to broaden learners’ experiences beyond what they already know with new knowledge,
• Three levels (stages) of planning in the NCS (as explained above),
• Philosophy and policy (the philosophy of OBE, Language in Education Policy, Inclusivity policy, and the National Protocol on Assessment are examples of policies that need to be considered),
• Planning for multigrade and multilevel classrooms (where relevant),
• Inclusivity and differentiated learning,
• Planning with learning and teaching support materials,
• Planning for content, concepts and context,
• Planning for integration, and
• Planning for assessment.

Since this research is based on linking classroom curriculum practices with the school garden, planning would need to ensure that the environmental discourse of the NCS is included in the planning process. Given that school food gardens are widely used in South African schools as a means to address poverty and food security issues, there have been a number of studies that have investigated lesson planning using school food gardens. These include studies by Ncula (2007), Asafo-Adjei (2004) and Mvula-Jamela (2007). These research projects all provide useful case studies of the lesson planning and implementation process as outlined by the OPD expectations above.

Ncula (2007) investigated how food gardens can be used for environmental lesson planning and active learning in the Life Skills Learning Programme in the Foundation Phase. This was conducted as a case study in school. A similar study is the work of Mvula-Jamela (2007), who studied the contribution of a School Environmental Policy to active learning in the context of the NCS. Her study also focused on school gardens as a site for learning. Similarly, Asafo-Adjei (2004) studied how indigenous knowledge of plants could be integrated into the Agricultural Science subject in the Further Education and Training band.

All these researchers were interested in effecting some changes in classroom practice through strengthening of lesson planning and active learning. These studies all showed that the planning expectations of the OPD are complex and ambiguous and areas that need further attention in curriculum praxis in rural Eastern Cape schools are:
• Interpretation of Learning Outcomes and Assessment Standards,
• Integration of context and content as the two were often conflated and confused,
• Structural and socio-cultural factors such as poverty, teachers and learners’ prior knowledge, and language of learning and teaching, and
• Assessment planning and practice.

My plan of work and the methodology followed in the study and the methods used by Mvula-Jamela (2007) and Ncula (2007) are almost the same. Their work was based on an action research design, which is what this work is based on. My research, however, is more critically focused on the recontextualising process than their research was.

2.6.2.3 Teaching and learning
Teaching and learning is a central process in any curriculum, including the NCS, as it could not be achieved without teachers and learners engaging in teaching and learning processes. According to the DoE (2006), the NCS requires that a situation or atmosphere that is conducive to teaching and learning be created where learning can take place so that learners can learn to their full potential. The DoE (2006) recommends that, in their teaching, teachers should employ a variety of teaching strategies that will ensure that they teach with inclusivity, and that they teach for skills, knowledge and values. The NCS requires that all teachers should think and cater for various learning styles and ‘… how their teaching can make learning both meaningful and successful’ (DoE 2006:41).

Teachers are expected to be mediators of learning (ibid.). This means that they facilitate learning. Learners’ prior knowledge, experience, their culture and their context are aspects that teachers have to consider as they try to mediate the learning process. These requirements of the NCS resonate with Cornbleth’s (1990) view of curriculum. As indicated earlier, Cornbleth describes curriculum as a contextualised social process where emphasis is put on action, reflection and context or setting, and not only curriculum policy documents, although these are also important to the process.

The DoE expects teachers to make sure that learners achieve the required Learning Outcomes (DoE 2006:43-60). Below is a list of expectations that the NCS outlines for teaching:

• Mediating learning using different strategies,
• Using learning and teaching support materials to support learning,
• Using different teaching methods to cater for different learning styles,
• Cater for teaching and learning in a multi-lingual classroom,
• Observe policy that supports inclusivity (ibid).

In considering the recontextualisation process, this study considered to what extent these approaches as required by the NCS were used to improve teaching practices (see Chapter 4).

2.6.2.4 Assessment
Assessment is described by the DoE (2006:63) as ‘… a process of making decisions about a learner’s performance’. It involves gathering and organising information (evidence of learning) in order to review what learners have achieved. It also ‘… informs decision making in education and helps teachers to establish whether learners are performing according to their potential and making progress towards the required standard as outlined in the Assessment Standards of the NCS’ (DoE 2006:63).

Assessment is a vital component of teaching and learning. For teaching and learning to be declared effective and successful assessment needs to be done to establish whether what has been learned produces the desired results. In the past education system, assessment was largely content and memory driven, with the result that only a small aspect of learners competence was assessed. In the NCS assessment is based on Learning Outcomes and Assessment Standards. ‘This takes into account the knowledge gained, the skills acquired and values that have been learnt’ (DoE 2006:73). The National Protocol on Assessment for Schools in the General and Further Education and Training Band (Grade R-12) indicates that assessment of learners’ work can either be formal or informal (ibid). In most cases assessment in the NCS is formative. The DoE (ibid.) explains that the purpose of this is to make sure that assessment is developmental and that teaching and leaning are continuously improved.

Hearne (2002 as cited in Dreyer and Loubser 2005:146) sees assessment for environmental learning as a barometer to measure the quality of learning and a compass to indicate the direction of future action. They maintain that assessment should be based on sound principles with clear purpose and can be done in a variety of ways using a variety of assessment types, methods and strategies (see also DoE 2006:63-116).

For assessment to be appropriate for learning the assessor must assess according to the principles of assessment. The purpose of assessment (as outlined by the DoE 2006 in the case of the NCS), must be clear and the assessor must make use of the various types of assessment (DoE, 2006; Dreyer & Loubser, 2005).
The DoE (2006) further explains that when assessing learners in the NCS the following types of assessment can be used:

- **Baseline assessment**: to determine the learners’ prior knowledge
- **Diagnostic assessment**: to determine barriers to learning, it can be done anytime
- **Formative assessment**: to determine the progress of learners towards achieving the outcomes and the appropriateness of learning required. It takes place during the learning process. It informs future activities.
- **Summative assessment**: It determines the overall achievement of learners and learning success. It takes place at the end of the learning programme or learning phase.
- **Continuous Assessment**: It spans the whole learning experience. It includes all of the above types of assessment. It can be used to give continuous feedback to learners.
- **Systemic evaluation or assessment**: It is used to evaluate the appropriateness of the education provided. It involves the monitoring of learner attainment at regular intervals, using nationally or provincially defined measuring instruments. In South Africa this is done at the end of General Education and training or Further Education and Training bands (DoE, 2006).

According to the DoE (2006) assessment should be authentic to achieve a balanced and fair assessment of the process of learning and should include a variety of opportunities to allow learners to demonstrate competence in different ways and in different contexts. This is facilitated through use of assessment strategies that include a variety of methods and appropriate tools and techniques that can be used to assess learners. This form of assessment provides a range of opportunities for learners to demonstrate knowledge, skills, values and attitudes. (Dreyer & Loubser 2005:146-149; DoE 2006: 65-108).

Other aspects of assessment which teachers are encouraged to practise are recording and reporting of learners' achievements. These records should be kept in both teachers’ and learners' portfolios (DoE, 2006). In simple terms what is recorded in these portfolios are learners' marks with evidence of the assessment activities. These to a certain extent, show learners scholastic achievements provided they are done meticulously. These records of achievement are used or can be used for promotional purposes, that is, promoting a learner from one grade to the next at the end of the year. When referring to evaluation rules, Bernstein (1990:212) stated that theories of instrument take as their reference what is to be evaluated so that the acquired (learner) performance in the official pedagogic discourse can be graded. Bernstein
went on to say that these theories of instruction and evaluation presuppose expected differences between learners. In the *Natural Sciences Teacher’s Guide for the development of Learning Programmes* (DoE, 2003:21), the DoE recommends that

To assess what the learners produce and do, we need to look at various aspects of the competence and that is where the Assessment Standards come in … The Assessment Standards describe the level at which learners should demonstrate their achievement of the Learning Outcomes and the ways of demonstrating that achievement. In other words, the Assessment Standards are statements that give detail to the Learning Outcomes and they describe criteria by which to judge how well learners are able to achieve the Natural Sciences Learning Outcomes.

Examples of Assessment Standards from the Natural Sciences Learning Area relevant to the biodiversity interest of this study in Grade 7 are:

- The learner plans investigations (Learning Outcome 1, AS #1)
- The learner conducts investigations and collects data (Learning Outcome 1, AS # 2)
- The learner evaluates data and communicates findings (Learning Outcome 1, AS # 3)
- The learner categorises information to reduce complexity and look for patterns for example, the learner compares features of different categories of objects, organisms and events (Learning Outcome 2, AS # 2)
- The learner applies knowledge to problems that are not taught explicitly, for example, the learner analyses information about the sustainable and unsustainable use of resources (Learning Outcome 2, AS # 4) (DoE, 2003:68-71)

2.7 RESOURCES AND LEARNING AND TEACHING SUPPORT MATERIAL (LTSM)

Learning and teaching support material (LTSM) is, according to the DoE (2006), a very important component of teaching and learning in the NCS (R-9). The use of LTSM in teaching learning activities is connected to the planning that a teacher does. The teacher should plan a lesson according to the availability or non-availability of LTSM. The procurement of textbooks and other LTSM is essential for good teaching and learning. It is therefore very important to select good quality textbooks and other LTSM for the NCS implementation and the realization of the environmental education aspects of the NCS (DoE 2006).

Acquiring good or relevant LTSM is a prerequisite for teaching and it is the responsibility of everyone involved in teaching. Various Learning Areas can require different or the same LTSM.
depending on the situation at hand and on the lesson planned. Although it is the responsibility of everyone to make sure that the LTSM are acquired it is the School Management Team (SMT) that must ensure that appropriate LTSM are ordered and made available in good time.

These can be purchased or improvised depending on the type of the LTSM needed or the context for which it is needed. In most cases and when it comes to environmental education, the school gardens can prove to be valuable LTSM or resources for learning, particularly if they are complemented with other materials. In our school, Mt Zion J.S.S we have school gardens provided by the Department of Environmental Affairs and Tourism through the South African National Biodiversity Institute (SANBI) (see Chapter 1). Indigenous plants were planted in my school and these can provide the teachers and learners alike with valuable resources for teaching biodiversity in Natural Science.

The potential exists to use the garden or environment for differentiated methods of teaching, learning and assessment (Ncula, 2007; Mvula-Jamela, 2007; Asafo-Adjei, 2004) and to ensure that the content that the learners are taught can be changed or differentiated according to context. The garden can also potentially provide a context for authentic assessment, if teachers are able to work appropriately with the Assessment Standards (Mvula-Jamela, 2007). Mvula-Jamela’s study found that teachers who were not adequately oriented towards the NCS and its expectations could teach good lessons, but that these lessons could be directed to the Assessment Standards of the entirely wrong grade for example. Mvula-Jamela (2007) found in the case she was reporting on that this resulted in ‘under teaching’ of learners where lessons for Grade 8 were being guided by the Assessment Standards for Grade 5. In the case reported by Mvula-Jamela (2007) this resulted from the teacher choosing an activity for a Grade 8 learner group from a Grade 5 textbook, and not adjusting the activity for the Grade 8 Assessment Standards. This shows that even if LTSM are available, they need to be carefully used in relation to the Assessment Standards of the Grade.

The gardens provide teachers and learners with a plethora of biodiversity of various forms. These include the soil organisms, indigenous plants and insects found in these gardens. The gardens also provide a site for learning about ecology and life skills as shown by Ncula (2007) in her study, and for science-based investigations as shown in Asafo-Adjei’s (2004) study.

2.8 CONCLUSION

This chapter has dealt with the theoretical vantage points that provide orientation to this research. As such this chapter presents broader context in which the participatory action research approach to making use of school gardens in teaching of Grade 7 Natural Science is
realised (see Chapter 4). It reviewed aspects of what is known about biodiversity in the area where I teach, which falls into the Maputoland-Pondoland-Albany biodiversity hotspot.

This chapter has also highlighted some of the international, national and local biodiversity and ecological aspects that have led to interest, discussions and policies in various circles like government and international organisations. It has also highlighted how these policies can shape the OPD of a country such as South Africa, in particular the Natural Sciences Learning Area. This chapter has highlighted some of the opportunities for environmental education and especially the realization of an environmental discourse that is part of the South African NCS.

As the focus of this study is on making a link between school gardens and curriculum requirements at school level, it has reviewed key aspects of the NCS, and some of the recontextualisation guidance provided by the DoE (2006) in the form of guidance on teaching and learning, planning, assessment and use of LTSM. This involves the process of making use of the gardens to learn about various forms of biodiversity while enabling learners develop attitudes and values to care for biodiversity and the environment as expected by the OPD of the NCS (R-9).

In the next chapter I discuss the research methodology and methods used to investigate such a recontextualising process in Bernstein’s Field of Reproduction (1990) at school level. The reason why I consider this to be a recontextualising process, and not simply a reproduction process, is the evidence provided by Ramsarup (2005); Ncula (2007); Mvula-Jamela (2007) and Asafo-Adjei (2004) in their studies that teachers are involved in recontextualising the OPD as they have nowadays to develop their own Learning Programmes, Work Schedules and Lesson Plans that contextualise the OPD according to learners needs and context (DoE, 2002). The new curriculum structure as I understand it, does not just expect teachers to technically reproduce the curriculum as in the old syllabi of the former Department of Education and Training under apartheid, but to recontextualise it. For this reason I have also selected an action research design, as it allowed me to study the process of recontextualisation at my school in the Natural Sciences Learning Area with the Grade 7 teacher and learners.
CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION
In this chapter I describe and discuss briefly the research design decisions that I made to guide this work. I also describe the methodology that I followed in undertaking this study, and the methods used to generate data.

In the previous chapters, that is, one and two, I provide the general background to the research question that this work is based on and is therefore trying to address. Bassey (1999) identifies seven stages in the research process, and in this work I followed them. They provided me with useful guidance on how to proceed with a study such as this. These stages are as follows:

- Stage 1: Identifying the research as an issue, problem or hypothesis (Chapter 1 and 2)
- Stage 2: Asking research questions and drawing up ethical guidelines (Chapter 1)
- Stage 3: Collecting and storing data (reported on in this chapter)
- Stage 4: Generating and testing analytical statements (Chapter 4 and 5)
- Stage 5: Interpreting or explaining the analytical statements (Chapter 5)
- Stage 6: Deciding on the outcome and writing the report (Chapter 1-6)
- Stage 7: Finishing and publishing the report (Chapter 1-6)

This chapter therefore indicates how stages three and four of the research process were conducted. Chapter 3 also shows how the ethical aspects or guidelines of the research were attended to and it describes how I tried to ensure validity and trustworthiness of the work.

3.2 RESEARCH DESIGN AND METHODOLOGY
This research is constituted as a case study using participatory action research approaches. Narayan (1996) describes participatory research as a dynamic, demand-based and change-oriented process whose central goal is to involve people as active creators of information and knowledge.

This kind of research embodies an approach to data collection that is two-dimensional, that is, from the researcher to the subject and vice versa. Narayan (1996) also argues that participatory research increases the chances of the findings being put to use (ibid.).

As indicated in Chapter 1 the key underlying intention of this research is to understand how the (school) curriculum can be used in relation to school gardens so that the environmental
discourse in the NCS can be recontextualised in the school. By linking the curriculum to the actual situation in the environment I hope to use the environment itself as a valuable learning and teaching support material (LTSM) in the process of recontextualising the OPD in the Natural Sciences Learning Area.

As indicated in Chapter 2, this approach is supported by both Cornbleth (1990) and Bernstein (1990) as they emphasise the importance of setting or context in the recontextualisation of a curriculum. Action research allows one to take the local context or environment where teaching and learning takes place into account in a process of ongoing planning, action and reflection, which involves interpretation of the action in context. With this in mind I also take into account what Cohen et al. (2000: 22) say about interpretation in context when they say:

- Situations are fluid and changing rather than fixed and events are richly affected by context.
- There are multiple interpretations of events and situations, and
- Reality is multi-layered and complex.

McTaggart (1991:86) explains that action research is ‘not only about doing, it is about learning by doing’, and that it essentially involves cycles of planning, acting and reflecting. In the planning phase, practitioners identify areas for improvement in their practice, and educational activities are planned. In the action phase, the plans are put into practice, and are observed at the same time by practitioners who also monitor the action in various ways (e.g. by collecting evidence of learners’ work). In the reflection phase, information collected during the planning and acting phase is examined and analysed to inform the next phase of planning, acting and reflecting.

McKernan (1991) explains that different action research studies are shaped by different knowledge interests that can be technical, practical or critical. This study mostly has a practical knowledge interest, but it is also critical as it aims to investigate some of the structural factors that influence curriculum recontextualising processes as explained by Cornbleth (1990). The practical knowledge interest of this action research case study is to establish whether the school gardens can be used to recontextualise the Natural Sciences curriculum at school level, with specific emphasis on the realisation of an environmental discourse in the NCS. The practical knowledge interest referred to in this study can be explained by what Grundy (1987) called curriculum ‘praxis’. By referring to curriculum as praxis Grundy meant that curriculum develops through a dynamic interaction of planning, action and reflection. Curriculum is developed through an active process where planning, acting and evaluation are all reciprocally related and
integrated into the process (ibid.). This informed the choice of action research as methodology in this study which according to Kemmis (1982: 42) is a form of research carried out by practitioners into their own practice, ‘…a participatory form educational research for educational improvement … (which) contributes to social change.’ Grundy (1982:353) argues that the action in action research is ‘… different from other forms of action because it is deliberate and considered, and is undertaken to bring about change through reflecting on the action before undertaking new actions’. In this case study four lessons were planned within an action research process of planning, acting and reflecting, as shown in Table 3.1.

The research was constituted as a case study of praxis in my school, involving one other teacher involved in NS teaching. This allowed me to explore the recontextualising particularities and complexity of a single case (Bassey, 1999; Stake, 1995). Case study provides descriptive, rich information about a particular situation. Bassey (1999:40) describes case study as ‘…an empirical enquiry conducted within a localised boundary of space and time’. Yin (2003) states that case study research involves direct observation of events in a specific context, using a variety of techniques to generate rich data of the specific context.

In this case study the activities of planning, teaching (acting), assessing and evaluating the learners' work and the teaching strategies employed are all observed and reflected on. The learning process and the teaching approach are both considered since these are tied to one another in this case. In this study I have worked with both the teacher and the learners. I have also tried to avoid imposing my voice or influence the learning situation unnecessarily, while still playing a role of participant observer in study. As explained in my reflections on the study towards the end (Chapter 6), this was not an easy process, particularly since I am the school principal, and therefore have a pre-determined role in the school that is not easy to change in the context of a research initiative.

3.3 DATA GENERATING TECHNIQUES

3.3.1 A range of data generation techniques within an action research process

In the case of this study I worked with the Grade 7 Natural Science teacher in deciding what to teach and how to teach it. Four lessons in all were taught, one of them being a demonstration lesson that I taught (which she observed and reflected on with me) before the teacher started teaching her three lessons (which I observed with her and reflected on with her). As indicated in Chapter 1, we were both learning how to implement and work with the NCS, and its environmental discourse, as we both only recently were oriented by the DoE (2006) on how to recontextualise the NCS in our schools through the DoE NCS Orientation Programme. The following table, Table 2.1, shows the cycles that constitute the action research approach in this
study, and the associated data gathering activities. The table shows that action research processes involve ongoing monitoring of actions, and ongoing collection of data that needs to be organised effectively to ensure that the action process is actually also a research process. For ease of management and to ensure ongoing reflections (see Chapter 4), I therefore treated each lesson as a (small-scale) action research cycle. The data generation strategy that I followed in each cycle is outlined in Table 3.1 below.

Table 3.1 Data gathering approach for each of the action research cycles

<table>
<thead>
<tr>
<th>Cases</th>
<th>Data generating techniques</th>
<th>Stages of a cycle</th>
<th>Methods of capturing data</th>
<th>Data codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstration lesson (by me)</td>
<td>(i) Workshop/discussion with the teacher.</td>
<td>Planning</td>
<td>Interview audiotaped and notes taken.</td>
<td>TD1</td>
</tr>
<tr>
<td></td>
<td>(ii) Lesson observation.</td>
<td>Action</td>
<td>Notes taken.</td>
<td>DN</td>
</tr>
<tr>
<td></td>
<td>(iii) Interview: teacher, learners/ focus group.</td>
<td>Reflection</td>
<td>Audio taped and notes.</td>
<td>TD 2</td>
</tr>
<tr>
<td></td>
<td>(iv) Teacher’s and learners’ work.</td>
<td></td>
<td>Samples of work collected and notes taken</td>
<td>LI 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TW1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LW 1</td>
</tr>
<tr>
<td>Lesson 1 (by teacher)</td>
<td>(i) Discussion With teacher.</td>
<td>Planning</td>
<td>Interview audiotaped and notes taken.</td>
<td>TD 3</td>
</tr>
<tr>
<td></td>
<td>(ii) Lesson observation.</td>
<td>Action</td>
<td>Notes taken.</td>
<td>ON 1</td>
</tr>
<tr>
<td></td>
<td>(iii) Interview: teacher and learners.</td>
<td>Reflection</td>
<td>Audio taped and notes.</td>
<td>TD 4</td>
</tr>
<tr>
<td></td>
<td>(iv) Teacher’s and learners’ work.</td>
<td></td>
<td>Samples of work collected and notes taken</td>
<td>LI 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TW 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LW 2</td>
</tr>
<tr>
<td>Lesson 2 (by teacher)</td>
<td>(i)Discussion with teacher.</td>
<td>Planning</td>
<td>Discussion taped and notes taken.</td>
<td>TD 5</td>
</tr>
<tr>
<td></td>
<td>(ii) Lesson observation</td>
<td>Action</td>
<td>Notes taken.</td>
<td>ON 2</td>
</tr>
<tr>
<td></td>
<td>(iii) Teacher’s and learners’ work.</td>
<td>Reflection</td>
<td>Work samples collected.</td>
<td>TD 6</td>
</tr>
<tr>
<td></td>
<td>(iv) Interview teacher and learners.</td>
<td></td>
<td>Taped</td>
<td>TW 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LW 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LI 3</td>
</tr>
<tr>
<td>Lesson 3 (by teacher)</td>
<td>(i)Discussion with teacher.</td>
<td>Planning</td>
<td>Taped</td>
<td>TD 7</td>
</tr>
<tr>
<td></td>
<td>(ii) Lesson observation</td>
<td>Action</td>
<td>Samples of notes collected.</td>
<td>ON 3</td>
</tr>
<tr>
<td></td>
<td>(iii) Teacher’s and learners’ work.</td>
<td>Reflection</td>
<td>Taped</td>
<td>TW 4</td>
</tr>
<tr>
<td></td>
<td>(iv) Interview teacher and learners.</td>
<td></td>
<td></td>
<td>LW 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TD 8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LI 4</td>
</tr>
</tbody>
</table>

As shown in the table above, I coded the different sets of data according to the type of data source. The codes used are as follows:

- **TD** = teacher discussion (there were eight such discussions, some of which were similar to interviews - see below)
- **TW** = teacher work (planning documents) (there were four sets of teacher planning work)
• LW = learners’ work (evidence of learning) (there were four sets of learners’ work)
• LI = learner interview (normally focus group interviews) (there were four learner interviews)
• ON = observation notes (there were three sets of observation notes which refer to observation of the lessons taught by the teacher)
• DN = demonstration lesson notes (these were notes on the demonstration lesson which I gave at the start of the process).

Given the volume of the data generated, I only selected examples of this data to include in the appendices (Appendix 1-12), and kept the rest of the data in a file (in the form of a case record), which has been verified and examined by my research supervisor. I have carefully referenced the use of the various data sources in compiling the action research reports in Chapter 4.

3.3.2 Planning and reflection discussions with the teacher
At the start of the process, I held discussions with the teacher to discuss the entire research initiative and how we might approach it. We talked about a number of things. We discussed planning and we agreed that before we could embark on any activity, that is teaching, we ought to have had three stages of planning. We agreed that we should have a Learning Programme, and Work Schedule to inform the Lesson Plans, as advised by the DoE (2006) (see section 2.6.2.1). These stages of planning are a prerequisite for recontextualising the NCS as explained in Chapter 2. The first two stages of planning that is, the Learning Programme and the Work Schedule were already available and were already in use since it was almost in the middle of the year when this research process was started. These were done at the beginning of the year, and we felt that they could be used as the starting point for this research process, which was to focus on the Lesson Plans and teaching and learning activities using the school gardens. We also discussed the requirements of the Natural Science Learning Area such as the Core Content, the Learning Outcomes, the Assessment Standards, the activities that would be given to learners, the teaching strategies that I could use in the demonstration lesson and the teaching strategies that the teacher could use in the subsequent three lessons, the language that should be used during teaching, the LTSM that could be used and how to use it (such as the greened areas of the school) and the possible barriers that could hinder the learning process. This constituted a broad first discussion, which was followed by more detailed discussions in the form of interview conversations (semi-structured) as reported below. Initially I called these interviews, but after reflecting more carefully on their contents, I called them discussions, which more accurately reflected what was happening in the participatory research process as we were both making contributions. The reason why I initially called them interviews was I wanted to ensure that I was
able to capture some of our conversations formally, as action research activities can sometimes be very informal and difficult to capture. I captured our initial planning discussions data with a tape recorder and notes were also taken so that they could complement the data that was taped by an audio tape recorder.

I conducted a number of other planning discussions with the teacher before and after every lesson that was conducted (see Appendix 8 for one example of one of these discussions). Discussing the lesson with the teacher before the lesson was conducted helped me as I was able to know what her views were concerning the lesson itself, the approach to the lesson that she was planning to take, and the LTSM to be used and we also shared ideas. I used discussions instead of interviews because of the participatory nature of the action research, where we were both contributing ideas to the Lesson Plans, and we were both contributing to the reflections. The discussions were tape-recorded and analysed later. For these discussions to be successful I tried to establish and maintain a positive rapport between myself and the teacher similar to what one would do with interviewing (Le Roux, 2005:189), although the discussions did have quite a formal tone due to the fact that we were both unfamiliar with research-based discussion processes (see Appendix 8 for example). Our normal discussions were less formal than those reflected in the transcribed data.

The discussions that I conducted were oriented towards the planning and reflections on the lessons (see Appendix 8). I made every effort to first put the teacher at ease by telling her what the discussion would be about, and how I would record it, and use the data, and how it would be of use to us in the school, and in our Learning Area particularly.

Even though these were not formal interviews, but discussions, I drew on Le Roux (2005:189) who emphasises the importance of several basic interviewing skills. These, according to Le Roux include active listening, which involves attending to the responses as this skill demonstrates respect and shows that the interviewer is interested in what the respondent has to say. This in turn facilitates free expression from the respondent, which enhances the validity of the responses. In Appendix 8 it can be seen that the teacher felt free enough to give her ideas in the discussions, and to state what she thought would be best to do, as shown by this quote when I asked her if she would conduct the lesson outside or inside the classroom. She said ‘I think I am going to just ask questions while we are in the classroom and maybe later I am going to take them outside’, although there is also evidence that she was also swayed by some of my suggestions in her responses such as when she said for example ‘Ja! That is correct. We can do that’ (see Appendix 8).
I tried to allow the teacher freedom to express herself without interfering, although I did make collaborative suggestions as to what could be useful to do in the lessons as shown by this extract from my contribution in the Appendix 8 discussion ‘And you also need to plan your activities well and any assessment activity that you think you shall need’. From this interchange with the teacher, I was able to gather data on aspects of the lesson planning, and also on the reflections on the lessons. Capturing this discussion data was important for the action research process, as it allowed me to acquire information about the lessons that were to be taught and issues that came out of the reflections on the lessons, and the general feelings of the teacher about experiences of the recontextualisation processes involving all four of the lessons conducted in the action research process.

3.3.3 Focus group interviews with learners
Le Roux (2005:190) wrote that a focus group is a moderated informal discussion or interview among people, usually involving about 6-12 persons who share a common interest in the topic being researched. The focus group interview gives a researcher an opportunity to clarify and expand upon existing perceptions by sharing and comparing them with those of others (ibid).

In this study, I conducted focus group interviews with groups of learners after every lesson that was presented, starting with my demonstration lesson. This was done to assist us to reflect on the lessons and their success or issues that were arising in the lessons. I selected four learners from the class and then called for other volunteers. Initially I thought I would have six but because more learners were willing to volunteer I decided to make it eight learners. The four learners that I chose were selected on the basis that they would be able to talk as they had no problem in expressing themselves in English. By this I am not trying to say they are perfect or fluent in English. They are able to talk which is what is needed. Among the four learners I chose were two class leaders who assist in Natural Science matters in their class. They talk freely and they are used to talking to their classmates and to their teachers, myself included. Two of these learners are leaders in the class. They were chosen by other learners to be their leaders probably because of their openness and willingness to assist in problem solving.

Four other learners volunteered to work with me and the number of focus group members grew to eight learners in all. Le Roux (2005:190) believes that when selecting individuals to be included in the focus group, the researcher must ‘screen’ and select an appropriate category or group of participants. Once the learners were selected I wrote a letter to the parents requesting their consent to allow the learners to participate in the focus group (see Appendix 4).
The questions that I asked in the focus group interviews were simple. They ranged from what was happening during the lesson to how they viewed or perceived the lesson as a whole (see Appendix 6 and Appendix 10 for examples). My questions were a mixture of closed and open-ended questions. These questions allowed me to get specific answers as well as allowing the respondents to express their views the way they liked. The focus group interviews were critical for allowing us to reflect on the lessons.

3.3.4 Observation
This method was used to collect information, as the teacher was busy presenting the lessons I was recording the main parts of what was happening as the teacher was teaching. She similarly observed my demonstration lesson. Sometimes I would jot down some of the questions that the teacher asked and then observe the interactions that took place. Sometimes some of the valuable information or aspects of the lesson were missed when I was busy recording. Some of the notes were written after the lessons were presented. The reason for this was that I sometimes would be part of what was happening in the lesson to an extent that I did not record anything. This is a typical challenge for participant observers in participatory action research processes (Cohen et al., 2000).

Le Roux (2005:191) describes three ways in which a researcher can observe within a research setting:

- A complete observer, who enters the setting and remains physically detached from the activities and social interactions.
- A complete participant, where the researcher participates in the proceedings as if he or she is one of the respondents. Here the identity of the researcher has been cancelled per agreement.
- A participant observer, where the researcher engages in the regular activities, but periodically withdraws from the setting to check perceptions, record field notes and analyse data.

In the case of this study, I used the latter method or I assumed the latter identity. Both the teacher and the learners knew about me and I was sometimes part of the proceedings and all the participants had no problem with that as I am a Natural Science teacher myself in grade seven and we had agreed that the research would be a participatory process. We usually work together with the teacher in other aspects of teaching. Moreover a formal request to this effect was made (see Appendix 3).
To a lesser extent I took photographs of what was happening. I took pictures of learners and the teacher during lesson presentation. I might have missed some important information through this technique due to my inability to take photographs of what is happening. Those that I took in my view do give an indication of what was happening (see Chapter 4 for some of the photographs). Sometimes I took photos when the participants were not aware and were in the middle of the activity.

3.3.5 Document Analysis
The documents that I analyzed were the National Curriculum Statement, the teacher’s and my own recorded work like our Learning Programme, Work Schedule (see Appendix 7a and 7b) and Lesson Plans, tests, memoranda, the text books and the learners’ answer sheets or answer books (see Appendix 5, 11, 12 for examples).

To start with, I needed to analyse the Natural Sciences Learning Area Statement to understand the contents of the OPD, and what was expected of us as teachers involved in recontextualising this discourse. I used a content analysis strategy for this (Cohen, et al., 2000) and reviewed the documents to identify features of the discourse. I did this together with a colleague who was also involved in similar work but his work was in the context of the Life Orientation Learning Area (Jenkins, 2008) and we managed to identify the following features of the Official Pedagogic Discourse of the NCS, which I used to create an analytic memo (see section 4.3, Table 4.1) for further analyzing the OPD:

- Outcomes-Based discourse
- Standards-based discourse
- Human rights, social justice and inclusivity discourse
- Environmental discourse
- Learner-centred discourse
- Integration and progression discourse
- Contextual discourse
- Knowledge, skills and values discourse
- Investigation and problem solving discourse

In the work that I did with my colleague (Jenkins, 2008), we discovered that the Learning Areas share a similar set of discourse and so on (e.g. the outcomes-based discourse, the standards-based discourse, learner-centred discourse, environmental discourse, human and so on) but that specific Learning Areas also have their own specific discourse. In this case the investigation
and problem solving discourse was particular to the Natural Sciences Learning Area. So while we used similar categories for our analysis of the OPD in the two Learning Areas, they were not exactly the same. I could therefore not use exactly the same categories as those proposed by Jenkins (2008).

Analysing the teacher’s work and learners’ work in the form of documents gave me the opportunity to see first-hand what was recorded no matter what the feeling of the respondents might be about the research process. Documents are a true reflection of what is going on in a particular situation (Patton, 2001). Learners’ work gave a true reflection of how they understood the lessons. The learners’ work generated in the four lessons gave me the indication of how learners were responding after each and every activity (see Appendix 5 for an example). The teacher’s Lesson Plan (see Appendix 9 for an example), for instance, gave me an indication of how the teacher was going to use the school gardens (which form part of the learning and teaching support materials / resources available to teachers in our school) in her lesson presentation, thus providing insight into the planning process, as well as the lesson processes. I was also able to see how the teacher was planning to assess the learning (see Appendix 12 for an example). I used these documents to describe the recontextualising processes in each of the lessons reported on in more detail in Chapter 4.

### 3.3.6 Questionnaire

Only one questionnaire was administered. This questionnaire was given to the teacher to fill in before the research processes started in the classroom (see Appendix 1). I initially felt that I should give the teacher I was going to work with a questionnaire so that it could provide additional information about the teacher and the situation at the school in general that we may not have covered in the participatory process or in our discussions.

I wanted this information to provide rich contextual picture of the school. I also wanted to find out how the teacher felt about our situation at school concerning the working conditions for instance. While this questionnaire did not appear to have a direct bearing on the proceedings in class, I thought it might help to further understand some aspects of curriculum recontextualisation in the Grade 7 class or at the school and help to provide further perspective on the data that had been gathered in the lessons.

Le Roux (2005:186) explains that the advantage of a questionnaire is that, if properly designed, it provides a collection of reliable and reasonably valid data in a simple, cheap and timely manner. Having said all this I want to acknowledge the challenges that are encountered as a researcher tries to put together a questionnaire. For instance it was difficult to come up with
questions that would really probe and be objective so as to provide this study with rich data. Again it was challenging for me to ask probing questions about my management and leadership at the school. Despite this, the information gathered gave me a better indication of what is happening at my school and what the teacher’s feelings were about the working conditions at our school although the teacher did not answer some of the questions in the questionnaire (see Appendix 1).

3.4 DATA ANALYSIS
As indicated earlier, this research was conducted as a participatory action research case study. In this approach I tried to work together with the respondents as the approach suggests. This ensured that I was part of the process as it unfolded. In designing the study, I drew on the views of two theorists who seem to share views about curriculum development and its implementation in schools. These two theorists are Cornbleth (1990) who advocated that curriculum is a contextualised social process which is realised through a dynamic interaction of action, reflection and setting, and Bernstein (1990) who refers to the curriculum as the pedagogic discourse that results from a social recontextualisation process.

Both these theorists refer to the way curriculum is influenced and shaped by context. Cornbleth (1990: 6) refers to a curriculum as contextually shaped, whereas Bernstein (1990) refers to a recontextualising context during the relocation of a discourse that is curriculum. Although I employed the approaches of the two theorists mentioned above, I found the Bernstein concepts helpful to interpret the recontextualisation process, that is, what happened within the NCS discourse as we planned, implemented and reflected on our lessons.

In this work I used four cycles each containing three processes, namely planning, action and reflection. During each cycle the text underwent some transformations as Bernstein (1990:192) put when he said a curriculum undergoes transformation as it is regulated by rules and practices in the recontextualising fields, in this case the school, in the field of reproduction. These theories were therefore used to guide some of the analysis work in this study.

To start the analysis process I did the following:
- I firstly analysed the questionnaire data to provide a more detailed contextual profile than the one provided in Chapters 1 and 2, using an inductive approach to analysis (Cohen, et al., 2000)
- I then analysed the NCS to identify features of the Official Pedagogic Discourse so that I could understand what was meant to be recontextualised (as described in Table 3.2
below). I used an inductive approach to analysis (Cohen, et al., 2000) to construct an analytic memo for this analysis, which I then report on in Chapter 4 (see section 4.4).

- I then analysed each of the lessons through identifying what happened and what was said in the planning, action and reflection cycle of each lesson, following the action research process. I drew up an analytic memo for each of the lessons using the categories of planning, action and reflection. This was also an inductive approach to analysis (Cohen et al., 2000).

- I then compared what was expected by the OPD using the categories I developed (as explained above) to analyse the OPD at the start of the study, with what actually happened in each of the lessons (see analytic memo in Table 3.2 below). In this process I was extending the interpretations of the data using theory and contextual insights gained from the questionnaire.

**Table 3.2 Analytic memos comparing the OPD with what actually happened in each of the lessons**

<table>
<thead>
<tr>
<th>OPD in lessons: categories</th>
<th>Lesson 1: demo lesson</th>
<th>Lesson 2: by the teacher</th>
<th>Lesson 3: by the teacher</th>
<th>Lesson 4: by the teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcomes-based: NS has 3 Learning Outcomes, It also draws on the Critical &amp; Developmental Outcomes</td>
<td>Used LO 1 &amp; 2 in lesson planning &amp; assessing learners’ work.</td>
<td>Used LO 1, 2 &amp; 3. Learners involved in discussing &amp; collecting data.</td>
<td>Used LO 1 &amp; 3 in planning. Learners gathering data outside &amp; reported back.</td>
<td>Used LO 1 &amp;2 to plan lesson &amp; activities. Learners discussed results. Teacher did some of the work.</td>
</tr>
<tr>
<td>Standards based: NS has 7 AS that set the standards for assessment in different grades.</td>
<td>AS 1 – 7 were used to assess learners. Activities addressed AS.</td>
<td>AS1-7 were used. Only knowledge AS used for assessment. AS of LO 1 neglected.</td>
<td>AS 1, 2, 3 &amp; 5 were used. Only knowledge AS tested. AS of LO 1 neglected.</td>
<td>AS 1, 3 &amp; 4 were used. Assessment did not quite match AS. AS of LO 1 neglected.</td>
</tr>
<tr>
<td>Scientific concepts: Includes core content on scientific concepts</td>
<td>Teaching &amp; assessment based on core content on biodiversity</td>
<td>Teaching &amp; assessment were aligned with core content.</td>
<td>Teaching &amp; assessment aligned to content</td>
<td>Activities linked to core content of NS Learning Area.</td>
</tr>
<tr>
<td>Human Rights &amp; Social Justice: A principle statements ensures that human rights and social justice issues are integral to the Learning Area</td>
<td>Learners discussed ways of preserving environment – Human rights and social justice issues not dealt with.</td>
<td>This aspect not dealt with in the lesson.</td>
<td>This aspect not dealt with in the lesson</td>
<td>This aspect not dealt with in the lesson</td>
</tr>
<tr>
<td>Environmental: A principle statement ensures that environment is integral to the Learning Area</td>
<td>Learners identified animals in the environment.</td>
<td>Learners identified animals in their environment.</td>
<td>Learners worked among plants in their environment and identified uses and values of plants.</td>
<td>Learners gained deeper insight into value of plants.</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>------------------------------------------------</td>
<td>------------------------------------------------</td>
<td>-------------------------------------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td><strong>Investigation &amp; Problem Solving:</strong> The AS are oriented towards investigation and problem solving pedagogies</td>
<td>Learners investigated similarities in different organisms, with emphasis on distinguishing between concepts. Problem solving process skills not developed.</td>
<td>Learners identified differences in vertebrates themselves – emphasis on concepts. Problem solving process skills not developed.</td>
<td>Learners discussed importance of plants, and went outside to identify uses of plants. Problem solving process skills not developed.</td>
<td>Learners were involved in investigating photosynthesis in plants through observing experiments and answering questions. Problem solving process skills not developed.</td>
</tr>
<tr>
<td><strong>Learner-centeredness:</strong> The AS encourages learner participation and decision making</td>
<td>Learners answered questions.</td>
<td>Learners answered questions as they identified animals themselves.</td>
<td>Learners answered questions and gave feedback.</td>
<td>Learners not quite involved in performing experiments, but participated as observers and in answering questions.</td>
</tr>
<tr>
<td><strong>Integration &amp; progression:</strong> The NCS requires teachers to integrate NS with other Learning Areas, and to ensure that progression takes place from grade to grade and phase to phase.</td>
<td>Integration with languages done as learners talked, not indicated in Lesson Plan. Progression planned for (first Lesson Plan in a series)</td>
<td>Integration with languages done as learners wrote and talked. Not planned for in Lesson Plan. Progression dealt with as lesson built on earlier demonstration lesson.</td>
<td>Integration done with languages as learners wrote in their books. Also planned for in Lesson Plan. Progression dealt with as lesson broadened to include plants (and not only animals in biodiversity concept)</td>
<td>Integration done with Life Orientation as learners were taught to respect environment, but not indicated in Lesson Plan. Integration with Languages indicated, as well as integration within Learning Area. Progression dealt with in terms of introducing learners to more complex knowledge of plant uses and values.</td>
</tr>
</tbody>
</table>

AS = Assessment Standards  
LO = Learning Outcomes  
NS = Natural Science
The above data distribution represents a synopsis of the more detailed descriptions of the lessons reported in Chapter 4. Reviewing this data against the research questions gave rise to the first analytical statement listed below. Considering this analytical statement more carefully gave rise to further Analytic Statements that together represented the final process of data analysis, where I linked the data based findings in the study, with the literature presented in Chapter 2 in order to address the research question. Bassey (1999) describes Analytic Statements as useful way of handling and making sense of data by condensing the data into meaningful statements. He suggests that these statements need to be firmly based on the raw data and that links to the data through coding is essential to enable one to go back and verify the statements. The analytic statements that I developed were used to structure the discussions in Chapter 5. The analytic statements are:

- **Analytic statement 1**
  Gardens provide a resource and context for Natural Science Learning Outcomes and principles that assist with curriculum recontextualisation processes, but they need to be used effectively for this purpose.

- **Analytic statement 2**
  Recontextualisation possibilities using gardens are affected by teachers knowledge, experience, motivation and understanding of the OPD.

- **Analytic statement 3**
  Using gardens for recontextualising aspects of the Natural Science curriculum has management implications.

- **Analytic statement 4**
  Socio-cultural and structural factors have an influence on the recontextualisation of the OPD.

### 3.5 ETHICS IN THE RESEARCH

Cohen et al. (2003:56) describe ethics as a matter of principled sensitivity to the rights of others. To address this issue informed consent was sought. I wrote letters to the School Management Team (SMT) and School Governing Body (SGB) requesting permission to conduct research work at the school. I was granted permission to do the research (see Appendix 3 and 4). The teacher that I was going to work with was asked if she would be interested in participating in the research (voluntarily) and I also spoke to the teacher to discuss the concept of participatory action research and how she might participate in the study. She agreed to work with me.
I wrote letters to the parents of the learners I identified for my focus group, asking for permission to work with their children. Permission was granted (see Appendix 4). The reasons why I was going to work with both teachers and learners were explained. In this regard Cohen et al. (2000: 53) state ‘Permission to carry out an investigation must always be sought at an early stage’. This was exactly what I did, as I have explained. The purpose of this exercise was to deal with power relations that exist or might exist between the researcher, who in this case is myself - the principal of the school - and the teacher who is my ‘subordinate’ at the school and who participated in the research with me. However, I was of the opinion that the power relations that might have existed between myself and the Grade 7 Natural Science teacher were lessened by the fact that I already work with the teacher in the Senior Phase (Grade 7-9) on Natural Science matters and other spheres of the school, where we usually interact with one another on various professional matters, and working with her was therefore not be a new thing at all.

3.6 VALIDITY AND TRUSTWORTHINESS
Ensuring that the data that was collected was detailed and used a range of methods contributed to the validity and trustworthiness of my work. Data was collected and participants were involved in checking the data and appended their signatures, proving that they agreed with the data. This is a process of member checking as explained by Lather (1986). During the whole process of data collection I tried to keep a very detailed report of what took place in the action research process. This, together with multiple sources of data allowed me to provide a thick description, which is said to ensure trustworthiness in qualitative research (see Chapter 4).

Different data collection techniques have been used to ensure that the data could be compared through a process of triangulation as explained by Cohen et al. (2000:112). I also kept a research journal to ensure that I reflected on of the research process throughout. This facilitates a reflexive approach to the action research process (Lather, 1986), and helped me to keep track of what was happening in the research process.

3.7 CONCLUSION
This chapter described the research design and the methods that were used to generate data. This chapter also described how data was analysed and the categories that emerged out of the data as it was being analysed. I also indicated how I attended to issues of ethics and validity in the study. In the next chapter I share the detail of the research process, through a ‘thick description’ of what happened. I first provide the contextual data from the questionnaire, then an analysis of the OPD and then a detailed description of the four lessons using the action research process.
CHAPTER 4: RECONTEXTUALISING THE NATURAL SCIENCE OFFICIAL PEDAGOGIC DISCOURSE IN FOUR LESSONS

4.1 INTRODUCTION

In this chapter I explain the process of recontextualisation of four lessons that took place in four lesson-based action research cycles (i.e. each lesson represents a small-scale action research cycle). This presents the evidence of what took place in the research process. This chapter also explains the process of linking the pedagogic discourse (the Natural Science National Curriculum Statement) to what took place during lesson presentation. The use of school gardens formed the broader context of the recontextualisation process of the Natural Science OPD in each of the four lessons. The focus of this process is the grade seven Natural Science Learning Area. As indicated in Chapter 1, the school garden and other greened areas of the school provide both teachers and learners with a resource for teaching and learning about biodiversity aspects in the curriculum. As indicated in Chapter 1 too, this resource is new in our schools, as it has recently been provided by SANBI. Working with the Natural Sciences Learning Outcomes and Assessment Standards is also new in our school, as the Department of Education has only recently provided Grade 7, 8 and 9 teachers with orientation training on how to work with this new curriculum. As a result, we (myself as principal and the Natural Science teacher) were both relatively unfamiliar with the requirements of the OPD, and with the process of working with school gardens for Natural Science teaching at the start of this action research process.

As indicated in Chapter 3, I have chosen to work with only one teacher so as to concentrate on the activities of one teacher and the class that will be taught. This chapter also looks at whether the processes of delocation and relocation that occur as a result of the recontextualisation process reflect achievement of the desired Learning Outcomes after the assessment. This chapter is about revealing the situation as it is. It also reflects on the process of our learning together through the action research lessons.

I present the demonstration lesson first, which I taught so that the participatory research process could begin. After that I engaged the teacher and learners in a discussion and interviewed them to get their views about the various aspects of the lesson. In this way the whole process was opened up for discussion so that when the next lesson was presented by the teacher improvements could be made.

Before this, however, I provide a more detailed profile of the teacher I worked with to provide a deeper insight into the context in which we work. I also write about her impressions on the
school as a whole the way she put them. (See also Appendix 1). This is accompanied by a brief school profile as the school forms the basic context in which all the processes take place.

As indicated in Chapter 2, Bernstein (1990) explains that selective appropriation and ideological transformation takes place in the recontextualising process. For a detailed reporting of the evidence of selective appropriation and to a certain extent, the ideological transformation that occurred in the four lessons, I provide a separate and detailed discussion on each of the lessons, thereby providing a thick description of what occurred.

4.2 SCHOOL CONTEXT AND TEACHER PROFILE
4.2.1 The school profile
Our school MT Zion J.S.S, which I introduced in Chapter 1, is one of the largest schools in Bizana. It is one of the schools that are known to produce good results in the district. Mt Zion J. S. S. is also known for maintaining good discipline at school and that is something that makes teaching and learning take place smoothly and successfully.

Maintaining good discipline and producing good quality results is a challenge especially when the school has a high learner population like Mt Zion. The school offers classes from Grade R-9. The learner population is above eight hundred and seventy learners (870) with sixteen teachers at the present moment. The teacher-learner ratio is well above the government-approved ratio of 1:36 as the present ratio is 1:54 on average. The enrolment keeps growing steadily every year, as more parents want to place their children in the school because of its successes, and because the school is known to provide the learners with good education.

As indicated in Chapter 1, the school has no permanent structures. Some classrooms are prefabricated structures, some are mud structures and some are made of iron. These are iron shacks. The classroom accommodation is insufficient. The odds are against us at school because the school is faced with high enrolment figures and a lack of enough accommodation for learners. The school has no administration offices. The principal and the school management operate from the classrooms. There are no staff rooms. Teachers sit with their learners in the classrooms and do their work. As mentioned in Chapter 1, the school has asked permission from the local municipal councillor to use some of the rooms in the community hall that was erected inside the school premises. Teachers use this hall as their staff room, though on a temporary basis. They are now able to work freely and there is more space for them to keep their books, belongings and equipment.
4.2.2 The Teacher Profile

The teacher that I worked with is a fine young woman who is between 20-30 years of age. Her professional qualifications include a Senior Primary Teacher’s Diploma (SPTD), which she obtained after finishing her Grade 12 education in 2001. Her first employment was in 2002 at Mt Zion J.S.S. She is a qualified Mathematics and Science teacher. While teaching at Mount Zion she progressed with her education and did an Advanced Certificate in Science Education (ACE) at Rhodes University. She was given the senior phase Mathematics and Natural Science Learning Areas to teach. Like other schools in South Africa, the school still has a shortage of teachers in these Learning Areas. This teacher has attended some workshops organised by the Department of Education in the district with the purpose of advancing the teachers’ knowledge and capacity in various fields in the education sector. The teacher in question has attended the following in-service training courses: OBE training in 2003 and 2004 and NCS Orientation Training in 2006. These training courses are of a short duration (normally only one week).

The teacher is diligent and good at what she does. She is trying very hard to cope with the amount of work she has been given. She has become a pillar of strength in the teaching of Mathematics and Sciences Learning Areas in the Senior Phase section in our school. When the teacher was interviewed she commented on the administrative side of the school. Some of the questions in the interview had bearing on both the structural and administrative side of the school as a whole and especially in the phase where the teacher is teaching. For instance when the teacher was asked about the problems she encounters in teaching at Mount Zion J.S.S she complained about learners that do not understand the language of instruction that is English, overcrowded classrooms, lack of resources like classrooms and what she called classroom organisation. She stated for example that ‘I think something needs to be done. How can one teacher teach a class of 80 learners and expect learning to be effective?’ (see Appendix 1). When asked whether management was listening to her she said ‘yes’, but when asked if management was assisting her in these problems her response was ‘no’. When asked whether she had any possible solution to the problems, her response was that more classrooms should be constructed and that the Department of Education should intervene to resolve these and other issues of the school. She said, ‘Government should help in constructing schools and resources like science laboratories’ (see Appendix 1).

Some of the questions in the interview were left blank and not answered at all. These are the questions that probed whether the management was willing to assist in the problems that she encountered in her at school. The interview also touched on the possible solutions that the teacher could think of. The questions also probed the teacher’s views on the role that the School Management Team (SMT) is playing at the school as far as supporting the teachers'
needs. The teacher also provided some light on the support base that is available at school in so far as her colleagues, learners and parents are concerned. The teacher also gave her views on discipline matters at the school in general. The teacher regarded the support she was receiving from her colleagues, parents and management as ‘satisfactory’. This indicates that despite the fact that the teacher was encountering problems, as discussed above, moral support was provided by her colleagues and management, and this is vital in boosting and maintaining the morale among the staff.

With regards to curriculum issues, the questionnaire revealed that the teacher saw Natural Sciences teaching as important because it ‘… helps them to develop and use Science process skills in different situations, develop problem solving skills and be able to work together and share ideas’ (see Appendix 1). She saw Outcomes-Based Education as important because the outcomes were transparent to both the teacher and the learners, and because ‘…there is more than one chance of achieving success, learners can learn in the way that suits them best, learners are actively involved in the learning experience’ (ibid.). With regards to environmental learning in the Natural Sciences Learning Area, she reflected that much of the content of Natural Sciences was environmental, for example ‘… Science deals with real life in the environment, living and non-living, earth’s resources, and … knowledge about the use of resources and environmental impacts’ (ibid.). She stated further that ‘… everything in Natural Science is in the environment i.e. soil, water, air, animals and plants. It focuses on life and living, earth and beyond, matter and materials, and energy and change – all of which are based on the environment and society’ (ibid.). She also saw environment as a useful teaching tool. With regards to curriculum planning and assessment, the teacher showed a good understanding of the importance of planning lessons when she said that ‘good planning and preparation will ensure that activities requiring resources are successful’ and that ‘planning also helps to achieve the required Learning Outcomes’ (ibid.). She showed a broad understanding of assessment when she indicated that assessment in OBE involves assessment of ‘… learners attitudes, understanding, confidence, problem solving skills, and also ranks learners according to academic achievement’ (ibid.). Her view of assessment also indicated that assessment practice could help teachers to be more reflective when she stated that ‘it also helps the teacher to see if the outcomes were achieved’ (ibid.).

After gaining a better understanding of the school, and the teacher’s views of the management and other issues in the school, and some insight into her views on curriculum, assessment and environmental learning in Natural Sciences and the school, I wanted to gain a better understanding of the NCS Learning Area Statement. I therefore undertook an analysis of this statement to identify key features of the Official Pedagogic Discourse.
4.3 FEATURES OF THE OFFICIAL PEDAGOGIC DISCOURSE (THE NATURAL SCIENCE LEARNING AREA STATEMENT)

The analysis of the Natural Science Learning Area statement shows a range of key features that represent the Official Pedagogic Discourse. These include an outcomes-based discourse, a standards-based discourse, human rights, social justice and environmental discourse, an investigation and problem solving discourse, a learner-centred discourse, and a curriculum discourse that emphasises integration and progression. The NCS discourse also foregrounds knowledge, skills and values, as well as links to context. Many of these features of the curriculum discourse are new. For example, in apartheid education (Bantu Education) the social justice, human rights, environmental and inclusivity discourses were absent. The past education system was not learner-centred, nor did it encourage teachers to make links to context. It was also primarily subject content based, and did not encourage integration or emphasis on knowledge, skills and values. As reflected in Jenkins (2008), this complex discourse presents teachers with many new challenges. Table 4.1 below summarises the key features of the OPD, as identified through an analysis of the Natural Science Learning Area Statement for General Education and Training (DoE, 2002) (with specific focus on Grade 7).

Table 4.1  An analysis of the OPD as identified in the Natural Science Learning Area Statement for GET (with specific focus on Grade 7).

<table>
<thead>
<tr>
<th>KEY FEATURE OF THE OPD</th>
<th>EVIDENCE OF THIS KEY FEATURE AS IDENTIFIED IN THE NATURAL SCIENCES LEARNING AREA STATEMENT (DoE, 2002)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTCOMES-BASED</td>
<td>The Natural Science Learning Area Statement is organised according to 3 Learning Outcomes. These are: Learning Outcome 1: Scientific Investigations Learning Outcome 2: Constructing Science Knowledge Learning Outcome 3: Science, Society and The Environment. The NS starts with a section that explains Outcomes-Based Education (pg. 1) and it states that the Learning Outcomes are guided by a set of Critical and Developmental Outcomes. It states that Outcomes-' it strives to enable all learners to achieve to their maximum ability' (pg. 1). It also states that ‘the outcomes encourage a learner-centred and activity-based approach to education’ (pg. 1).</td>
</tr>
<tr>
<td>STANDARDS BASED</td>
<td>The NS Learning Area statement specifies the Assessment Standards that will enable the Learning Outcomes to be achieved (pg. 2). The Assessment Standards are identified for each grade and a learner must achieve these or learner must show an approved level of competence before progressing to the next grade or level. The standards ‘... describe the depth and breadth of what learners should know and be able to do’ (pg. 2). The Assessment Standards further show ‘... how conceptual and skills development can take place over time’ (pg. 2). These standards ‘... can be integrated within grades as well as across the grades’ (pg. 2).</td>
</tr>
</tbody>
</table>
The use of Assessment Standards for assessment should provide ‘... indications of learner achievement in the most effective and efficient manner’ (pg. 3). For example for Learning Outcome 2: Constructing Science Knowledge, the Assessment Standard 1 (for Grade 7) expects learners to ‘recall meaningful information’, and more specifically to be able to ‘distinguish vertebrates from invertebrates’ (pg. 52). Assessment Standard 2 of the same Learning Outcome expects learners to be able to ‘categorise information’ by, for example using ‘... a simple classification system to group root types of different plants’ (pg. 52).

| HUMAN RIGHTS, SOCIAL JUSTICE AND INCLUSIVITY | This discourse is supported by a principle statement that supports the values of the Constitution and the Bill of Rights in the Constitution (pg. 1). The curriculum is used as a basis for social transformation, healing of the divisions of the past and is intended to contribute to establishing a society based on democratic values, social justice and fundamental human rights (pg 1). The NS Curriculum Statement, indicates that ‘... education and the curriculum have an important role to play’ in realising the Constitutional aims (pg. 1). Through this principle, the curriculum shows sensitivity to issues of poverty and other challenges such as HIV/AIDS, and the curriculum adopts an inclusive approach by ‘specifying the minimum standards for all learners’ (pg. 2). It also states that ‘All the Learning Area Statements try to create an awareness of the relationship between social justice, human rights, a healthy environment and inclusivity’ (pg. 2). |
| ENVIRONMENTAL | As indicated above, the environmental discourse in the NCS is also linked to the human rights and social justice discourse. As such, the Critical Outcomes guiding the NS Learning Area envisage learners who use science and technology effectively and critically showing responsibility towards the environment and the health of others (pg 1 and 4). The curriculum also addresses longer term environmental, and sustainability issues. This approach also ensures that South Africa’s resources are used wisely so that future generations can also benefit from clean water, clean air, water, food and healthy environment (DoE, 2006:82). The NS curriculum also specifies environmental content to be covered by Senior Phase learners. It has a specific theme on Biodiversity, Change and Continuity (pg. 64) that talks about understanding biodiversity in terms of a history of change in environments and in characteristics of plants and animals over time. Senior Phase learners are expected to learn about sexual reproduction of plants and animals, and inter-generational changes, and changes in species over a long period of time. They are also meant to understand variation in a species, natural selection and how biodiversity enables ecosystems to sustain life. They are also meant to understand issues associated with biodiversity loss and impacts of human activities on biodiversity, including extinction. They are also meant to classify organisms using categories of vertebrates and invertebrates, and classes (pg. 62-65). |
| INVESTIGATION AND PROBLEM SOLVING | The NS Learning Area foregrounds investigation and problem solving as it tries to support the development of ‘a systematic approach to scientific inquiry’ (pg. 4). The NS Learning Outcome 1 ‘Scientific Investigations’ and Assessment Standards are structured according to an investigation process, and learners are required to: 
• Plan investigations (AS 1) 
• Conducts investigations and collect data (AS 2) 
• Evaluate data and communicate findings (AS 3) (pg. 49-50) |
This feature challenges learners to use a variety of forms of reasoning while they use process skills to investigate, reflect, analyse, synthesise and communicate with others. It also allows learners to understand that problem-solving contexts do not exist in isolation but coexist with others (pg 1, 4).

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<tr>
<th>LEARNER-CENTREDNESS</th>
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<td>Outcomes-Based Education emphasises and encourages a learner-centred approach to teaching (pg. 1). This ensures that learners are able to learn and do things themselves. The purpose for this is to create a lifelong learner who is ‘… confident and independent, literate, numerate, multi-skilled, compassionate, with a respect for the environment and the ability to participate in society as a critical and active citizen’ (pg. 3). This feature also aims at making education meaningful (pg. 5), and it states that ‘Meaningful education has to be learning-centred and help learners to understand not only scientific knowledge and how it is produced, but also the contextual environment and global issues that are intertwined with the Learning Area … the Learning Area must be able to provide a foundation on which learners can build throughout life’ (pg. 5). This concept of learner-centredness does not only focus on learners’ prior knowledge, but on learners in society.</td>
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<th>INTEGRATION AND PROGRESSION</th>
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<tr>
<td>The NS Assessment Standards can be integrated within grades and across grades. These features of integration across Learning Areas and conceptual progression from grade to grade are central to the NCS (pg. 2). Integration happens between Learning Areas that the learners are working on with their teachers, and is aimed at enabling learners to construct a coherent whole unit of knowledge. Progression aims to enable a smooth flow and growth of knowledge as the learner progresses to the next grade or level. This feature of the NS allows learners to consider a connected series of events and allows a learner to see and describe simple associations between events especially if experience or prior knowledge gained by a learner is also brought in the learning environment (DoE, 2006:29). This also ensures that learning gets progressively more complex from grade to grade and from phase to phase. Progression in the NS Learning Area is not only reflected in terms of the amount of knowledge a learner can recall, but also in terms of the learners’ ability to ‘plan and carry out investigations using knowledge, and the ability to interpret and apply the knowledge in classroom situations as well as situations affecting the learner as a member of a changing society’ (pg. 7).</td>
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<th>LINKS TO CONTEXT</th>
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<tr>
<td>Both Critical and Developmental Outcomes stipulate that a learner needs to develop an understanding that ‘problem-solving contexts do not exist in isolation. The Learning Area Statement also indicates that learners need be culturally and aesthetically sensitive across a range of social contexts’ (pg. 1). Different contexts are represented by different assessment methods that are used to assess learners in various grades or phases. In terms of content, the Learning Area Statement presents four core knowledge statements, which represent a minimum content coverage of 70% of the Learning Area. The statement indicates that ‘Teachers are encouraged to view the remaining 30% of the time as available for extending the core and for curriculum development around contexts which are significant to learners and the local community. These may be economic, environmental, social or health contexts. This policy creates an opportunity for curriculum development and teacher professional development at school and district levels, and enables learners to demonstrate outcomes on issues which have relevance to their lives’ (pg. 7).</td>
</tr>
</tbody>
</table>
The NCS expects all learners to be offered opportunities to develop a high level of knowledge and skills (DoE, 2006:29). A mix of knowledge, skills and values are assessed whenever a learner’s performance against Assessment Standards are tested or assessed (DoE, 2006:73). These can be explained in terms of concepts, content and context in which learning is taking place. These are embodied in Assessment Standards and the learners are required to achieve the Learning Outcomes (DoE, 2006:73). The NS Statement indicates that to promote scientific literacy, the NS Learning Area supports the ‘… development and use of science process skills in a variety of settings; the development and application of scientific knowledge and understanding; and appreciation of the relationships and responsibilities between science, society and the environment’ (pg. 4). This mix of knowledge, skills and values forms the basis of the Learning Outcomes and Assessment Standards.

This analysis provides insight into the complex and multi-dimensional features of the South African National Curriculum Statements, and specifically the Official Pedagogic Discourse of the Natural Sciences (with emphasis on Grade 7). This analysis provides insight into the OPD used to plan our lessons. To do this, we were also guided by the recontextualising materials provided by the Department of Education’s (2006) guidelines for planning, teaching, assessment and LTSM use (described in Chapter 2). I now describe four cases of recontextualising processes in the form of Lesson 1, 2, 3 and 4, which I present as action research processes using the planning, action and reflection cycles of the action research process.

4.4 RECONTEXTUALISING PROCESSES IN LESSON 1 (DEMONSTRATION LESSON)

4.4.1 Planning Lesson 1

During the planning of Lesson 1, which was a demonstration lesson that I taught, I organised a discussion session with the Grade 7 Natural Science teacher (as explained in Chapter 3). During the discussion we identified the following important issues to consider in planning a Natural Science lesson focusing on biodiversity (TD 1).

- The Department of Education’s planning framework

We discussed that before we plan an individual lesson we need a year-long programme, which the Department of Education calls a Work Schedule (see Chapter 2), and that this is linked to the Learning Programme (TD1). The Work Schedule maps out what needs to be covered at different times in the year. We examined our Learning Programme that we had previously constructed (see Appendix 7a) and we were able to identify that we had planned to do activities that focus on NS Learning Outcome 1, and that biodiversity needs to be dealt with in Grade 7.

We had also previously developed our Grade 7 Work Schedule, soon after the DoE Orientation
Training (see Appendix 7b) that provided more detail on Assessment and Teaching than the Learning Programme. In reviewing our Work Schedule, we identified the need to deal with Scientific Investigations (Learning Outcome 1), and we thought that we could use the topics of vertebrates and invertebrates to assist learners to achieve the Learning Outcomes and Assessment Standards (see Appendix 7b).

The Department of Education requirements for Lesson Plans (as outlined in the DoE, 2006) recontextualising materials were also discussed. We discussed these and noted that the DoE requires that we consider the following when making a Lesson Plan:

- Philosophy and policy
- Principles underpinning the curriculum
- Time allocation and weighting
- Integration
- Resources available
- Inclusivity and barriers to learning
- Learning Outcomes and Assessment Standards

All these aspects influence the planning of a lesson (see Appendix 9 for an example). They are therefore a prerequisite for every lesson that is planned.

- **The requirements of Learning Areas**
We also discussed the requirements of the Learning Areas (TD1). This brought out the fact that we need to also develop skills, values and attitude of the learners. We agreed that these could be achieved by taking into account the Learning Outcomes and Assessment Standards. We also had to consider the content to be taught and the context in which it was to be taught.

We discussed the concept of biodiversity broadly (TD1) and we also suggested a content and context that would suit the lesson. The topic ‘Classification of Living Things (both plants and animals)’ was chosen, because this topic followed a lesson that was previously taught by the teacher. The topic of the previous lesson was ‘Characteristics of Living Things’. This topic dealt with the concept of biodiversity (TW 1)

- **Assessment**
We also discussed assessment, and how we should plan for assessment (TD1), as the DoE (2006) recontextualising materials emphasized the importance of assessment. We decided that the assessment activities would be as follows:
Activity 1: Questions on prior knowledge concerning the features of living things. Ask learners to give characteristics of living things for example: They breathe. They eat/feed. They move around. They reproduce (TW1).

We also planned that learners would complete worksheets on the characteristics of plants and animals and look at possible differences between plants and animals (LW1).

- **Medium of instruction and learner participation**
  
  The medium of instruction in which learners were to be taught was also discussed (TD1). English was going to be used. Xhosa would be used sparingly for clarity. The involvement of learners in the lesson was also discussed (TD1). We decided that learners were going to:

  - Answer questions orally
  - Write notes in their books
  - Fill in worksheets on information regarding the differences between plants and animals (TD 1).

- **The actual lesson planning**
  
  Further evidence of the planning process is provided in the actual lesson that was planned (TW1). The Lesson Plan shows the topic as: ‘Classifying Living Organisms’, as planned above. I planned three related activities (as described below) to address the Learning Outcomes and the Assessment Standard identified for the Lesson Plan. The Learning Outcomes and Assessment Standard selected for the Lesson Plan were the following:

  Learning Outcome LO 1: Scientific investigations
  
  Assessment Standard 1: Distinguishes vertebrates from invertebrates (TW 1).

  The other aspects of the Lesson Plan were as planned and reported on above, with the most emphasis being on the classification of animals into vertebrates and invertebrates, because this was the focus of the Assessment Standard.

4.4.2. Teaching the Lesson

  The Grade 7 NS teacher observed as I taught. We planned to discuss the lesson and its process and outcomes after the lesson was completed. The lesson that I taught included the activities listed below. Examples of questions asked and the learners' responses appear in the discussion that follows activity 2 below.
• **Activity 1:** (20 minutes)
I asked questions that probed the learners’ prior knowledge of living things and their features or characteristics.

• **Activity 2:** (30 minutes)
Learners were expected to write about the differences between plants and animals. They were also expected to list the similarities between plants and animals. These were based on the characteristics of both plants and animals as living things. The worksheets or learners’ workbooks show this work (LW 1).

It took me quite some time to try and explain what the lesson was about and to ensure that all understood the concepts. For instance I had to first explain the meaning of terms like vertebrate and invertebrate animals before I could proceed with my lesson. The following are some of the questions that were asked so as to try and consolidate all the activities or work that was done so far:

  Teacher: What makes animals and plants living things? Why do we say they are living?
  First Learner: Animals and plants grow, sir.
  Second Learner: They die.
  Third Learner: They eat.

• **Activity 3:** (50 minutes)
The third activity was meant to introduce a classification system for different groups of animals. Learners were asked if animals were all the same. They were also asked to group together animals they thought were similar or belonged to one class. Learners listed these on separate sheets of paper (see Appendix 5; LW1). Notes were jotted down on the board to emphasize certain points so that learners could copy them into their books.

• **Assessment**
Assessment was based on Activity 3 above. Learners grouped animals according to whether or not they had a backbone in their bodies using the vocabulary of vertebrates and invertebrates as classification system (see Appendix 5, LW1). The teacher marked this work. Marks were given as shown in their workbooks (see Appendix 5, LW1).

4.4.3 **Reflections on the lesson**
After the lesson was finished I sat down with the teacher, to discuss the lesson (TD 2). I also held a focus group discussion with the learners (L1 1, see Appendix 6). We shared views on the
demonstration lesson. In the discussion with the teacher (TD 2) the following issues came up:

- **The multilevel nature of the class**
  This issue referred to the fact that learners have differing learning styles and are at different levels of understanding. Concerning the issue of the multilevel nature of the learners the teacher had this to say: ‘I also think that what is called multilevelness is also a problem. You get learners who differ in learning styles. This makes it quite challenging because of the differing learning styles’ (TD 2). This was based on the teachers’ observation that not all of the learners understood the concept at the same time, or equally well, which required me to spend a lot of time ensuring that all learners adequately understood the concept (as explained above). The learners did not reflect on this issue in the focus group interview I held with them after the lesson.

- **Learners who want IsiXhosa, as the mother tongue, to be used in teaching**
  The second issue raised for reflection by the teacher was the issue of language of instruction. We both agreed that learners wanted isiXhosa to be used as well as English so that they could better understand what was taught. The teacher said: ‘Like I said in the previous interview, they (learners) seemed to understand better when you use isiXhosa’ (TD2). In the focus group discussion with the learners, the learners also indicated that use of isiXhosa makes the lesson easier to understand because it is their home language. This is evident from this quotation from that came from one of the learners when they were interviewed after the lesson when he said ‘Yes sir we understood it, and Xhosa made it very easy to understand….because we know isiXhosa sir’ (LI 1, see Appendix 6). The teacher and I agreed that we would continue to use isiXhosa (in addition to English) when we taught them as this seemed to work well as the learners showed interest in what they were learning, as indicated by this comment from one of the learners ‘I liked to hear that animals and plants are very important to us’ and ‘We see plants and animals in our area sir. It was easy to talk about them sir’.

- **Interpretation of scientific concepts**
  In our reflections, we also discussed the process of interpreting scientific concepts for the learners. Animal kingdom/plant kingdom and vertebral column were some of the scientific terms that I had to interpret in English and isiXhosa. For example, vertebral column given in isiXhosa is: ‘ezinethambo lomqolo’. In the interview with the learners afterwards, I checked to see if they understood the concepts that were interpreted in the lesson. I also asked the learners whether they understood the scientific words used such as ‘feature’ and ‘species’, and they were able to provide adequate descriptions of these terms.
**Links to other education opportunities**

In the interview with the learners, they raised the issue of poaching, and caring for living things, which had not been widely covered in the lesson, as the main focus was on understanding the concepts and scientific language. In the interview, however, we discussed how the learners could watch television programmes to learn more about the animals discussed in the lesson. The learners seemed aware of programmes that could give them more information on animals, such as National Geographic on ‘SABC on Sundays at 6pm’. As indicated in the interview, I encouraged the learners to extend their knowledge through watching television.

**Achievement of Learning Outcomes and Assessment Standards**

We both agreed that the lesson was appropriate to the grade and the Assessment Standard requirements of the NCS, as planned for our lesson. The learners’ work (LW 1) shows that they achieved the following in lesson:

- **Knowledge:** This the learners achieved as they gained knowledge of classifying vertebrates and invertebrates and how they differ from each other. This is evident from the learners’ work, which shows that they successfully identified vertebrates and invertebrates, and that they were able to distinguish between them, and explain why they were different (LW1, Appendix 5).

- **Skills:** They gained skills by knowing how to identify and classify animals found in their area (LW1, Appendix 5)

- **Values:** They developed values by learning to appreciate and admire these organisms and understood that these animals need to be protected by people. This was reflected in some of the interview responses such as ‘I like to hear that plants and animals are very important to us’, and ‘we can’t change living things and in the world there is a lot of poaching, killing plants and animals. We can reduce poaching by teaching how important living things are’ (LI 1, Appendix 6).

**Broader reflection**

After these direct reflections on the lesson with the teacher and learners, I later looked at the Learning Outcomes, the features of the OPD identified above, and the broader intentions of the NCS (as outlined and discussed in Chapter 2, and in Section 4.3 above) to reflect on the lesson. I wanted to identify selective appropriations, ideological transformations, and delocation and relocation of the discourse, as explained by Bernstein (1990) (see Chapter 1 and 2). As can be
seen from the report on the lesson above, Learning Outcome 1 and Assessment Standard 1 were selected as focus for the lesson. In dealing with this lesson we selectively appropriated knowledge on vertebrates and invertebrates as the means for achieving the Learning Outcomes and the Assessment Standards, as this was also directly indicated by the example given for the Assessment Standard for this Learning Outcome.

In this process, aspects of the NCS discourse (i.e. the classification of animals) were delocated from the OPD and relocated to the classroom where learners completed activities to show their understanding of the concepts. As indicated above use of Xhosa (the language of learning, and the multi-levelled nature of the class) were influencing factors here. Although Learning Outcome 1 is focussed on Scientific Investigations, they did not undertake an in-depth investigation into differences between vertebrates and invertebrates, and we did not use the gardens (although learners could have been asked to investigate different invertebrates found in the gardens for example). Because we did not undertake investigations, and did not use the gardens, the teaching approach (which focussed on explaining concepts) changed the intention of the NCS from that was meant to support investigations to one that concentrated on knowledge and concepts. This could be discussed as ideological transformation. We also did not pay any attention to other aspects of the OPD in this lesson such as the human rights discourse, or the discourse on integration, although we did attend to the outcomes-based, standards-based, environmental, progression, knowledge, skills and values features of the OPD.

A closer examination of the Learning Outcomes and Assessment Standards in the NS document shows that we should rather have used Learning Outcome 2 in the Lesson Plan, because it emphasises the construction of scientific knowledge, particularly since the first Assessment Standard requires learners to recall meaningful information and it gives the example of learners being able to distinguish between vertebrates and invertebrates. Assessment Standard 2 requires learners to categorise information and to compare features of different organisms (e.g. animals). It was at this stage of the reflections, that I noticed that we had selected an AS from Learning Outcome 2, while working with Learning Outcome 1 in our Lesson Plan. This could help to explain the ideological transformation identified above.

4.5. RECONTEXTUALISING PROCESSES IN LESSON 2 (BY THE TEACHER)
4.5.1 Planning the lesson
The Grade 7 NS teacher and I met to discuss the planning of the lesson (TD3). This was to be the first lesson taught by the teacher after the demonstration lesson that I had taught.
The three stages of planning were discussed. We both agreed that every time a lesson was planned the teacher needed to consult the Learning Programme and the Work Schedule (see Appendices 7a and 7b). The requirements of the Learning Areas were discussed and these included:

- The Learning Outcomes
- Assessment Standards
- The content to be taught and the context of the lesson (TD 3).

Assessment activities were also discussed but the actual details of the assessment activities were left to the teacher to decide (TD 3).

We agreed that the English language was to be used throughout the lesson although we also felt that Xhosa could be used, particularly since the learners had raised it as an issue in the last lesson, and we had seen that it was an important strategy for introducing scientific concepts (TD3). We decided that learners were to be assessed after the lesson but questions were to be posed by the teacher throughout the lesson to keep learners focused on the lesson and to ensure consolidation of what was being done. This would also ensure that learners were participating in the lesson, and that they understood the concepts being taught (TD3).

We also discussed using the garden as a resource, since it had not been used in the demonstration lesson (TD3). In the discussion the teacher indicated, ‘That is what I am going to do in my lesson … take them outside so that whatever we do or they learn is linked to the environment’ (TD3, see Appendix 8).

After our discussion, the teacher planned a lesson, and produced a Lesson Plan to guide her teaching (TW2). The Lesson Plan (TW2) document included the following information that indicated how the teacher planned to work with the Learning Outcomes and Assessment Standards, as well as the content indicated in the NS curriculum statement. The topic of the Lesson Plan was ‘Classifying vertebrate animals’ (TW2), which indicated that the lesson was to build on the earlier demonstration lesson that I had taught. The Learning Outcomes chosen were:

- LO1: Scientific investigation
- LO2: Constructing science knowledge (TW2, see also Appendix 8)

The Assessment Standards that were seen to be relevant were listed as the following:

- AS 1: Plans investigation
- AS 2: Conducts investigation
• AS 3: Evaluate data and communicates findings
• AS 4: Recalls meaningful information (TW2)

The following activities were proposed in the Lesson Plan:

• Learners answering questions based on vertebrate animals
• Learners were to be taken outside to identify vertebrate animals in the immediate environment
• Learners were going to write and paste pictures of vertebrate and invertebrate animals on separate sheets of papers
• Learners were going to classify vertebrate animals with the guidance of the teacher. This activity was to be done in the classroom (TW2)

4.5.2 Teaching the Lesson

The teacher first worked with the learners inside the classroom (ON1). She asked questions based on the learners’ prior knowledge of animals in general, making links with the previous lesson and building on learners’ prior knowledge. Examples are:

Teacher: Tell me class, are all animals the same?
Class: No miss.
Teacher: What do we call the two groups of animals that we have in the whole of the animal kingdom?
Learner 1: They are called vertebrate and invertebrate animals, Miss …
Teacher: OK then, we are going to talk about vertebrate animals. We are going to classify them. That means we are going to put them into different groups or classes. When we talk of vertebrate animals we mean animals that have a backbone in their bodies.

Figure 4.1: Teacher busy teaching in the classroom
This explanation came after learners had been asked to define vertebrate animals. The teacher agreed with the definition that was given by a learner. The first activity therefore consolidated the concepts taught in the first lesson, ensuring continuity and progression. The teacher then continued to the second activity. She gave the following instruction:

Teacher: Now class I want you to go outside and I want you to show me all the animals that you think are vertebrate animals and those that you think are vertebrate animals. You shall go outside and look around and then given the name of an animal that has a backbone (ON1).

The learners went outside. When they were outside the classroom they pointed out the animals like cattle that were grazing near the school and described them as vertebrate animals they also saw horses, dogs, and goats and they identified them as vertebrate animals (ON1). Some of the animals they mentioned were not in their environment. They mentioned those animals from knowledge and experience in everyday life. A wide range of animals was mentioned. Some learners, however, even mentioned invertebrate animals under the category of vertebrate animals. The teacher asked other learners to correct them. Throughout the lesson the teacher used English. She did give some explanations in Xhosa but not often (ON1).

After some time the learners were asked to go back to the class. When they were back inside the class, the teacher gave them some work to do, which was also going to be their assessment task. Learners were given this assessment task as class work:

Write on separate sheets the names of animals that are vertebrates and those that are invertebrates. Also make some picture cuttings of all those animals that are vertebrate and those that are invertebrates. Table those pictures as you put them under these groups.

Examples were given by the teacher to ensure clarity. This was given orally. This work was given as homework and the teacher planned to mark it later (LW2, see Appendix 9).

The teacher also discussed with the learners the different classes of vertebrate animals. The teacher guided the learners as they classified vertebrate animals. For example, the following classes and their examples were given:

- Birds (examples given were chicken, ducks etc)
- Fish (examples given were line fish, sharks etc)
• Mammals (examples given were cows, dogs, cats etc)
• Reptiles (examples given were snakes, lizards etc)
• Amphibians (examples given were frogs, platana etc) (ON1).

4.5.3 Reflection on the lesson
After the lesson we met to discuss and reflect on the lesson, as agreed in our earlier discussion (see Appendix 8). This time we discussed the following aspects of the lesson:

• Learning outside the classroom
The teacher commented on the fact that learners seemed to enjoy going outside to be taught outside. She said: ‘It’s always the case with them…they like to go outside but you have to keep control of their activities…Some like to play for the sake of playing’ (TD4). When I discussed the lesson with the learners they said they enjoyed the lesson. They said they liked the fact that they were taken outside to learn as shown by the quote from one of the learners: ‘I like it (i.e. going outside) because it is not like sitting in the classroom and we see things we are talking about’ (LI2).

• Appropriateness of level, grade and standard
The appropriateness of the level, grade and standard was also discussed (TD4). We both agreed that the lesson met the requirements of the NCS, as we felt that learners had been involved in scientific investigations (LO1) by investigating the vertebrates in the school area, and that they had improved their scientific knowledge (LO2) by learning more about vertebrates. We thought that the activities were appropriate for Grade 7 level, as the Assessment Standard required learners to recall meaningful information.

• Achievement of Learning Outcomes and Assessment Standards
Learners work (their homework task, LW2), showed that learners had achieved the following:
• Knowledge: Knowledge of concepts and the classification of vertebrate animals was extended. Learners were able to recall definitions of vertebrate animals, and to distinguish between vertebrates and invertebrates.

• Skills: More detailed classifications skills were gained, as learners now were not only able to classify into vertebrates and invertebrates, but also were able to classify vertebrates looking at their different features, and to classify them into different groups (e.g. reptiles, mammals etc.). Learners’ work (LW2, see Appendix 9) showed that learners were able to distinguish between different classes of vertebrates.
• Values: Values were expressed through learners reflecting on their enjoyment of learning outside, which showed an appreciation for animals in the environment. The teacher also emphasized learning to love and respect animals in the environment.

As indicated above, the teacher did not use much Xhosa in the lesson, which seemed to indicate that learners understood these concepts more easily this time in the second language (English), than was the case in the demonstration lesson that I taught.

• Broader reflection

As can be seen from the report on the lesson above, Learning Outcome 1 and Learning Outcome 2, with Assessment Standards 1-4 were indicated as the selected LO and AS to guide the lesson (the OPD). The Lesson Plan did not indicate whether these Assessment Standards were from LO 1 or LO 2. After reading the NS Learning Area statement again, I noticed that AS 2 is listed as ‘Conducts investigations and collects data’ not ‘Conducts investigation’ as indicated in the Lesson Plan. AS 4 listed in the Lesson Plan is indicated in the NS Learning Area Statement as AS 1 for LO 2, while the first three AS listed above are for LO 1.

Because the teacher only listed the ‘headings’ of each AS, she did not examine what exactly (in detail) was expected in terms of the planning and conducting of an investigation. For example LO1, AS1 requires learners to ‘identify a testable question among a possible set of questions’ and ‘contribute in ways that aid the investigation’. LO1 AS 2 requires learners, when conducting an investigation to ‘systematically test two or more items in order to compare them on the same property’, and to ‘modify procedure to obtain better observations or readings’ (DoE, 2002:48). These detailed interpretations of the AS did not guide the teachers’ work with the AS, and the investigation (to identify vertebrates outside) in the lesson was selectively appropriated at a more superficial or general level.

In dealing with this lesson the teacher selected the topic ‘classification of vertebrates’ to ensure progression and continuity with this lesson. In this process, she delocated aspects of the NS discourse (i.e. classification of animals) from the OPD and relocated it in the classroom through activities. The one enjoyed most by learners was the classification activity outside where learners had to identify and distinguish vertebrates, and different classes of vertebrates. While they did go outside for this identification activity, they did not plan the investigation because the teacher planned it for them. They also did not organise and use equipment to gather and record information when they were outside and they did not evaluate their data (as required by the
detail in the AS) although the teacher did ask them to correct each other. Again it would seem that the teaching method (the teacher planning the investigation instead of asking learners how they would plan an investigation on vertebrates in the school environment) ideologically transformed the investigation discourse as proposed in the OPD.

This lesson did not focus on human rights issues, or on integration, although it did address the other dimensions of the OPD as outlined in section 4.2. The assessment activity was focused more on science knowledge, although AS 4 (which was actually AS#1 from LO2) was only one of the AS listed in the Lesson Plan, showing selective appropriation of assessment standards for assessment. The garden was not really used in the lesson either, even though learners did go outside to identify vertebrates. The gardens could, for example, have been used to identify various invertebrates, as these are plentiful in the gardens. Again, it was only after a careful review of the lesson against the NS Learning Area Statement expectations, using Bernstein's (1990) concepts of delocation and relocation, selective appropriation and ideological transformation that I was able to make these broader reflections. I did not discuss these broader reflections with the teacher or learners at the time, although we did reflect on key aspects of the lesson such as the experience of learning outdoors.

4.6 RECONTEXTUALISING PROCESSES IN LESSON 3 (BY THE TEACHER)

4.6.1 Planning the lesson

This was the second lesson taught by the teacher in our participatory research process. In our discussion of the planning of the lesson we once again went through the important aspects of planning as in the previous lesson planning discussions (TD5). We again discussed the Department of Education approaches to planning, and consulted the Learning Programme and Work Schedule (see Appendix 7a and 7b) and we both agreed that we would continue dealing with the concept of Biodiversity, although we had, as yet not introduced this terminology to the learners (TD5). We reflected that we had also not really used the gardens yet, and on the fact that learners had enjoyed the last lesson outside (TD5). We also discussed the need to consider integration this time. We also discussed the requirements of the NS Learning Area and this time, as previously, we focused on:

- Learning Outcomes
- Assessment Standards
- The content and the context of the lesson to be taught
- Assessment activities and the question of language to be used when teaching (TD5)
We both agreed that we would follow the same procedure and use both the English language as the medium of instruction and isiXhosa to clarify some of the terminology. The involvement of learners was discussed and we agreed that learners were to be involved in the form of answering questions asked by the teacher and that these questions would be based on the learners' prior knowledge. We both felt that these questions would engage learners and help to focus the lesson (TD5).

We agreed that the assessment would be in form of filling in information in activity sheets that the teacher would design (TD5). The specific questions were left to the teacher to decide. We noted that we had not yet worked with Learning Outcome 3 and that it must be considered in the lesson (TD5).

After this discussion, the teacher prepared a Lesson Plan (TW3), which was focused on the topic 'Importance of plants in the environment’. This was to extend knowledge from knowledge of animals to animals of plants. The learning outcomes selected for the lesson were the following:

- LO1: Constructing science knowledge
- LO3: Science, society and the environment (TW3)

Assessment Standards were listed as follows:

- AS 1: Plans investigation
- AS 2: Conducts investigation and collects data
- AS 3: Evaluates data and communicates findings
- AS 4: Understands sustainable use of earths resources

To ensure that learners would achieve these Learning Outcomes and Assessment Standards, the teacher proposed the following activities in her Lesson Plan (TW3):

Activity 1 (10 minutes)
Learners were to go outside and work among the plants. Identify living plants from non-living or dead plants. Make learners aware that while some plants are not green, they are still living.

Activity 2 (30 minutes)
Learners to work in groups and discuss the importance of plants in their lives and in the environment in general. Write their answers in their books and give reports later. Representatives from groups to give reports later.

Integration with English:
LO1: Listening
- AS1: Listens for specific information
- AS2: Lists activities in a discussion

LO2: Speaking
- AS1: Begins to debate and express opinion and supports them with reasons
- AS2: Uses language for expressing opinions and feelings makes choices

LO4: Writing
- AS1: Writes to communicate information (TW3)

As can be seen from the Lesson Plan (TW3) this was the first of the three lessons where we actively considered integration in our planning.

4.6.2 Teaching the lesson

The teacher introduced the topic to the class. She told the learners what the topic of the day was going to be, that is, the importance of plants (in the environment). The teacher instructed the learners to go outside the classroom so that they could look at plants, as they would be talking about them. The class left their books and went outside (ON2). The learners went outside as a class and not in groups (ON2). When they were outside, the teacher continued to talk about what she wanted learners to do. Questions were asked by the teacher to guide the lesson process, as shown by the dialogue below:

Teacher: Ok class now I want you to look at the plants that are around you and then give the difference between living plants and dead plants.
Learners: They looked around, touching plants.
Teacher: Can you tell me the colour of dead plants?
Learners: Brown Miss.
Teacher: Yes, dead plants are dark brown in colour. Now I want you to give me the uses of plants in the environment. What do plants do in the environment?
Leaer1: Plants are eaten by animals Miss.
Teacher: Good: What else do plants do?
Learner2: Plants make the land beautiful.
Teacher3: We make medicine, miss.
Teacher: Good! Yes what else?
Learner4: We make wood and furniture (ON2).
This activity continued for a while as the learners continued to give answers (ON2). The learners’ knowledge on the importance of plants in the environment was probed until learners were no longer able to give answers. The teacher then added some more points to those that the learners had given. For instance the following points were added:

Teacher: Plants also give us oxygen that we breathe as human beings and animals. They release oxygen that we breathe, during photosynthesis but we are not going to talk about that now (ON2).

She then instructed the class to go back inside, and while they were inside the classroom the learners were given homework exercise that they had to do during their spare time at home (ON2). This homework exercise was on the importance and the uses of plants in the environment. Learners were required to list all the points that they discussed while they were working outside the classroom (LW3).

The learners were lively during the lesson and were interested in the lesson. They discussed among themselves and were raising hands when the teacher asked questions. They also answered questions freely. The language used was English although the teacher used Xhosa here and there to explain a few things. Learners seemed to enjoy the lesson (ON2).

The assessment activity was in the form of oral questions that the teacher asked and which the learners answered (ON2). The second activity was in the form of a homework exercise that was given to learners (LW3). In further discussion, the teacher indicated that the homework exercise
was going to be marked on the following day. The teacher said that she was going to mark it herself (ON2).

4.6.3 Reflection on the lesson
When I sat down with the teacher to discuss the lesson that she had taught (TD6), she seemed satisfied with the lesson and the responses the learners gave (TD6) and she felt that they had adequately answered the questions, and that they had learned what she intended them to learn. The learners too, once again, seemed to enjoy the lesson, and they reflected that they had understood what the teacher was teaching them (LI3). This time, however, another issue came up in the reflections with the teacher (TD6), which had not come up before, namely completion of work.

- Completion of work
The teacher mentioned the fact that some learners just do not do their homework or they do not submit their work at all. The teacher indicated this concern as follows: ‘But there is a problem that I think I must mention here … learners, in fact some, do not do their work. They just don’t do their class work or homework’. We unfortunately did not probe the reasons for this in our discussions at the time.

- Achievement of Learning Outcomes and Assessment Standards
In our reflections, the teacher indicated that she thought the lesson was appropriate to the level, the grade and the standard requirements of the NCS. From our reflections on what the learners had done in the lesson, we were able to establish that they had achieved the following:

- Knowledge of plant biodiversity (although the teacher did not use this term), and the role of biodiversity in society and nature, as they looked at the role of various plants in the environment. From the observations described above, it seemed that learners were not aware of the more complex role that plants play (e.g. photosynthesis), and their knowledge was therefore limited to observable benefits of plants (e.g. food, medicines etc.).

- Skills as they understood the ways of distinguishing between a living and non-living plant. The intended language integration skills were not assessed, but the teacher did reflect that learners were able to express themselves in English although she still had to use some Xhosa in the lesson (TD6).
• Values as the learners appreciated the importance of plants in the environment and that the environment must be protected for future sustainability. When I asked learners why they think we must protect the environment, one learner gave the following reply: ‘Because plants help us to decorate our homes, they give us food. We shall need the environment in the future’.

(L13)

• Broader reflection
As in the case of the previous two lessons, I later reflected on the lesson more carefully using the NS Learning Area statement and its requirements to examine the OPD and the lesson more carefully. I identified that the teacher did not address the issue of sustainable uses of resources (i.e. plants), as she only focused on the role of plants in the environment, even though she had listed this (sustainable use of resources) as a chosen AS. This is an example of how the teacher selectively appropriated only an aspect of the OPD. The Assessment Standard for Learning Outcome 3: Science, Society and Environment requires learners to understand sustainable use of the earth’s resources, and to analyse information about sustainable and unsustainable use of resources. This did not take place in the lesson, and the OPD in LO2#AS2 was therefore not fully implemented.

While the lesson was focused on biodiversity, and she asked learners to identify the difference between living and non-living plants, she did not introduce the concept of biodiversity loss, or how ‘biodiversity enables ecosystems to sustain life and recover from changes in the environment’, which is required in the Senior Phase NS content (DoE, 2002:64). She taught learners how to identify dead plants, but did not link this to biodiversity loss or to how ‘Loss of biodiversity seriously affects the capacity of ecosystems and the earth, to sustain life’ (DoE, 2002:65), as required in the NS Learning Area content statement for the Senior Phase. She
also did not address the issue of sustainable use of plants in relation to biodiversity loss when learners were talking about how they use plants (e.g. for medicine). Thus these selective appropriations of the teacher (focusing on living plants and plant uses, and identification of dead plants) ideologically transformed the intended NCS discourse (biodiversity loss and sustainable use).

Although the teacher once again indicated use of Learning Outcome1 Assessment Standards (AS1, 2,3) (although she indicated LO1 as ‘constructing science knowledge), learners were not involved in planning the investigation in the garden, or in using equipment to collect data as expected by the Assessment Standards. It seemed that the teacher equated or selectively appropriated the concept of investigation with asking learners questions. This shows again how the teaching style and methods of the teacher changed (ideologically transformed) the intended OPD related to investigations in Natural Science Learning Area. While the garden was used in this lesson, learners could have been more involved in planning and conducting investigations on what biodiversity is found in the school gardens, and what different plants were used for, which plants were widely used in the community, and they could have been asked to find out if any were threatened, and how these plants could be more sustainably used. These kinds of activities are contained in the CAPE book on biodiversity teaching in the Further Education and Training band (C.A.P.E., no date). This might have addressed the expected OPD more adequately, allowing learners the opportunities to develop the knowledge, skills and values necessary for achieving the content requirements and Assessment Standards outlined in the NS. As in the case of the previous two lessons, it was only after some time, and after a careful examination of the lesson against a more careful review of the NS Learning Area Statement and using Bernstein’s (1990) concepts that I was able to make these reflections. I did not make these broader reflections with the teacher or learners at the time.

4.7 RECONTEXTUALISING PROCESSES IN LESSON 4 (BY THE TEACHER)

4.7.1 Planning the lesson

This is the third and final lesson taught by the teacher in Grade 7 in this participatory research process. During the planning of this lesson all the necessary steps on the planning of a lesson, as required by the NCS and the Department of Education were followed, as had been done previously (TD7). As usual the following approaches to the planning of a lesson were discussed thoroughly, with reference to the Learning Programme and Work Schedule (TD 7). This time we decided that the concept of biodiversity was to be addressed using the content suggestions that appear in the Learning Programme and the Work Schedule (Appendix 7a and 7b). The teacher felt that the theme ‘Life and Living’ in the NS core knowledge and concepts section could be
used. The requirements of the NS Learning Area were discussed. The requirements that we discussed this time were:

- The Learning Outcomes that must be achieved
- The Assessment Standards
- The content and the context of lesson to be taught
- The assessment activities that must be included in the lesson
- The language of instruction during teaching
- The involvement of the learners in the lesson (TD 7)

As previously, the teacher developed a Lesson Plan document (TW4, see Appendix 11), which indicates that the topic of the lesson as ‘Life and Living - Photosynthesis’.

The Learning Outcomes that were selected were the following:

- LO2: Constructs science knowledge
  - AS1: Recalls meaningful information
  - AS3: Interprets information
  - AS4: Applies knowledge
- LO1: Scientific investigation
  - AS2: Conducts investigations and collects data
  - AS3: Evaluate data and communicate findings (TW4, see Appendix 11)

The Lesson Plan also indicates that the teacher was planning for integration within the Learning Area by integrating with LO 3: Science, society and the environment using AS 2: Understands sustainable use of the earth’s resources (the same AS she had used in the previous lesson). She was also planning for integration across the Learning Area through integration with English (First Additional Language) LO 2: Speaking: AS - Discusses answers with a partner, and with LO 3: Reading and viewing: AS – Reads and follows written instructions (TW4). This indicates that the teacher had a good understanding of the OPD with regards to integration, as it requires teachers to plan for integration within the Learning Area, and across Learning Areas (DoE, 2006).

The teacher also included other issues that we had reflected on earlier in her lesson planning, namely the language issue (learners’ poor understanding of English) and the multi-leveled nature of the class (learners’ levels of understanding is not the same), as issues to consider in her teaching (TW4).
She planned the following activities for learning:

- **Activity 1 (10 minutes)**
  She told learners to use their prior knowledge to discuss their understanding and knowledge of the process of photosynthesis. The purpose was for learners to define photosynthesis. The teacher was going to ask questions and the learners were going to answer them orally (TW4, TD7)

- **Activity 2 (15 minutes)**
  Learners were to discuss the requirements for photosynthesis to take place. They would use flash cards in this activity to show how plants make their food by photosynthesis. Learners were going to work or discuss in groups and were to remain inside the classroom for the activity (TW4, TD7).

- **Activity 3 (30 minutes)**
  In this activity learners were to plan and carry out an investigation on how the process of photosynthesis really takes place. The teacher would work with the learners in carrying out this activity. The teacher planned for the groups to do the tests using different foods they were to bring to class (TW4, TD7).

Another issue that we discussed was that the teacher would ensure that the apparatus needed was available (TD7). Since this activity needed more time the teacher would decide on how to sequence the activities, and the time allocation of the lesson itself. We noted that the activities would take more than one period. Each period is an hour long (TD7).

The teacher identified that the following tests need to be carried out when experiments on photosynthesis are performed:

- Tests for the presence of starch in plants – that is whether plants do make starch or not.
- Investigate whether plants really need chlorophyll to make food or not.
- To investigate whether sunlight is really needed for photosynthesis to take place in plants (TD7).

The teacher was going to decide on how to conduct these experiments and on the time allocation as mentioned above, as these experiments could not be carried out at the same time, and they would require more than one period. We reflected that this Lesson Plan could take days to finalize (TD7).

We both agreed that the activities chosen would address the Assessment Standard of the NS Learning Area (TD7). The content suggestions that are given in the NS Learning Area document
were used. The Senior Phase Life and Living theme indicates that learners should learn the following core knowledge and concepts related to photosynthesis: ‘Green plants use energy from the sun, water and carbon dioxide from the air to make food by the photosynthesis. This chemical reaction is central to the survival of all organisms living on earth’ (DoE 2002:64). We went through this statement before the lessons together (TD7).

The availability of resources or the LTSM that was to be used during the lesson was discussed. Apparatus was collected in order to ensure that the lesson was carried out properly. The apparatus collected was iodine solution, a potato or green leaf and heating lamps. One of the textbooks that were used to guide the activity was Shutters Natural Sciences for Grade 7 (Learners’ Book, pg. 46-49) for experiments on how to test for the processes of photosynthesis.

As can be seen from the discussion on the planning phase of this lesson, the planning was more detailed, and more attention was given to the contents of the NS Learning Area Statement. Use of the textbook also helped with more specific planning for the lesson. The links between LOs and their specific AS were also more clearly indicated than previously.

4.7.2 Teaching the lesson
The teacher came to the class carrying some of the apparatus that was needed for the experiments (ON3). She brought iodine solution, a potato, a plate and some laundry starch. The teacher told the class about the topic of the lesson but first asked questions based on the learners’ prior knowledge on photosynthesis (ON3). As indicated above, the Lesson Plan required more than one period, so I only observed one of the experiments in a sequence of lessons. The lesson that I observed followed a lesson in which the teacher introduced the topic of photosynthesis to the learners. The following are some of the questions that the teacher asked about photosynthesis to recap on their previous knowledge.

Teacher: Now class before we can work on these experiments I want you to give all the substances that a plant needs in order to make its own food. Tell me what are they?
Learner 1: They are light and water miss.
Teacher: Yes well, what else?
Learner2: They are chlorophyll and carbon dioxide, miss.
Teacher: Good! So a plant needs chlorophyll carbon dioxide, sunlight and water to make food. Now we all know that it is a living plant that can make food, is it not so class?
Class: Yes Miss! (ON3)
After this the teacher asked learners to come around her so that they could work together in carrying out the experiments. The teacher demonstrated how the experiment was going to be carried out. The teacher explained each step of the experiment as indicated in this quote below.

Teacher: Now class we are going to test for the presence of starch in this green leaf. Remember this potato contains the food for the plant and some of the food made by the plants is starch. So we are going to see if there is starch in this potato. If there is starch in this potato the colour is going to show...we are going to use this starch, the laundry starch first. We are going to look at the colour of iodine when it is mixed with this laundry starch. After that we are going to test for the presence of starch and then colour of the iodine solution after we have put it in the potato. (ON3)

The experiment was then performed and the learners were watching. The learners had to answer questions based on the experiments from time to time (ON3). The experiment that was performed was based on testing whether plants do really make starch or not. The teacher demonstrated how the experiment could be done. The learners were watching. The teacher asked some questions based on what the learners were observing, as indicated below:

Teacher: Now class, ok class, we boil the leaf in water and I want you to observe the colour of the leaf. Keep that. Now we shall pour methylated spirits on the boiled leaf and then boil it in water. We are not going to boil methylated spirits directly in the flame. Why do we not do that class?
Some Learners: It is going to burn into fire, miss.
Teacher: Yes, good if we burn it directly it will cause fire. So we put it in water. Now what is the colour of the leaf?
Learners: It is green, miss.
Teacher: Now we shall remove this leaf and put it on a plate and pour iodine on it. Observe the colour please. (ON3)

The teacher continued with the experiment and the learners continued to watch. Iodine solution was poured on the leaf and after a while the colour of the leaf turned a blue-black colour. The teacher asked the learners to describe the colour of the leaf, as indicated below:

Teacher: Tell me what is the colour of the leaf now
Learners: It is blue
Teacher: Good. Now tell me was the colour of the leaf after it was put in laundry starch.
Learners: It was blue, Miss.

After this experiment was completed the teacher concluded by leading the class to draw the conclusion that leaves do really make starch as food.

Throughout the lesson the teacher used English. The learners seemed to understand what the teacher was saying as they were watching every step of the experiment. Learners were referred to their textbooks so that could read on their own. After this the teacher promised the class that they would continue with other experiments that were also based on photosynthesis in plants.

There was no assessment given for learners to do, the teacher was still going to do other experiments so as to complete all the aspects that deal with photosynthesis. The questions that the learners answered during the lesson were the only method of assessing what the learners were learning thus far. The teacher did, however, set a final assignment for the learners to do at the end of the Lesson Plan which was a small ten point test to see if learners had gained the main content points from the lessons (LW4, see Appendix 12). This assignment did not indicate how investigations skills or knowledge of sustainable use of resources (LO1, AS1,2,3; LO3, AS2) would be assessed, but only concentrated on content and concepts.

4.7.3 Reflection on the lesson
On discussing the lesson with the teacher, the teacher sounded happy with the process and the success of the lesson process so far (TD8). This time another issue was raised in the reflections, which affected the lesson process (and the recontextualising of the OPD).

- Size of class and learner participation
The teacher, in our reflection discussion, complained about the big numbers in class that made it difficult for all the learners to see what was happening. She also complained that it was not easy to deal with such big class (TD8). Although there was no specific reference to the size of the class in the discussion, the teacher had many times before, referred to the challenge of teaching big classes in the Senior Phase section. She had previously also referred to the large numbers as a cause for her using certain teaching strategies instead of others. Although we did not discuss this directly in the reflection discussion (TD8) it would seem plausible that the reason why she used the demonstration method was because of the size of the class, as well as by the limited availability of experimental resources (e.g. apparatus to conduct experiment on
photosynthesis). Using group-based experiments for example, would have taken her too long to address the assessment standards that were meant to be addressed in this lesson.

When I discussed the outcome of the lesson with the learner focus group (LI4), they showed interest in the experiment, but they also complained about the fact that they could not all see what was really taking place in the experiment. Some learners are tall and some are short so this was a problem as they got in each other’s way. The learners said they understood the lesson and were interested in the other experiments that their teacher promised to do (LI4).

- **Achievement of Learning Outcomes and Assessment Standards**

  In our reflections, we agreed that the lesson was appropriate to the grade and the standard that the NCS requires (TD8). The NS textbook that we used showed how this lesson should be carried out and provided a useful guideline for the lesson. These are Grade 7 NS textbooks that are prescribed for the grade, which provide assurance that the content and skills being taught are at the correct level (TD8). The learners gained the following from the lesson:

  - **Knowledge:** Learners gained more complex knowledge of plants and their value in nature and society, because they now knew that plants make food using sunlight, carbon dioxide and chlorophyll, and that plants make their food during the day. They also knew that plants breathe in carbon dioxide during the day and release oxygen into the atmosphere, which is needed for other organisms like people and animals for their breathing. They also learned that the process of breathing in plants is reversed during the night as plants breathe in oxygen and release carbon dioxide (ON3).

  - **Skills:** although learners did not actually perform the experiment they watched as the teacher demonstrated how the experiment was conducted. They could explain the steps that must be followed when the experiment is conducted (LI4).

  - **Values:** Learners were able to appreciate the phenomenon of photosynthesis where plants make their own food but end up being the food on which all the organisms of the earth depend. These values were also indicated in the textbook (ON3, LI4).

- **Broader reflection**

  As in the previous lessons, I undertook a broader reflection on the lesson at a later date through carefully reviewing what was achieved in the lesson against the OPD of the NS Learning Area Statement, and through using Bernstein’s (1990) concepts to see what happened in the lesson.
I could identify that the teacher selectively appropriated content from the NS Senior Phase on photosynthesis, and combined it with Learning Outcome 1: Scientific Investigation and delocated it to the classroom through conducting an experiment using a textbook as guidance for the experiment. The lesson concentrated on the concept of photosynthesis, and built on an earlier lesson where the concept was introduced. The teacher’s planning indicated that she would focus on integration with Learning Outcome 3: Science, Society and the Environment as this would develop learners’ understanding of sustainable use of the earth’s resources; the links between photosynthesis, biodiversity and sustainable use of use of the earth’s resources were not made.

The teacher did point out why photosynthesis was an important life-giving process, or that it is central to the survival of all organisms on earth, and hence to the continued survival of biodiversity, as the concepts were dealt with mostly in the context of the experiment. Learners were, however, able to gain this knowledge through reading the textbook. This shows how the selective appropriations of the teacher changed the OPD, and also what role the textbook can play in recontextualising the discourse through adding to what the teacher tells or shows the learners. The teaching method of the teacher once again did not allow learners to plan how to conduct an investigation as the teacher did all of this herself, because of the size of the class, as reflected in the teacher discussions after the experiment (see above). The assessment strategy (see Appendix 12) which focussed on recall of content and knowledge of concepts selectively appropriated assessment towards LO2 only, which focuses on Construction of science knowledge.

The learners themselves also could not really participate in investigation as circumstances (large numbers and availability of equipment) only allowed them to watch the teacher conducting the experiment. This shows that contextual circumstances also transform the intended OPD, as well as the teacher’s teaching style and methods. Once again the gardens were not used to their full potential. The teacher could have, for example, asked learners to collect different leaves from the plants in the gardens, and they could have used these different leaves in the photosynthesis experiment. Learners could also have made a leaf collection comparing different green leaves and sizes of leaves in terms of their photosynthesis activity and food value for humans and animals.

As mentioned before, these broader reflections were only done after the lesson, and were not done with the teacher or learner.
4.7 CONCLUSION

This chapter describes the profile of the teacher involved in the study, based on the questionnaire data, and adds more insight into the context of the school (first introduced in Chapter 1). It also provided a review of the OPD as presented in the NS Curriculum statement. This was useful to provide insight into the processes of recontextualisation described in the four lessons that were intended to make use of the school gardens for NS teaching, to help teach the concept of biodiversity, as our school is in a biodiversity hotspot (see Chapter 2) and SANBI recently gave us a school garden.

As indicated in this chapter in four lessons various things influenced the curriculum recontextualisation process. These included:

- The selections and choices made by the teacher on what to teach and what to assess
- The teaching style of the teacher
- The language of the learners, and the language used in the lessons
- Availability of learning and teaching support materials and equipment
- The size of the classes
- Teacher’s knowledge of the OPD and how to implement the NCS
- Learners’ enthusiasm for the different activities
- Teacher’s experience with using the school gardens for teaching.

These issues are discussed in more detail in the next chapter in relation to the research question, through use of a set of analytical statements.
CHAPTER 5: USING GARDENS FOR BIODIVERSITY ACTIVITIES IN THE NATURAL SCIENCES LEARNING AREA

5.1 INTRODUCTION

In the previous chapter I outlined how the recontextualisation processes in the environmental discourse of the National Curriculum Statement in National Science Learning Area (with a focus on biodiversity) were carried out in four lessons. The data provided rich information about selective appropriations, and to some extent the changes (ideological transformations) that emerged when the environmental discourse in Natural Science Learning Area was recontextualised. The data also provided useful insights on where and how the improvements to the recontextualising processes can be made, particularly how the gardens could have been used to extend the activities planned by the teacher to achieve the Learning Outcomes and Assessment Standards.

The research question in Chapter 1 indicates that this study was focused on how Grade seven teachers can use the school garden for biodiversity activities that address the requirements of the Natural Science Learning Area (the Official Pedagogic Discourse). As indicated in Chapter 4, the garden was used in two of the four activities, but both times it was used more as a site for learning (i.e. learning science concepts outdoors), than for exploring biodiversity issues in depth. The lesson planning processes that we followed were strongly focused on addressing the requirements of the NCS in the Natural Science Learning Area, and focused on knowledge of animals and plants, as required by the NS Learning Area Statement. One issue that was identified through the reflections on the four lessons is that biodiversity as a concept was not optimally used in the lessons, although we focused on plants and animals in the lessons, and the Assessment Standard on sustainable use of natural resources (LO3#AS2) was not successfully used either. Chapter 4 also indicated that the lessons were affected by a number of issues that influenced the recontextualisation process and the intention to use the school gardens for biodiversity activities. The issues that emerged gave rise to the following analytic statements that will be discussed in this chapter:

- **Analytic statement I**
  Gardens provide a resource and context for Natural Science Learning Outcomes and principles that assist with curriculum recontextualisation processes, but need to be used effectively for this purpose.
• **Analytic statement 2**
  Recontextualisation possibilities using gardens are affected by teachers knowledge, experience, motivation and understanding of the OPD.

• **Analytic statement 4**
  Using gardens for recontextualising aspects of the Natural Sciences curriculum has management implications.

• **Analytic statement 5**
  Socio-cultural and structural factors have an influence on the recontextualisation of the OPD.

5.2  **USE OF GARDENS FOR BIODIVERSITY ACTIVITIES IN THE NS LEARNING AREA**

5.2.1  **Analytic statement 1**
  Gardens provide a resource and context for Natural Science Learning Outcomes and principles that assist with curriculum recontextualisation processes, but need to be used effectively for this purpose.

The observations made during the recontextualisation processes in the Grade 7 Natural Sciences class made it clear that the use of gardens as a resource and context in the recontextualisation processes can assist in achieving the Learning Outcomes and Assessment Standards of the Natural Sciences Learning Area. Throughout the recontextualisation process the observations showed that learners enjoyed working out in the gardens. This is evident in the recorded conversations with the learners (see Chapter 4). During these observations learners indicated that they appreciated the lessons when they were able to observe and experience the objects they were talking about.

In two of the lessons reported in Chapter 4 the gardens provided both teachers and learners with concrete real world resources (plants and animals) that might have been missed out if the gardens were not used. In this regard the gardens acted as a useful learning and teaching support material. In Lesson 2 learners went outside to identify vertebrates and learned to distinguish between vertebrates and invertebrates (i.e. classify species) through observations in or around the gardens. In Lesson 3 learners went into the gardens to identify living plants and to identify uses of plants in the environment.

As reported in Chapter 4 however, the gardens could have been more optimally used to teach learners about:
• Biodiversity (they could have audited the biodiversity in the gardens identifying and classifying different plants and animals (vertebrates and invertebrates)
• Biodiversity loss (what leads to and causes biodiversity loss)
• Sustainable use of plant resources (i.e. sustainable use of food and medicinal plants).

As indicated in Chapter 4, if we had involved the learners more in planning of investigations, learners could have been more involved in investigations in the garden related to the topics being covered in the lessons, or the topics outlined above. As indicated in the reflections in Chapter 4, this would have further extended the learning opportunities in the gardens, and would have strengthened the NS Learning Outcomes and achievement of the Assessment Standards. We could also have used the gardens to explore relationships between for example biodiversity in the garden and sustainable use of plants. When the teacher performed an experiment on testing the presence of starch in the leaves of a plant, learners were interested and they admired the lesson. The reason for this might be that they were able to see and touch things first hand. They witnessed all that was happening, indicating that more active approaches to learning seemed to suit the learners and to hold their interest. The lessons also showed that the learners' knowledge needed to be extended by the teacher's knowledge of more complex processes (e.g. photosynthesis).

As indicated in Chapter 4, what takes place in the lessons is influenced by how the teacher plans the lessons, and the resources / LTSM that are used, and the activities that are planned for. As indicated by C.A.P.E. (no date) various kinds of biodiversity activities and investigations can be conducted using gardens. These can include studies of the landscape and biodiversity in the landscape audits of biodiversity, investigations into habitat loss and issues impacting on or affecting biodiversity, the relationship between biodiversity use and conservation of biodiversity, and strategies to use biodiversity more sustainably. Other activities indicated in other biodiversity resources (LTSM) such as the SANBI greening materials (SANBI, 2005) also suggest that the use of gardens for biodiversity activities can stimulate a number of innovative ways of dealing with the environment. Learners can for instance learn about the relationships that exist between various organisms they see in the environment. The feeding habits that exist between plants and animals in an area they are working on can be studied. Different plants that grow in different parts of their environment can be identified. Plants that grow in dry areas and those that grow in wet areas can be identified as well and the different characteristics can be studied. The NCS itself also points to other ways of using gardens. For example the theme ‘Interactions in the Environment’ requires Senior Phase learners to understand the specific characteristics of different species, and how species have adapted for survival in their habitats.
that can be examined in the gardens (DoE 2002:64). Ecosystems and biological changes including decomposition and recycling of matter in ecosystems (e.g. through composting) are other aspects relevant to biodiversity that can be investigated by learners in the school gardens (DoE 2002:64). Studies by Asafo-Adjei (2004); Ncula (2007) and Mvula-Jamela (2007) have all shown that school gardens provide a valuable resource for learning and that other Learning Area content and concepts can be integrated with NS (e.g. Life Orientation or Mathematics activities can be used in the NS investigations).

As indicated in the lessons in Chapter 4, we did not make use of many of these available LTSM during the teaching of the lessons, which could have provided us with more ideas on how to use the gardens more effectively for biodiversity studies. The uses (or non use) of TLSM, which can be the gardens in the school environment, other materials produced on biodiversity activities, or textbooks, influence the lesson planning and the teaching strategy that will be used in the recontextualisation of the OPD. As indicated in these resources (C.A.P.E., no date; SANBI, 2005), use of the gardens requires teachers to use more active methods that allow for different styles of learning. Some learners like to learn by exploring and doing things themselves while others like to observe and answer questions. The DoE (2006) in its guidelines on how the NCS should be implemented recommends use of different teaching methods that allow for different learning styles (see Chapter 2).

As discussed above, and in Chapter 4, the aspect of gardens being used during the recontextualisation processes is not maximized in NS teaching. The teacher I worked with tended to do things for the learners, and to confine her concept of investigation to asking questions. In most cases she demonstrated things to learners while they watched or listened or answered questions posed by her. While this is not a bad teaching strategy, it does not allow learners to explore things themselves and therefore to undertake investigations in the way the NS OPD anticipates, or the way that other biodiversity resource materials (such as C.A.P.E, 2006) suggest gardens can be used.

5.2.2. **Analytic statement 2**

Recontextualisation possibilities using gardens are affected by teachers knowledge, experience, motivation and understanding of the OPD

As indicated in Chapter 4 and in the discussion above, the aspect of gardens being used during the recontextualisation processes of the OPD in the NS Learning Area is not maximized. As indicated in the broader reflections on the lessons in Chapter 4 this was influenced by the selective appropriations and the ideological transformations made by us when planning and
teaching the lessons, and how the OPD was delocated and relocated. In some cases this was because of not fully covering the knowledge requirements of the NCS relating to biodiversity, and in other cases it was related to general or superficial interpretations of skills such as investigation. In other cases the contextual issues also influenced the recontextualisation processes (e.g. large classes, needing to spend time on explaining concepts in English and isiXhosa etc).

As reported in Section 4.2, the Grade 7 Natural Science teacher that I worked with is a young woman who was employed in 2002. She has five years experience of teaching in a Junior Secondary School and this is her first post and her first employment by the Department of Education. When she was employed her qualification was a Senior Primary Teachers Diploma (SPTD). This makes her suitable to teach at Intermediate Phase, which is made up of grades 4, 5 and 6. She studied further and received an Advanced Certificate in Science Education in 2006, and has therefore only recently started teaching at the Senior Phase level (See Appendix 1). As indicated in Chapter 1 and 4, the OPD as we now find it in the NS Learning Area Statement is also new to us, and we have only recently received training (one week of training) on how to use the NCS and how to teach with these new Learning Outcomes, Assessment Standards and content areas. Many of these would therefore not have been included in her training (and were not included in my training), and are therefore new to us as teachers and managers alike.

While she is clearly a capable teacher, as indicated in Chapter 4, and I have many years of experience as a teacher and principal, we are all still relatively inexperienced when it comes to the NCS and OBE principles as we have only all attended only a few workshops and we all still have a lot to learn. This does not mean that the knowledge and understanding we posses do not make us good teachers. During observations when the teacher was engaging in the recontextualisation processes in Grade 7 the understanding of how the environmental discourse in the NCS could be realized was minimal. This was evident in most of the lessons which were limited to building knowledge of plants and animals, and not the broader concepts of biodiversity, biodiversity loss etc. as indicated in the NS Learning Area content section for the Senior Phase.

This issue of the need to extend and develop teachers' knowledge of the concepts and processes required in the NCS is not a new issue, and has been reported on by many researchers in South Africa such as Ramsarup (2005), Mvula-Jamela (2007), Asafo-Adjei (2004), Ncula (2007) and others. They have also reported that an understanding of Learning Outcomes and Assessment Standards will enhance the teacher's abilities to teach and recontextualise the OPD (Ramsarup, 2005; Jenkins, 2008). If Learning Outcomes are
understood in more depth, then the planning of lessons and their learning activities can result in well planned assessment activities by the teachers (Mvula-Jamela, 2007). Good planning of assessment activities and knowledge of which teaching strategies to employ will lead to the achievement of Learning Outcomes in their deepest and broadest form (Mvula-Jamela, 2007; Ramsarup, 2005).

However, teachers need to be motivated so that they can work with enthusiasm (Jenkins, 2008; Mvula-Jamela, 2007). Examining the use of gardens as a teaching tool in this research showed that teachers do really need some help as far as linking school gardens with the NS learning activities that were carried out in the classroom (see also Jenkins, 2008 and Mvula-Jamela, 2007 for similar findings). The study shows that the availability of gardens can assist in the recontextualisation processes of OPD in the NS Learning Area, but that this requires teachers to plan and then make sure that the use of garden really fits well into the lesson that had been planned, and that the use of the gardens as a possible learning resource is maximized (see above and Chapter 4).

As shown in Chapter 4, and in the discussion above, a more in-depth understanding of Learning Outcomes, Assessment Standards and core knowledge and concepts will enhance the teacher’s abilities and recontextualise the OPD. In particular, it seems we all need better skills to consider how core knowledge and concepts should be taught in OBE. For example, if the teacher could involve learners in more in-depth investigations of biodiversity, biodiversity loss and sustainable use of plants, the OPD would have been more effectively recontextualised. If the Learning Outcomes are understood the planning of lessons and their learning activities can result in well planned assessment activities. Good planning of assessment activities and the knowledge of which strategies to employ will lead to the achievement of Learning Outcomes and in their deepest and broadest form. The DoE (2006) recommends that teachers need to support learners to develop these skills by allowing them to do careful planning of assessment activities. In our lessons, assessment was mainly content based and did not therefore address the Assessment Standards effectively; it only addressed Assessment Standards related to LO2, which focuses on science knowledge.

As indicated above, it would seem important to develop our knowledge and understanding of the principles that underpin the Natural Sciences Learning Area, and especially a wider range of process skills (wider than answering questions and developing concepts). The DoE (2002:13) indicates that the Natural Sciences Learning Area requires teachers to integrate a range of process skills across the three Learning Outcomes. From the evidence presented in Chapter 4 (and in Table 5.1 below) it would seem that this would require a teacher to understand that these
process skills are the key aspects by which learner's progress in learning can be measured, and they are necessary for widening assessment practice away from only assessing content acquisition. Table 5.1 below indicates the range of process skills that learners need to acquire (DoE, 2006), and how these were not attended to in the four lessons described in Chapter 4, indicating that this is a key issue to be addressed for recontextualising of the OPD in the NS Learning Area.

Table 5.1 Process skills of the Natural Science Learning Area (DoE, 2006) and how they were reflected in the four lessons observed

<table>
<thead>
<tr>
<th>Skill</th>
<th>Reflection in Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observing and comparing</td>
<td>This aspect was achieved in all 4 lessons</td>
</tr>
<tr>
<td>Measuring</td>
<td>This aspect was not addressed in the lessons.</td>
</tr>
<tr>
<td>Recording information</td>
<td>This aspect was addressed in lesson 3.</td>
</tr>
<tr>
<td>Sorting and classifying</td>
<td>This aspect was addressed in lesson 1, 2 and 3.</td>
</tr>
<tr>
<td>Interpreting information</td>
<td>This aspect was not addressed in the lessons.</td>
</tr>
<tr>
<td>Predicting</td>
<td>This aspect was not addressed in the lessons.</td>
</tr>
<tr>
<td>Hypothesizing</td>
<td>Partly addressed in all 4 lessons.</td>
</tr>
<tr>
<td>Raising questions about a situation</td>
<td>This aspect was not addressed in all 4 lessons.</td>
</tr>
<tr>
<td>Planning science investigations</td>
<td>This aspect was not addressed in all 4 lessons.</td>
</tr>
<tr>
<td>Conducting investigations</td>
<td>This aspect was not addressed in all 4 lessons.</td>
</tr>
<tr>
<td>Communicating science information</td>
<td>This aspect was addressed in all 4 lessons.</td>
</tr>
</tbody>
</table>

This skill allows a learner to share information with others. This skill also links up with Critical Outcome 5 which requires that a learner communicates effectively / or develops language skills in various modes.
The DoE (2006) recommends that teachers need to support learners to develop these skills by allowing learners to work and learn in an integrated, active and broader manner. They promote Outcomes-Based learning that is the key feature of the OPD. As indicated in the table above, lessons taught during the recontextualisation process did not actually appear to develop all these skills. They tended to deal with some of these and not with others or all of them. As indicated above teachers in this case study, tended to do things for learners or demonstrate for learners. This makes the lessons more teacher-centred than learner-centred. As indicated in the discussion in Analytic Statement 1, using gardens for biodiversity education could help to develop more of these process skills, if a wider range of activities and LTSM are selected and used.

Observation showed that in almost all the lessons that were conducted during recontextualisation processes learners were just asked questions (ON1-3). Learners answered questions that were asked by the teacher. As shown in Chapter 4, the tendency of asking questions is that learners were not always given adequate time to think about them and answer them or to explore the questions in more depth. The questions also tended to dwell a lot on the learners' prior knowledge about content aspects that had been taught before. Critical thinking skills were not featured in the lessons.

As mentioned in Chapters 1 and 2, the introduction of OBE is relatively new in South Africa, and teachers have not yet been given adequate training to re-orientate their traditional teaching practices (e.g. content-based, teacher-centred approaches) towards a more learner-centred, investigation-centred curriculum, and as indicated earlier, both the teacher and myself have only recently been provided with orientation training to the NCS and its approaches, knowledge and concepts. As shown in the analysis of the OPD in Chapter 4 (see section 4.2), the OPD is also quite a complex discourse, and the environmental aspects of the discourse (e.g. concepts such as biodiversity and sustainable use) are new concepts that were not included in previous syllabi. As shown in Chapter 2, these are broad and complex concepts in themselves with local, national and global dimensions, which also present teachers with new challenges. Most of these discourses are also new, with most biodiversity policies only introduced after 1992 (see Chapter 2).

As indicated in Chapter 2, the South African curriculum prior to 1994 was a techno-centric curriculum (Doll, 1993) that emphasized the implementation of means over ends, negating the real world of lived practice. It would seem that one of the key challenges with the move to OBE is to shift the heavily teacher-centred nature of the curriculum to one that allows for carefully planned and well-supported teacher-guided investigations in NS. As shown in Chapter 4, the
teacher-centred approaches influenced both what and how the teachers (myself included) selectively appropriated aspects of the OPD. Particularly the dominance of a teacher-centred method of investigation (demonstrating or asking questions) seemed to ideologically transform the intended OPD and thus change or transform the OPD in the Field of Reproduction (the school).

Ramsarup (2005) also showed in her research how teachers, based on their prior experience of teaching also selectively appropriated aspects of the OPD, which was consequently ideologically transformed. Similar findings have also been reported in the study by Jenkins (2008) where he reports a significant ‘mismatch’ between the OPD and its expectations and teachers’ prior knowledge and experience in teaching. His study also shows how teacher-centred teaching strategies affect the implementation of the OPD according its expectations.

5.2.3 Analytic statement 3
Using gardens for recontextualising aspects of the NS curriculum has management implications

The use of gardens for recontextualising aspects of the NS Curriculum in the school also depends on the roles that management plays in the school. This refers to making sure that the following aspects are attended to so as to help teachers in their duties of mediating learning

- Availability, provision and use of resources
When the Grade 7 NS teacher was asked to shed some light and give her views on the importance of teaching and learning support material (LTSM) she stressed its importance. She even referred to availability of resources as one of the problems she faced at the school. In response to the question on ‘What problems or barriers do you often encounter in your teaching of the NS?’; she replied among other things: ‘Lack of resources … and inadequate classrooms’ (see Appendix 1). On further probing as to whether management was assisting in the problems, she replied, ‘no’. When the teacher was asked whether she had sat down with the management to look into the problems she was facing said there was no solution. She provided a solution to the lack of recourses indicating that there was need ‘to build more classrooms that are conducive to teaching and learning, and to build science laboratories.’ (see Appendix 1). When she was asked to elaborate as to why, in her view, the management did not help her, the reply was: ‘Because of lack of funds, I think the Department should intervene in this issue and also in the employment of Science and Maths educators, as I am overloaded.’ (see Appendix 1)
As reported in Section 4.1, these contextual resource issues are clearly a concern to the teacher. The issues raised by the teacher indicate that the school management including the School Governing Body and the Department of Education should help build classrooms, employ teachers and make TLSM available to teachers. In the case of our school the resources referred to above were hampering the teachers’ work. It is true that the school does not have funds to erect additional classrooms and purchase science equipment that is needed as these cost a lot of money, and despite many efforts on my side and the side of the School Governing Body (i.e. the management team at the school), the Department of Education is not helping in the erection of classrooms at the school. Learners are packed in the few available classrooms. In Grade 1 for instance, learners have been divided into two classes. Some are housed in the neighbouring homesteads. Classrooms in the junior section are overflowing with each grade having more than eighty (80) learners. The classrooms were designed to accommodate forty (40) learners at the most. This is not uncommon in rural schools in South Africa, as reported in the Nelson Mandela Foundation report on rural education (NMF, 2005).

As indicated in Chapter 1, the community surrounding our school is not wealthy, and they suffer from poverty. This makes it impossible for the School Governing Body to employ an additional teacher who can assist in teaching, as the people in the community cannot collect enough funds to pay the teacher. Most of them rely on government grants for survival. The Department’s policies somehow affect the school. Although the employment of a teacher is directly linked to the population of learners at the school, the Department of Education considers other factors as well when dealing with the employment of teachers at schools. One of these factors that comes to mind is whether the numbers are inflated or not. The Department of Education is concerned about school principals who inflate learner numbers in their schools because they want to be given more teachers, and according to the Department of Education’s policy this is a punishable criminal offence.

As indicated in the discussion on the experiment, availability of resources and size of classes affect the possibilities for using more learner-centred investigative approaches in the NS Learning Area, and hence it affects the recontextualisation process. While it is not always possible for the SMT to address all of the resource issues, it is possible to assist teachers to make better use of the available resources such as the school garden. This participatory action research project has given me more experience as to how I (as principal) can begin to support and encourage the teachers in our school to more effectively use this resource in their efforts to recontextualise the curriculum at school level, where they are now responsible for the design of Learning Programmes, Work Schedules and Lesson Plans (DoE: 2002; 2006). Having a deeper knowledge of the OPD and the associated expectations for planning, teaching and learning and
use of resources can assist school managers (like myself) to support teachers to make better use of resources such as school gardens, as shown in this study, although the study has also shown that school managers (such as myself) are also still learning to understand and interpret the OPD, which, as reported in Chapter 2 and 4, is a complex curriculum discourse with many different expectations.

• **Curriculum strengthening in the school**

As indicated in this study, there is a need for ongoing strengthening of teachers’ and managers’ knowledge of the NCS and its expectations. The Curriculum section in the Department of Education and the School Management Team need to make sure that ongoing interventions are put in place to support the effective implementation of the NCS in the school. For example the management could organize workshops that will assist teachers in understanding the NCS. These workshops can either be organized at school level or at district level. In this case study the NS teacher had previously attended some workshops that dealt with OBE and NCS in the past (see Appendix 1). There is no doubt that these workshops helped the teacher a great deal in understanding the NCS and in its implementation at school level, since we were able to plan according to the NCS planning framework and the teacher was interpreting some aspects of the core knowledge and concepts section of the NS Learning Area Statement, new knowledge areas such as use of Assessment Standards and integration approaches. As discussed above, new knowledge areas such as biodiversity and sustainable use of resources were not as well understood. The teacher also did not appear to fully understand the Assessment Standards for Learning Outcome 1 and Learning Outcome 3. This indicates that a deeper knowledge of the OPD and the NS Learning Area is needed, and provision needs to be made for such support.

• **Motivation to try new things**

During the recontextualisation processes in Grade 7 it was evident that the teacher (and I) did not try new methods of teaching. Although her Lesson Plan indicated a certain approach to the lesson (based on our discussion) the teacher did not actually explore new things when she taught her lessons. She tended to mostly ask questions and give learners instructions and teach or demonstrate content and concepts. She did not allow learners to venture out to do investigations or to ask critical questions. As indicated in the discussions above, there were many other possible activities that she could have given learners to allow them to investigate and to come up with examples and their own questions, especially if we had used other LTSM such as those provided by C.A.P.E. which gave other ideas on how to use gardens for biodiversity. She could also have used other strategies to allow them to collect data (e.g. they
could have used a questionnaire to interview community members on the use of medicinal plants).

Despite opportunities for discussing and planning new options, the teacher seemed to lack the motivation to try new things out. This presents a challenge for school management to find ways of motivating teachers to try out new things and new methods in the school. The only strategy I used in this participatory action research project was a demonstration lesson and ongoing collaborative planning and reflections. While this did show some effect (e.g. the teacher took learners outside after we had reflected on their enjoyment of learning outdoors in the previous lesson) it appears that these strategies were not adequate for bringing about a more substantial change in teaching practice. This was no doubt also a result of the fact that this process was also a new process for me and if I could do it again I would have done some things differently. For example I could have demonstrated a learner-centred investigation in the school garden and looked at what kind of questions the learners were asking.

- **Planning issues**

As discussed in Chapter 2 the Learning Programme, Work Schedule and the Lesson Plan are the three stages that the Department of Education emphasises in planning (DoE, 2006). Each stage plays an important role in the teaching–learning situation and the achievement of results. What results does a teacher get when a teacher did not plan the lesson or plan for the lesson?

In this case study, I was heavily involved in planning Lesson 2 with the teacher. However, the teacher did not seem to make a link between what was intended in the activities planned and what she did, hence no investigations were done by learners. This shows that collaborative planning does not always lead to successful teaching.

Another issue that arose was the issue of thoroughness in planning. In the planning for the photosynthesis activity the assessment task questions asked were based on the topic of photosynthesis but they did not seem to address the Assessment Standards (see Chapter 4 and Appendix 12). The questions were content-based, did not involve critical thinking on the part of learners, and they did not assess learners investigation skills. The assessment activity was written in red ink and the whole work looked sketchy (see Appendix 12). Test questions and the memorandum were written roughly on the same page. A heading ‘Marking Rubric’ was indicated but there was nothing written under the heading (see Appendix 12). The result was a content-based assessment that had little to do with the Assessment Standards focusing on investigation skills. This shows that planning for assessment requires careful attention to what is required in
the Assessment Standards. Mvula-Jamela (2007) found in her study that the planning of assessment was a critical issue for successful implementation of the NCS.

Despite these issues, there was evidence that the planning process did ensure that the teacher was prepared for the lessons. For example she was able to get together all the resources needed for the photosynthesis experiment. Having our Learning Programme and Work Schedule pre-planned also assisted with decisions as to what to include in the Lesson Plans. This made the lesson planning process easier. For management purposes, it would therefore seem helpful to teachers if managers were to ensure that at least the first two levels of planning are available at the start of the year to facilitate Lesson Planning. From the discussion above, it would also seem that management also needs to assist teachers with assessment planning according to the Assessment Standards during Lesson Planning. We did not engage deeply with this process in the participatory action research project, as indicated in Chapter 4.

- **Marking of work and giving feedback to learners**

  The work that teachers give to learners should be marked and feedback should be given to learners as feedback is as equally important as teaching and assessing. According to DoE (2006) feedback is one of the aspects that underpin developmental assessment. In this case study and in all four of the activities the teacher marked the learners' work and also awarded marks. Unfortunately I was not there when the teacher gave feedback to learners so I cannot tell how she did it. When I spoke to learners about whether they had received feedback, they could not remember her giving them feedback. The way that the assessment tasks were structured also influenced the type of feedback given to learners (i.e. in the form of marks). In the classroom and in the gardens, the teacher also gave learners informal feedback on the answers to the questions that helped to shape the lessons. From this it can be seen that feedback also affects the recontextualising process and should be planned for and encouraged. School managers can support teachers to develop a variety of approaches in giving learners feedback.

  From the above discussions, it is clear that school managers can play an important role in supporting effective use of school gardens and also for effective recontextualisation of the OPD through various management strategies.
5.2.4 **Analytic statement 4**

Socio-cultural and structural factors have an influence on the recontextualisation of OPD and the use of school gardens for NS biodiversity activities

Socio-cultural and structural factors of the school also have an influence during relocation or recontextualisation of the curriculum. As indicated by Cornbleth (1990), curriculum is a social process involving interactions among teachers and learners and among learners themselves and milieu or environment. The way these groups of people interact with each other has an influence on how the relocation or recontextualisation of the curriculum will take place. An example of this is when the teacher’s teaching strategy becomes a barrier to learning. If a teacher is arrogant during teaching and thinks of himself or herself as superior to learners, this can affect learning. Learners can feel intimidated and not feel free to relate to the teacher. In this case study, learners responded easily and freely to the questions posed by the teacher in the garden showing a good relationship. They also appreciated the teacher’s efforts to demonstrate to them but were frustrated because there were too many learners for them all to see what was happening in the experiment.

Another socio-cultural factor affecting teaching and learning for example, is the language used to teach. This is the medium of instruction that the teacher uses when teaching. If learners do not understand the terms used or the language used during teaching learning would be hampered. Language becomes the vehicle by which knowledge is transferred to learners. During the discussions that the researcher held with the learners and the teacher the question of language was raised as stumbling block in learning. Their mother tongue, isiXhosa was used to assist in clarifying some of the aspects of the lesson, like scientific terms. An example ‘reptiles’ = ezirhubuluzayo (isiXhosa). In the lessons we made a decision to include both English and isiXhosa to make sure that learners were able to understand the concepts being introduced. As indicated in the first lesson, these explanations in two languages took up a lot of time in the lesson, but as indicated in the next three lessons, learners gradually became more familiar with the English versions of the concepts as the teacher used them again.

The belief systems of both teachers and learners also affect learning. This is evident when teachers and learners do not view a certain aspect the same way. The cause for this may lie in different backgrounds of learners and teachers and also what the teacher emphasizes as important during teaching. These are the ideological inclinations of both the teacher and learners (Bernstein, 1990). Ramsarup (2005) showed in her study how different views of different people in the education system affect the recontextualisation of the OPD. In the case of this study, the teacher’s view that she should plan all the investigations and ask all the questions
affected how learners could experience the lesson. They had to stop some questions and discussions (e.g. on uses of plants) even though an investigative approach may have allowed them to explore some aspects further.

The shortage of teachers also affects teaching and learning badly (NMF, 2005). The teachers that are available are overloaded, which is not uncommon in the Eastern Cape, and especially in the Natural Sciences and Mathematics Learning Areas (NMF, 2005). This was raised by the teacher as discussed above, and also by the learners when they reflected on watching the demonstrations on photosynthesis.

Lack of non-teaching support staff is also a problem since teachers have to deal with a lot of paper work that support staff like a school clerk could deal with (NMF, 2005). Teachers find themselves doubling up as clerks and spend a lot of time doing duties like collecting school fees, doing filling and typing of school reports to name but a few. This wastes valuable teaching time, and takes away time from planning and preparing lessons which this study has shown is important in the recontextualising process.

Other structural factors, such as the availability of a school garden can, however, be a positive influence in the school. Cornbleth’s (1990) theory indicates that structural factors influence the curriculum recontextualising process. As shown in this case study these factors are likely to be unique in each school. The studies by Ncula (2007), Mvula-Jamela (2008) and Asafo-Adjei (2004) show that even though these schools are also situated in the rural Eastern Cape and they share many socio-cultural (e.g. language issues) and structural challenges (e.g. poverty and poorly resourced schools) they are not exactly the same as those in Mount Zion J.S.S. Each school is therefore likely to have unique contextual challenges that will affect the curriculum recontextualisation process, and therefore also the use of school gardens in teaching.

5.3 CONCLUSION

This chapter has looked at the recontextualisation aspects of the Natural Science Learning Area using the school gardens for biodiversity activities. The emerging issues that came out of the data from the previous chapter were reviewed and the issues were considered in relation to the research question. The chapter examines how the recontextualisation issues described in Chapter 4 shed light on the use of gardens for the teaching of biodiversity in the Natural Sciences.

In this work it became evident that when it comes to recontextualising aspects of the NCS (such as the biodiversity content of the NS Learning Area, and the Learning Outcomes and
Assessment Standards) it is not only the teacher that plays a role. The school itself, its resources, socio-cultural and structural factors, and the management of the school including the Department of Education and the District Office, all contribute to the situation as it is. All should play a role in ensuring that the conditions at the school are conducive to good education that learners must receive, and that the OPD of the curriculum is understood and thoroughly implemented, even though it is complex and not very easy to work with as shown in this study.

This chapter has indicated that there are many facets to this process of working with school gardens, biodiversity and the NCS that do not make implementation easy. The discussion has also shown that working with new concepts such as biodiversity, using school gardens as resources for learning, and the NCS itself are all new for school managers and teachers. The study has also shown that working together to plan lessons can help to address some of the challenges although this is not always an easy process. Reflection on the lessons was very helpful to us, and it was useful to get both the teachers’ and the learners’ views on the lessons. Chapter 4 showed that I also needed to review the lesson using the NS curriculum statement and to use Bernstein’s (1990) concepts to reflect deeply on what happened in the lessons.

In the next chapter I make recommendations from the study, and reflect on the research process as a whole.
CHAPTER 6: SUMMARY AND RECOMMENDATIONS

6.1 INTRODUCTION
This study was undertaken as a participatory action research case study. Its interest was to gain practical knowledge of how biodiversity activities can be linked with school garden in addressing the requirements of the NS Learning Area (OPD). In this chapter I summarise the study and make recommendations within the case, as I do not propose to generalise outside of the case. I will also provide a reflection on the study as a whole.

6.2 SUMMARY OF THE STUDY
The study concentrated mostly on the work of one teacher in my school, but I participated in the research process through giving an initial demonstration lesson on how the school gardens can be used for teaching biodiversity in the Natural Sciences Learning Area. This demonstration lesson was not situated in the gardens, but introduced key concepts of the NCS, which were to be followed up on by the teacher who would use the gardens in a series of lessons aimed at recontextualising the NCS using gardens with a focus on biodiversity. I held regular planning and reflection meetings with the teacher (and a group of learners). I made observations and gathered evidence of the recontextualising process in four lessons (including my own). The research study took place in the context of my school in Grade 7 Natural Sciences.

To provide a broader perspective of the school, I produced a school profile and a teacher profile from questionnaire data. I also undertook document analysis to identify some of the main features of the Official Pedagogic Discourse (in this case the NS Learning Area Statement). I also reviewed the teachers’ planning documents and learners’ work to provide a thick description of the four lessons that were taught and I also explored how learners participated in the lessons (the recontextualising process) that the teacher engaged them in. The study also looked at how the Natural Sciences teacher showed understanding of the NCS requirements for planning before any lesson can be taught.

To understand the relationship between what happens in a school during lessons, and the official curriculum (the NS Learning Area Statement) I drew on the theories of Cornbleth (1990) and Bernstein (1990) who explain the curriculum recontextualisation process. Bernstein (1990) explains that the OPD is delocated and relocated in different recontextualising fields, including the Field of Production (the school). Wilmot (2005) argued that teachers are also recontextualisers because they interpret the Official Pedagogic Discourse (the NS Learning Area
Statement in this study). Cornbleth (1990) explains that the curriculum is influenced by structural and socio-cultural factors.

I also provided an overview of biodiversity issues in South Africa, as this is a new knowledge area in the NS Learning Area, and it also explains why SANBI have sponsored gardens in our schools as we are situated at one of South Africa’s biodiversity hotspots. This added impetus for this research, which focused on biodiversity in the NS Learning Area. In Chapter 4 I discussed four recontextualisation processes, namely four lessons and how they were planned, taught and assessed. I also reported on our collective reflections, and gave a more critical reflection on each lesson by reviewing the lessons against the NS Learning Area Statement’s expectations (the OPD) and also by considering the potential for using the school gardens for NS teaching and learning.

Following this, I provided a more critical discussion on the findings of the study using four analytical statements that I now use to guide recommendations for the study.

6.3 RECOMMENDATIONS

The recommendations that I make in this chapter are based on the analytical statements that emerged and were discussed in Chapter 5. They refer to the case of Mt Zion Junior Secondary School and are therefore confined to recommendations that the management team (including myself) and teachers of this school can use. They may, however, prove to be useful or provide useful insights to other researchers or readers that might be interested in this work. Through this work other researchers might want to develop other research questions based on these recommendations.

Recommendation 1:
School gardens should be used to provide a resource and context for Natural Science Learning Outcomes and Assessment Standards

This study has shown that if school gardens can be treated as useful resource for learning at the school they can go a long way in providing both teachers and learners with a valuable context for the recontextualisation processes of the OPD, specifically biodiversity activities in the NS. However, other NS themes can also be taught using the garden as discussed in Chapter 5. Teachers need to plan their lessons with the intention of using gardens.

It was evident in the lessons that were taught that learners enjoyed working out in the gardens where they could use their senses to experience learning. The study also showed, however,
that teachers need to understand how to work with the environmental focus in the NCS as these are new concepts. A better understanding of the investigation process, as outlined in the NS Assessment Standards can also facilitate better use of the gardens.

**Recommendation 2:**
**Teachers' knowledge, experience, motivation and understanding of using gardens must be used to enhance recontextualisation possibilities**

Teachers are the mediators of learning (DoE, 2006). They therefore have a responsibility to keep abreast of new knowledge and developments that will enhance the education of their learners. As shown in this study teachers' knowledge, experience, motivation and understanding influences the use of gardens in the recontextualisation process, and this affects the quality of learning and the achievement of Learning Outcomes.

It is recommended that teachers should gain more knowledge through workshops that can be organized by the Department of Education or the school. The school can play a leading role in encouraging teachers to gain more valuable knowledge that they will need to improve their knowledge of the NCS, and how they can improve their skills to use more learner-centred approaches to teaching during the recontextualisation of the OPD.

The school should make efforts to motivate teachers to improve their level of understanding of the NCS. If teachers are motivated experience has shown that they can achieve a lot. School management can implement activities (e.g. demonstrations) to ensure that teachers at the school are motivated to try out new approaches (e.g. using gardens for science investigations), and to develop knowledge of new concepts (e.g. biodiversity and sustainable use) and science process skills.

**Recommendation 3:**
**The School Management should assist teachers to use the in the gardens for recontextualising aspects of the OPD in the NS (e.g. biodiversity)**

This study has shown that the school management can assist teachers in the recontextualising aspects of the OPD using gardens. The management can do this by making sure that the school premises are well fenced and well looked after so that the school gardens can flourish and provide the whole school with rich biodiversity and ecological aspects from which learners can benefit.
There are also other aspects of the school management that can help teachers in their work. These include the provision of resources such as plants for biodiversity and eco-system studies, LTSM provided by organizations such as C.A.P.E. and SANBI, classrooms, and employing more teachers. The duty of the school management is to continue to seek additional reserves from the DoE and elsewhere to facilitate learning, and to maximize the use of those resources that do exist (e.g. the garden).

It is also recommended that the school management should play a leading role in supporting planning processes with teachers as they prepare to engage in the recontextualisation of OPD at school. The management must ensure that all the three stages of planning that are required by the NCS are attended to adequately and especially to support assessment planning. The school management, so as to ensure that teachers are well equipped with the necessary knowledge and skill of the NCS, must also find ways to support curriculum strengthening in an ongoing manner.

School management can also ensure that teachers mark learners’ work and give productive and developmental feedback to learners on their work.

**Recommendation 4:**

The school’s socio-cultural and structural factors that have an influence on the recontextualisation of the OPD need to be taken into account

Factors that involve teaching personnel, non-teaching support staff, like clerks and the language and cultural background of learners must also be taken into account. If the school needs more teaching staff then the management should try to involve the DoE in employing more teachers to reduce overload.

The school management can also ensure that the school develops a language policy and teaching strategies that can help teachers to deal with the differences in language among learners in the school. Such policy and strategies need to take account of the fact that learners come from different cultural backgrounds and that most are learning in their second language and that they have different learning abilities, as pointed out by the teacher in her reflections and planning of the lessons in this study. Simple strategies like using both English and isiXhosa in lesson teaching can help with learning concepts such as those related to biodiversity, as shown in this study.
6.4 REFLECTIONS ON THE STUDY

Through this action research case study I have focused on the links that can be made between the curriculum and the school gardens in the Senior Phase in my school. I have explained how the Natural Science teacher and I engaged in participatory research process to develop biodiversity activities for NS in the school gardens. These activities were explained as recontextualising processes. The study found that teachers selectively appropriate aspects of the OPD and ideologically transform it based on their knowledge, experience and teaching practices. The study also showed that recontextualising the NS Learning Area Statement is not an easy matter as it involves new knowledge and concepts and a range of science process skills as well as values and attitudes that need to be understood by school managers and teachers alike. The study also found that school gardens provide a potentially valuable resource for learning in NS, if maximized and supported by teachers and managers in the school.

This study has gone a long way in trying to show to me what it is like to work with people in a research project. This study has also revealed that working with people as colleagues is one thing and conducting research with colleagues where probing questions are asked, are totally different things. Establishing the ‘participating’ process in an action research process is not an easy process. I, for example, found it difficult to involve the teacher in all of the interpretations of the study, as she seemed satisfied with the lessons after each one was completed. At the time of our reflections I too was satisfied, and it was only later when I was writing up each of the lessons that I realised more could be said about each lesson, especially when I critically reflected on the lesson in relation to the Learning Outcomes and Assessment Standards, core knowledge, concepts (i.e. the OPD as reflected in the NS Learning Area Statement) and what actually took place in the lessons. These more critical interpretations therefore only came later in the study. While these more in-depth reflections might seem to be critical of the teachers practice, they are equally critical of my own understandings and practice at the time as I too was learning about how to recontextualise the OPD in the NS using school gardens.

To address this I have critically reflected on my own role, and have considered management’s responsibility in supporting the NCS and its recontextualisation in the school. The critical reflections do not reflect badly on the teachers’ practice per se, as it is clear that she is a good teacher with many skills is able to cope with large groups of learners and teach effectively. The critical reflections rather highlight the challenges posed to all teachers, myself included, by the NCS and its Official Pedagogic Discourse.
This study has proved to me that doing research in ones’ workplace can be a great challenge that needs careful consideration by the researcher. Being a principal and doing research in my workplace has shown that my colleagues will relate to me with mixed feelings. Some supported me while others wanted to retard me in my endeavours. These are the challenges that make research a very tough but valuable and rewarding experience.

6.5 CONCLUSION
This study has been a valuable learning experience for me. I have learned to understand the NCS and its discourses better. I have learned that the area where my school is located is in a national biodiversity hotspot, and I have also learned to understand how a curriculum is transformed by the selective appropriations and ideological transformations of teachers, which in turn is influenced by their knowledge, experience and motivation. I have also learned that curriculum recontextualisation is influenced by socio-cultural and structural factors, and that management in a school has an important role to play in supporting the successful recontextualisation of the curriculum. I have also learned that the new South African curriculum is complex and that it poses many challenges to teachers and school managers particularly in contexts that are not well resourced. In addition I have learned how to make better use of the school garden in the Natural Sciences Learning Area so that learners can have better opportunities to achieve the Learning Outcomes and Assessment Standards of the curriculum.
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