INVESTIGATING TEACHING STRATEGIES USED BY TEACHERS TO FOSTER ENVIRONMENTAL LEARNING IN THE NAMIBIAN LIFE SCIENCE CURRICULUM

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by

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DECLARATION

I, the undersigned, hereby declare that the work contained in this dissertation is my own original work and has not previously in its entirely or in part been submitted at any university for a degree.

_____ 15 December 2003

Signature **Date**

ABSTRACT

This study was carried out to investigate the strategies used by teachers to foster environmental learning in the Namibian Life Science curriculum in four schools in Swakopmund, Erongo Education Region. This study is a qualitative case study. I used semi-structured interviews, observation and document analysis as instruments to collect data. Two schools were selected to participate in the case study. Research participants included four teachers (two teachers from each school) of which two teachers are teaching at each school.

The study was contextualised through a review of policy changes in Namibian education, which focus on learner-centred education. The study identified six strategies used by teachers to foster environmental learning in the Life Sciences curriculum. These are planning; working with information; practical, excursions and clubs; involving the learners; using visual aids and teaching materials; and choosing topics with a local focus.

Through a consideration of the different strategies used by teachers, in relation to the learner-centred nature of the educational reform project in Namibia the study provides insight into the way in which teachers view learner-centred education. The study also illuminates how strategies used by teachers reflect learner-centred education principles and it outlines a number of tensions emerging in the fostering of environmental learning in learner-centred ways. The study identifies further support required by teachers, and makes recommendations which will further enhance the strategies used by teachers to foster the environmental learning focus in Life Sciences, and also enhance learner-centred teaching in Life Science.

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LIST OF ABBREVIATIONS USED

AT	Advisory Teacher
BETD	Basic Education Teacher Diploma
DANCED	Danish Cooperation for Environment and Development
EE	Environmental Education
Et	Enviroteach
JSS	Junior Secondary School
LS	Life Science
LSM	Learning Support Material
LSP	Life Science Project
MBEC	Ministry of Basic Education and Culture
MEC	Ministry of Education and Culture
MHETEC	Ministry of Higher Education, Training, and Employment Creation
MHEVTST	Ministry of Higher Education, Vocational Training, Science and Technology
NIED	National Institute for Educational Development
SIDA	Swedish International Development Agency
SWAPO	South West Africa People's Organisation

CHAPTER 1

OVERVIEW OF THE STUDY

1.1 Introduction and background

In this chapter I introduce the background to the study and also the aims and the objectives of the research.

In this research I reviewed a range of literature on Namibian education reform, learner-centred education in a Namibian context, and the strategies used by the teachers in classrooms to teach the environmental focus in the Life Sciences curriculum. Instructional strategies (also called teaching strategies in this thesis) are strategies that teachers use which should enable learners of different cultures and abilities to progress. According to the MEC (1993:39), these instructional strategies are embedded in constructivism, and should therefore allow for interactive teaching and learning, and for learning which recognizes learners' prior knowledge. The literature helped me to understand the phenomenon being studied. In this chapter, I start by describing the context of the study, which centers on Life Science as a subject in the Namibian curriculum. I also briefly introduce my research aims, and then provide an overview of the different chapters in this study.

1.2 Namibian education reform

Since independence in 1990, the Namibian government has embarked upon a major reform of the Namibian Education system. The Namibian Education reform is guided by the policy document '*Toward Education for All' (MEC, 1993).* According to this document "… the curriculum inherited from the previous administration was very distant from the lives and experiences of most

Namibians …" (MEC, 1993:120). The policy advocates a paradigm shift from education for an elite to education for all (Kristensen, 1999:22).

The new education system, as described in the same document (*ibid*) is built on learner-centred education. *'Towards Education for All'* identifies learning as an active process of participation involving learners in developing, organising, implementing and managing learning (Kristensen, 1999:23). In Namibia, learner-centred education is underpinned by the learning theory of constructivism. Learner-centred education aims to enable learners to construct meaning in educational settings, and to develop particular capacities needed to interact in and with their world (*ibid*). Learner-centred education therefore takes as its departure point, the prior knowledge and experience of the learner, and provides opportunities for the construction of meaning in context.

In Namibia, educational reform was therefore perceived as a way of redressing the apartheid legacy of pedagogy and learning process that were restricted by behaviourist learning theory and the ideology of Christian National Education (Rhodes University Certificate, 1995 cited in Kristensen 1999:21). The intention was (and still is) to bring about a democratic learner-centred education for all. At the same time the reform was (and still is) seen as a vehicle to bring about sustainable development through incorporating relevant environmental education processes into various carrier subjects. One such carrier subject is Life Science, which is compulsory from Grade 8 to 10 (Kristensen, 1999). The subject Life Science is divided into three main themes: Plant production and the environment in Grade 8; Animal production and the environment in Grade 9; and Human Biology and the global environment in Grade 10. Through these themes Life Science addresses a wide variety of environmental issues including soil degradation, deforestation, desertification, pollution, sustainable use of natural resources, health, sex education and population issues. The rationale being that to educate people is to enable them to take more informed decisions about these issues (Kristensen,1999).

The Namibian National Environmental Education Draft Project document (DANCED, 2001) indicates that environmental education topics in the existing syllabi are often dealt with through a content-based approach with a few associated activities that do not necessarily link to learners experience or the local context. It argues that environmental education activities are therefore not enabling learners to achieve action competence, and curriculum activities appear to not be adequately contextualised, hence the problem of inappropriate environmental education praxis (*ibid* 2001). This research seeks to investigate the strategies used by teachers to foster environmental learning in the Life Science curriculum.

1.3 Research context

Through this study I would like to investigate the teaching strategies used by teachers to foster environmental learning in the Life Science curriculum at two successful Senior Secondary schools. The reason I decided to investigate the strategies used by the teachers in these schools, is influenced by my role as an Advisory Teacher (AT) appointed by the Ministry of Basic Education, Sport and Culture to advise and guide the teachers to teach Life Science successfully. In this context a successful school is a school with the average pass rate of 80 - 100% with a normal distribution curve and quality grades for example grades A-D. One of the criteria I used in the identification of the two successful schools is the proximity of the school to the place where I work (as Namibia is a large country), and the accessibility of the school and teachers.

I envisage that this study will provide me with a deeper understanding of what is going on in classrooms and what teaching strategies the teachers may use to teach the environmental topics in Life Science curriculum. The results of this study will hopefully inform my work, and assist me to support teachers in using a variety of strategies in their teaching. The results will also hopefully assist other Advisory Teachers and curriculum implementers. At national level, I also contribute to Learning Support Material (LSM) development and represent my

region on the Natural Sciences curriculum panel. The research results may therefore be shared at a broader, national level.

1.4 My role as Advisory Teacher

During 1996 I was appointed as an Advisory Teacher in Khorixas education region, responsible for Natural Science and Health Education Grades 5-7, Life Science grades 8-10 and Biology grades 11-12. Some of my duties among others include:

- Promote high standards of teaching and learning aimed at ensuring that learners receive the best education that their teachers can provide,
- Examine and evaluate the quality of teaching and learning at schools, based on established criteria,
- Give guidance, advice and support to teachers aimed at improving their performance particularly in these areas:
  - (a) creating an effective learning environment in classrooms
  - (b) teaching classes/phases effectively
  - (c) implementing syllabus requirements,
- promote and support the development of teachers,
- ensure that subject/phase policies are effectively implemented, and
- establish and maintain good working relations with teachers, schools managers and other education officers.

MBEC, (2002:1)

I am also involved in community affairs and projects. I am serving as Mayor of the Swakopmund Town Council and also as a chairperson of an Environmental Conservation Committee of Swakopmund. The above-mentioned involvements in community affairs enables me to address some of the environmental problems experienced by people in Swakopmund. Major environmental issues include the sanitation problems in Democratic Community (DRC), an informal settlement area established by the community. Another key environmental issue is off-road driving and littering, since Swakopmund is a tourist town with a beautiful and fragile landscape. Tourists are impacting heavily on the fragile dune environment with their 4x4 trucks.

1.5 Research question

As indicated above, the research question is directly related to my role as Advisory Teacher. It also, however, links with my community-based interests in fostering better environmental practice in Swakopmund. The research question is:

> *What are the teaching strategies used by Grade 8-10 teachers to foster environmental learning in the Life Science curriculum?*

The goals of the research are to:

- Identify good practices that are taking place; and
- Identify different teaching strategies that foster environmental learning in Life Science.

1.6 Significance of the study

I believe that this study is significant because it may contribute important insights which will help education policy makers, educational researchers as well as others in the broader educational fraternity. The study sheds light on how teaching strategies are contributing to the education transformation goals of the Namibian Government, which promotes a learner-centred approach to education. A further value of the study, is its contribution to inform my work as Advisory Teacher.

1.7 A brief overview of the study

Chapter one introduces the study by describing the context of the research briefly, the research questions and goals. It provides some insight into my role in

the education and training system, and provides insight into why I had a particular interest in this research question. I also provide a brief overview of each chapter.

Chapter two describes the historical background of educational reform in Namibia. It highlights some of the key issues and policy trends associated with this reform; and it outlines how environmental education has been conceptualized within the reform process. In particular, I focus on the importance of learner-centred education, which is situated at the 'heart' of educational reform in Namibia.

Chapter three describes the design of the study and the methodology employed. The chapter describes how I chose to work within an interpretive tradition using case study method, and how I applied different research techniques such as observations and interviews to develop a case study of teaching strategies used by teachers to foster environmental learning in the Namibian Life Science Curriculum.

In **chapter four** I present the data collected from semi structured interviews, observations and document analysis. I present the data within the framework of a number of categories, which emerged from the first layer of data analysis. These categories include:

- Teaching strategy 1: Planning
- Teaching strategy 2: Working with information
- Teaching strategy 3: Practical experience, excursions and clubs
- Teaching strategy 4: Involving learners
- Teaching strategy 5: Using visual aids and teaching materials
- Teaching strategy 6: Choosing topics within a local focus

In **chapter five** I discuss the research findings reported in chapter 4. A more in-depth analysis of the data is therefore presented in this chapter. In this chapter

the data is considered in relation to the key objective of Namibian education reform, which is to foster learner-centred education. The chapter discusses teachers' views on learner-centred education, and reviews how strategies used by teachers reflect learner centred education principles. It also discusses tensions emerging in fostering environmental learning in learner-centred ways, and considers the support that teachers need.

Chapter six presents the conclusion of the study and makes recommendations, which may guide teacher support and classroom practice. While the findings do not assume generalization, they are presented in such a way that they could be used and interpreted further by both teachers and advisory teachers, when involved in the teaching and/or support of environmental learning processes in the Namibian Life Science curriculum.

1.8 Conclusion

In this chapter, I have provided a description of the context and objectives of the research. I have also briefly introduced the goals of Namibian education reform and the introduction of environmental education in the Namibian Life Science Curriculum. This chapter also provided insight into the significance of the study and an overview of different chapters of this research report. I will now turn to the next chapter and reflect on the policy and other contextual influences that have relevance to this study. In the next chapter I also review recent research findings related to the use of strategies to foster environmental learning.

CHAPTER 2

NAMIBIAN EDUCATION REFORM AS CONTEXT FOR THIS STUDY

> *As education was seen to be in a position to play a pivotal role in nation building and in healing the wounds of apartheid, the entire education system had to be transformed and reformed in line with the vision, major goals and policies of the new government.*
>
> (Swarts 1998, cited in Mbamanovandu 2000:5).

2.1 Introduction

In this chapter I firstly draw on insights from localized (Namibian) literature on learner-centred education and associated teaching and learning strategies and how it is perceived and delivered by the teachers. I also draw on perspectives from the international literature to discuss the potential and the limitations of learner-centred approaches and how these are similar or different to that of Namibia. I furthermore draw on local and international literature regarding perceived ideas on environmental learning. This literature has been used to help frame my own theories and assumptions about the possibilities and limitations associated with teaching strategies in a Namibian context.

2.2 Educational reform in Namibia

After independence in 1990, Namibia embarked upon a major reform of the education system. Education has been proclaimed a national priority. The Namibian education system was fragmented and was organized along racial lines and was aimed at privileging the white minority under apartheid rule (prior to 1990 when Namibia was under the rule of apartheid South Africa). To redress

this situation the Namibian Government introduced a policy of *'Education for All'* (Ministry of Education and Culture, 1993:2, see also section 1.2).
Education for all does not only mean increasing the number of learners in schools, it means that there is a need to replace the philosophy and practices of education suitable for educating elites with a new philosophy and practice that will cater for educating all citizens of Namibia irrespective of their colour and race (Ministry of Education and Culture 1993:4). To this end, the Namibian government hopes to provide education programmes that focus on facilitating success in all schools. The intention is that this system should be able to encourage successful learning amongst all learners (*ibid*).

As a result, the Namibian government has introduced Basic Education. In this system, each Namibian citizen is to be guided by broader educational ideologies aimed at transforming pedagogical practices in order to bring them in line with the national goals of education in Namibia. According to the Ministry of Education and Culture (1993:32-41) the aims of education in Namibia are to provide:

- Access to education for all;
- Equity in overcoming the educational advantages;
- Improved quality of educational provision; and
- A democratic education system that will play a central role in transforming society.

With the introduction of Basic Education, the whole mode of education had to undergo a paradigm shift, from teacher-centred, behaviorist education, to learner-centred education where students are exposed to more practice-based inquiry. This orientation hopes to enable learners to critically analyze and act upon prevailing educational issues, in-and outside their classroom. In contrast, the previous system was teacher-centred, and was based on rote learning and memorization. This led to a greater emphasis on theory and a subsequent lack of attainment of coherent critical analytical skills (*ibid*). The *Pilot Curriculum Guide*

for Formal Basic Education (MBEC, 1996a) outlines the aims of the new Basic Education program. These include aims to:

- Enable learners to communicate effectively in speech and writing in English and in another language of Namibia;
- Develop a lively, questioning, appreciative and creative intellect, enabling learners to discuss issues rationally, to make careful observation and analysis, to experiment, to think scientifically, solve problems, and apply themselves to tasks;
- Help learners develop self confidence, self-knowledge, self-reliance and understanding of the world in which they live, through meaningful activities;
- Enable learners to obtain the knowledge and understanding, skills and competence, and attitudes and values needed for their personal development, related the changes in Namibian society; and
- **Promote the learner's involvement in practical activities to preserve and sustain the natural environment**

  (Ministry of Basic Education and Culture, 1996a:5-6 emphasis mine).

According to the Namibian policy '*Towards education for All*', teacher-centred instruction is inefficient and frustrating to most learners, and is not consistent with the aims and goals of education for all (Ministry of Education and Culture 1993:10). The transformation proposed by the Namibian Government, will involve enabling both teachers and learners to become skilled at developing and working in learner centred settings.

These policies have wide ranging implications for teacher education. The whole mode of teacher education has to undergo a paradigm shift, from previous programmes of pre-service teacher education (which were mostly teacher-centred) to the Basic Education Teacher Diploma (BETD) were teachers are encouraged to implement learner-centred educational approaches, and to reflect on their teaching. This introduces reflective practice to teacher education.

The broad curriculum for the BETD outlines the aims of the new teacher education program. This curriculum aims are, amongst others to:

- Develop the professional expertise which will enable the teacher to optimize the new basic education for the learners and to promote change towards the goals of education reform in Namibia;

- Strive to develop a reflective attitude and creative analytical and critical thinking; and

- Prepare teachers to be able to create learning opportunities which will enable learners to explore different ways of knowing, and develop the whole range of their thinking abilities both within and across subject areas of the whole curriculum.

  Ministry of Higher Education, Vocational Training, Science and Technology (MHEVTST) and Ministry of Basic Education and Culture, (MBEC) (1998:4-5)

The foregoing aims of the curriculum for BETD and Basic Education indicate that programmes need to be introduced to develop a pedagogy among teachers and learners based on broader reconstructive ideologies underpinning the reform in Namibia. As Kristensen (1999:17) notes: "A Namibian education reform was a call for change. A change of the curriculum, a change of the learning theory and a change of the educational system".

The MEC (1993:10) emphasizes the learner-centred focus for educational reform in Namibia when it notes "… as we make the transition from educating an elite to education for all we are also making another shift, from teacher-centred to learner-centred education".

The reform of the Namibian Education system also addresses changes in teaching strategies from using the textbook as main resource to using it as a guide. It also requires changes in teaching strategies so that learner-centred education becomes a reality in Namibian classrooms. This shift in teaching strategies forms the focus of my research.

2.2.1 Learner-centered education in the Namibian context

As noted above, the new education system is built on learner-centred education. According to Kristensen (1999) this means that the educational system is aimed at harnessing curiosity and excitement, and promoting democracy and responsibility in lifelong learning. The stated intentions of this curriculum are to employ a holistic view of learning, valuing life experiences and to assist learners in integrating school and life outside school (MEC, 1993). *'Towards Education for All'* identifies learning as an active process of participation involving learners in developing, organising, implementing and managing learning (Kristensen, 1999). '*Toward Education for All' states* that a student must learn to analyse and synthesise, to imagine and explore, to criticize and create, to understand and use. Students must also learn to relate " …what-is-now to what-can be and how to get there" (MEC, 1993:121).

The Ministry of Basic Education and Culture states that:

> Accordingly the Namibian approach to learning and teaching should be learner centred, which must aim amongst others towards:
>
> - A methodology that promotes learning through understanding and practice directed towards the autonomous mastery of living conditions;
> - A general reorientation of the organization of school work with the view to fostering the acquisition of basic knowledge and skills by all pupils;
> - Promoting and protecting the fundamental equality of all learners and equity in their access to, their work in, and their benefits from learning environment; and
> - Introducing and encouraging classroom practices that reflect and reinforce both the values and practices of democracy.
>
> (Ministry of Basic Education and Culture, 1996a:23)

The Ministry of Education and Culture has embarked upon a programme of curriculum and instruction reform whose components include:

- Developing learner-centred and self-accessing instructional materials (see 2.2.1 below);

- Enhancing learning through individualized instruction (see 2.2.1 below); and

- Improving the effectiveness of curriculum and instruction.

Following the proclamation of the '*Education for All'* policy, the Namibian Government has developed the *Pilot Curriculum Guide for Formal Education* (referred to in this thesis as the Broad Curriculum). This is a policy-enabling framework guiding Basic Education in Namibia. This document was developed by the National Institute for Education Development (NIED) and was issued with effect from January 1996. The Broad Curriculum went through several drafting phases, various stakeholders in education were given an opportunity to comment on the draft before the draft was adopted (Swarts, 1998 cited in Kristensen, 1999).

The Broad Curriculum guide is " … a statement of the goals and aims of Basic Education, what areas of learning and subjects are to be studied, and how teaching and assessment are to be done" (Kristensen, 1999:2), as such "… the Broad Curriculum guide provides the framework for devising subject syllabuses [syllabi] and material to be used in the various subjects of learning so that the goals and aims of Basic Education will be put into practice in a consistent way." (MBEC, 1996a:2).

From the above review, it is clear that learner-centred education features very prominently in the Namibian educational reform discourse. It has in fact become a "slogan" (Jickling and Spork, 1992, cited in Kristensen, 1999:38) and is almost

entirely tantamount with the education reform. According to Kristensen's evaluation of the Life Sciences Project (1999:118) teachers had a good understanding of learner-centred education as using the learners' previous experience but the teachers' view of learner-centredness was set within a liberal notion of education. Findings from Van Harmelen's study (2001:187) supports the statement above. She notes that teachers' articulate skills of learner-centred education but that their views of learner-centredness are not grounded in practice. This indicates some of the difficulties in implementing learner-centred education in the Namibian educational reform context.

Basic Education is based on the principles and practice of learner-centred education. This has implications for approaches to teaching and learning, for instructional materials, and for the way teaching is organized.

The change from teacher-centred teaching to learner-centred teaching has implications for how teachers teach learners.

2.2.2 Implications for teaching

The Broad Curriculum for the Basic Education Teacher Diploma and in-service Basic Education Teacher Diploma (MBEC, 1998, 2002) outlines what is expected of teachers in terms of learner-centred education:

> Learner-centred education presupposes that teachers have a holistic view of the learner valuing the learner's life experience as the starting point for their studies. Teacher should be able to select content and methods on the basis of a shared analysis of learner's needs, use local and natural resources as an alternative or supplement to ready- made study materials, and thus develop their own and the learner's creativity … A learner-centred approach demands a high degree of learner participation, contribution and production. Learner-centred education is based on a democratic pedagogy, a methodology which promotes learning through understanding, and practice directed towards empowerment to shape the conditions of one's own life. (Broad Curriculum for Basic Education Teacher Diploma and In-Service Teacher Diploma, MBEC, 1998:1-2 and 2002,8).

As noted above learner-centred education is about sharing and interaction. Teachers are required to create this platform for learners by involving the learners in teaching and learning processes. Teachers should create opportunities whereby learners will explore and find out things and through these processes enable them to develop different thinking skills. Teacher should view a learner as someone who brings a wealth of knowledge to the learning situation. The teacher's role is to provide learners with the needed tools for further learning. Through scaffolding and encouragement (among other strategies), learners can develop a range of skills in the classroom. The Curriculum Guide for Senior Secondary Education (MBEC, 1996c:7), indicates that:

> The learner brings to the school a wealth of knowledge and social experience gained from the family, the community and interaction with the environment … the learner …is an individual with his/her own needs, pace of learning, experiences and abilities.

The Broad Curriculum (MBEC, 1996a), describes the approaches to teaching and learning in learner-centred education as follows:

- The starting point at each stage of a learning process is the learners' existing knowledge, skills, interests and understanding derived from previous experience in and out of school;
- The natural curiosity and eagerness of all young people to learn to investigate and to make sense of a widening world must be nourished and encouraged by challenging and meaningful tasks;
- The learners' perspective needs to be appreciated and considered in the work of the school;
- Learners should be empowered to think and take responsibility not only for their own, but also for one another's learning and total development; and
- Learners should be involved as partners in, rather than receivers of, educational growth.

(Ministry of Basic Education and Culture, 1996a:23)

The Ministry of Education provides further guidelines for teachers by giving advice on a variety of teaching strategies that can be used in achieving learner-centred education. These include direct questioning, eliciting explaining, demonstrating, challenging the learners' ideas, checking for understanding, helping and supporting, and providing opportunities for active practice and problem solving (Ministry of Basic Education and Culture, 1996a:23)

As indicated above, learner-centred education is an approach to teaching and learning that is derived directly from the national goals of equity and democracy. It is an approach that requires teachers to put the needs of the learners at the center of what they do in the classroom (Enviroteach, 1995:15).

This means in teaching and learning situations teachers must first and foremost find out what background knowledge the learner brings with him/her to the classroom, and what are the skills and understanding the learner already has about a topic. It is the teacher's responsibility to develop different activities to find out what the learners already know about the topic. Then teachers develop more activities that build on and extend the learners' knowledge because learner-centred education is also activity based. I believe that skills are practiced during the process of doing something, for example, when learners work in the garden in the context of the Grade 8 Life Sciences syllabus.

The challenge of transforming education includes involving learners in the learning process. Teachers should choose methods whereby learners are encouraged to actively shape the learning process. Learners do not always have to conduct experiments, present topics, or give reports. They can also be actively involved through asking questions, engaging in discussions, listening attentively and relating their own experiences to the class. Learner-centred education encourages interaction between all the class members, including the teacher. (Ministry of Basic Education and Culture, 1993:10)

Despite all the conditions that have been put in to place for teachers to use learner-centred education Van Graan (1998:54) found in her research that teachers do not seem to speak the same language around learner-centred education. She further says that it seems that teachers use techniques in their classroom that support a learner-centred approach to education but that they do not see it as learner-centred education. She cites the following evidence of features of teacher practice which reflect the expectations of a learner-centred classroom:

- determining learners' prior knowledge and experience at the start of a lesson,
- checking the learners understanding,
- eliciting information,
- monitoring learner's progress,
- giving individual support where needed,
- teachers and learners demonstrating aspects of the lesson,
- integrating relevant content into lessons, and
- encouraging learners.

(Van Graan, 1998:54)

What was of interest to me, is the suggestions that some teachers appear not to perceive their teaching to be learner-centred, even though there are clear 'signs' that their approaches reflects some of the requirements for learner-centred education. This illustrates some disjuncture between teachers' views of their practice and their understandings of policy.

Van Graan's (1998) research indicates that there is a further need within the system to further support those teachers that are beginning to use learner-centred approaches in their teaching. It appears, however, that adopting a

learner-centred approach requires more than simply supporting teachers to change their practice. Wilmot (2000:27) claimed the 40 minutes timetabling hampers effective activity based learning, as 40-minute lessons do not suffice for the type of activities required by learner-centred approaches to Life Sciences. She further argues that sufficient time is needed for reporting back and for plenary sessions with the learners (*ibid*). Wilmot's research (2000) indicated that a broader range of teaching strategies were needed and that learners also needed to be engaged in activities that could develop their critical and creative thinking, problem-solving and decision-making skills, as advocated by Life Science curriculum.

The research reported above indicates that:

- there appears to be a need for increased support for teachers to become more reflective of their practice so that they can better interpret this practice in relation to policy (Van Graan, 1998);
- that further structural and systemic changes are required to enable learner-centred practice (e.g. changes to timetabling) (Wilmot, 2000); and
- that a broader range of teaching strategies are required to enable learner-centred education which is critical, creative and problem-oriented (Wilmot, 2000).

The change to learner-centred education not only influences the way in which the teacher views learners, and the teacher's practice, but also the learning process itself, and the instructional materials developed to support and enhance learning.

2.2.3 Implications for the design and use of instructional material

Learner-centred instructional materials are meant to be designed and used in such a way that they support implementation of the new curriculum, particularly its goal of learner-centred education. The Ministry of Education and Culture

underlines the importance of instructional materials, noting that they will be of special value in helping inexperienced and untrained teachers to be more effective in their classrooms (MEC, 1993:121-122).

Effective learning and teaching are closely linked to the use of materials (e.g. books, posters, charts, or reworked wire, egg cartons and so forth) and media (e.g. radio, newspaper, audio cassettes, films). In learner-centred education, the teacher is expected to select and develop the most appropriate materials and media for the learners to enrich and reinforce learning and assist them in achieving the learning objectives.

The MBEC (1996a:25) notes that teachers should make use of both the formal materials and ones developed by the teacher. Materials for activities can be used again and again, with improvements and changes being made as required because all learners are not the same.

According to the MBEC (*ibid*), the most effective materials should be learner-friendly. They should be designed to meet the learner's needs and should be stimulating and easy to use. They should engage attention, actively involve learners, and combine challenge and enjoyment. Such materials should be carefully designed for specific learning objectives, to help learners to understand, and should be easy for the teacher to use. The materials should guide and stimulate learning. Material should also encourage self-study and self-learning in an environment where the teacher is ready to lend support. The materials should also provide learners with opportunities to assess small elements of their own work and to discuss the corrections with the teacher. In providing guidelines, the Ministry of Basic Education and Culture (1996a:25) further advises that all materials of this nature should have clearly identified objectives and should focus on activities that develop interaction between learner(s) and material.

It may also be necessary that in some cases, teachers would need to be creative, and improvise teaching and learning materials from easily available and

inexpensive objects in the immediate environment such as sticks, string, bottle tops, cardboard, and so forth provided that they are safe and hygienic. Use of materials in this way, can involve learners, and can be based on discussion of the learners' experiences in order to also explore the learner's creativity. Other strategies which promote learner-centred pedagogy are, for example, developing reading materials from the learners' own creative writing. From the above, it seems that some of the teaching materials will be prepared by teachers and learners, while others are prepared by specialists, and will come in the form of textbooks. (MBEC, 1996a: 24-25).

Murray and Wilmot (2000:21-22), researching the use of instructional materials in a learner-centred approach within the Life Sciences curriculum, write that there was little evidence that the resources like teachers guides and colour posters (provided by the government) had been used. Van Harmelen (2000:188) also support Murray and Wilmot's finding and argues that evidence of the impact of the Life Science Kits and posters gave a very strong impression that these materials were not being used. Murray and Wilmot (2000) further stated that there was also evidence of poor management of instructional materials in schools. There is a shortage of textbooks in some schools. This issue also emerged in Van Harmelen's 2000 study (cited in Murray & Wilmot 2000:11) when she noted that many learners were sharing books. This creates a situation where learners are not able to use the textbook when they need it, and this reduces the learner-centred potential of the materials, although they can still be used in creative ways in group work.

Despite these intentions for instructional materials, Murray and Wilmot (2000:7) note that the textbooks do not exemplify, scaffold and facilitate the learner-centred approach for teachers, this is very important especially for inexperienced teachers who often depend only on textbooks. This issue emerges in Van Harmelen's (2000) research when she reports that teachers teaching Life Science heavily depends on the textbooks for information (*ibid*).

Wilmot (2000:22) notes that the Life Science Project donated a Life Science Kit, teachers' guides and textbooks to all schools teaching Life Science and according to Nott (cited in Murray and Wilmot, 2000:22) enough textbooks were purchased and distributed in 1998. Van Harmelen (2000:189) claims that the Life Science materials (posters and kits) were introduced to enable schools to implement the practical components of the subject. Issues associated with the use / non-use of materials are closely linked to the role of the teacher.

2.2.4 The role of teachers

In a learner-centred education system, teachers should provide learner-centred environments that stimulate co-operation, responsibility and learning by understanding through hands on activities. Teachers should also be able to adapt or develop materials to respond to the needs of their learners. It has been reported that the materials developed by the Life Science project are based on a participatory approach which stimulates learning by understanding, but according Murray and Wilmot the structure and the layout of the textbooks were not consistent with the goals of learner-centred education (Wilmot and Murray, 2000, cited in van Harmelen 2000:188).

2.3 Implications for learning: social constructivism and the Namibian curriculum

According to Van Harmelen (1998), learner-centred education in Namibia is underpinned by the learning theory of constructivism. Constructivist learning theories originated from cognitive psychology, which evolved as one of the alternative approaches to behaviourist psychology, and within the study of language acquisition. Cognitive psychology is concerned with how the mind works, about the nature of knowledge and how knowledge is acquired (Van Harmelen, 1998:27,31). In association, learner-centred education aims to enable learners to construct meaning in educational settings, and to develop particular

capacities needed to interact in and with their world (*ibid*). Learner-centred education therefore takes as its departure point, the prior knowledge and experience of the learner, and provides opportunities for the construction of meaning in context.

Vygotsky, a key proponent of constructivism, argues that meaning making requires not only language but a grasp of the cultural context in which language is used. According to Janse van Rensburg and Lotz-Sisitka (2000:12), his work emphasizes the socio-cultural nature and context of learning. He further argues that:

> mental development consists in mastering higher order culturally embodied symbolic structures, each of which may incorporate or even displace what existed before. According to Vygotsky these higher order structures are cultural products of continued social interaction. (Wood 1998:37).

Wood (1998:159) explains further that the process of language acquisition was understood through an examination of Vygotsky's work. He also discusses the work of Jerome Bruner (another cognitive theorist), who emphasized the role of children as "active architects of their own understanding". This resonates with the Namibian learner-centred education policy intentions. Both Bruner and Vygotsky stressed the role of social interaction and cultural practices in shaping the course of human development. Their approach is often referred to as 'social constructivism' (*ibid*). The social constructivist accepts that knowledge is constructed as learners interact in varied and different settings in order to understand the world. It emphasizes the role of language and culture in meaning making. As indicated above, the Namibian learner-centred 'Education for All' policy emphasizes the importance of learners being active 'architects of their own understanding' (*ibid*).

Van Harmelen (1998:30-31) argues that social constructivism has probably been the most influential theory informing learner-centred education in Namibia, to bring about the current emphasis on life long learning. She (*ibid*) further states

that social constructivism is a particularly strong proponent of discovery learning, in the sense that the "… learners construct their own knowledge through the discovery of meaning and in learning to do so, make sense of their world through ongoing conceptual development".

Janse van Rensburg and Lotz Sisitka (2000:12) argue that:

> social constructivism refers to a set of assumptions that constitute an epistemological position that is radically different from the empiricist and rationalist (pre-determinate) epistemologies currently dominant in western and westernised societies

This perspective is significant in the Namibian context, as Namibia is attempting to transform its education system and to introduce a different 'set of assumptions' that guide knowledge and knowledge production in schools. Like Social constructivists, the Namibian reform process seems to emphasise that knowledge and meaning are socially constructed as learners interact in varied and different settings in order to understand the world (Berger & Luckmann, 1967 cited in Janse Van Rensburg & Lotz Sisitka 2000:12).

As indicated above, the policy framework provided by the MEC, indicates support for a social constructivist view of teaching and learning but the National Institute of Educational Development argue in their discussion document (NIED 2003:28) that some of the research on learner-centred education shows, that teachers in Namibia have insufficient depth of understanding of learner–centred education to be able to implement it. The document also argues that the same research shows that the lack of deeper understanding is reflected by the phenomena that only superficial changes in methodology (e.g. group work as being evidence of learner-centredness) appear to be evident. They (*ibid*) ascribe this to the fact that a lot of in-service training has focused on classroom methods or checklists, without sufficient theoretical underpinning which will enable teachers to reflect on, critique and situate their own practice. This research seeks to explore the strategies that teachers apply in fostering environmental learning in the Life

Science curriculum, and through this, it will explore some of the perspectives on social constructivism as they 'play out' in classrooms.

2.3 Environmental education in the Namibian curriculum

> To enable Namibians to move from environmental awareness to understanding and action, the Namibian government will aim to provide all Namibians with access to environmental education, whether at the formal or non-formal level
>
> (Namibia's Green Plan, 1992 cited in Enviroteach 1995:32)

The Namibian government acknowledges that environmental education is one of the essential instruments for empowering Namibians to take meaningful decisions concerning environmental issues and risks. This is essential for the sustainable livelihoods of many Namibians and is therefore an important dimension of Namibian social and political reform.

Namibia is the driest country south of the Sahara. The Namibian environment is semi-arid and fragile, yet the majority of the population (approximately 70%) is directly dependent on the land for a living. Namibians must carefully manage their environment to sustain it for the present and future generations. After independence the Namibian government made it a priority to create an environmentally literate nation, which understood the consequences of the past to who are able to take action to live sustainably for the benefit of all Namibians. (Enviroteach, 1995:31).

With the drafting of the Namibian constitution the Namibian Government committed themselves to address environmental issues. Article 95 (l) of the Namibian Constitution (RN, 1990:52) states:

> the state should actively promote and maintain the welfare of the people by adopting, *inter alia,* policies aimed at maintenance of ecosystems, essential ecological processes and biological diversity of Namibia, and utilization of living natural resources on a sustainable basis for the benefit

> of all Namibians, both present and future; in particular, the Government shall provide measures against the dumping or recycling of foreign nuclear and toxic waste on Namibian territory.

In order to increase awareness of environmental problems, and to promote more sustainable natural resource management practices, the government of the Namibia has identified environmental education within the formal, non-formal and informal sectors as a priority. There are numerous policy documents that emphasize the importance of maintenance of ecosystem and environmental awareness, for example the MEC's 1993 *'Education for All'* policy document promotes the development of environmental awareness. The Broad Curriculum for formal Basic Education states that Basic Education will promote the development of environmental and population awareness. The BETD curriculum includes environmental education and awareness as one of its aims. While these policies exist, many of them have not been well implemented (DANCED 2001:6).

In order to implement the policies above the Ministry has identified aims covering different learning areas. Aims that have direct relevance to environmental education were also developed. The Ministry of Basic Education and Culture (1996:8) reflected these aims as follows:

- Develop understanding of the dynamic interdependence of living and non-living things and the environment;
- Develop a sense of responsibility for restoring and maintaining ecological balances through the sustainable management of natural resources;
- Promote the learners involvement in practical activities to preserve and sustain the natural environment; and
- Lay a foundation of informed and responsible attitudes and choices towards the balance of population growth, ecological sustainability, and the quality of life for all Namibians.

This emphasis on environmental education in educational policies has led to the incorporation of an environmental focus in the Life Sciences Curriculum.

2.4.1 The environmental focus in Life Sciences

> After many disappointments and many programmes that have failed, African countries have, under the heading of environmental education, made an independent attempt to integrate to a greater extent their own social reality into the curriculum (Adewole, 1979 cited in Melber 1997:67).

As indicated earlier, the Basic Education curriculum consists of a range of subjects guided by a 'broad curriculum' and a range of syllabi. A number of cross-curricular themes (including environmental education) form part of the broad curriculum. Some of these subjects, particularly Life Sciences (Grades 8-10); Natural Science and Health Education (Grades 4-7), and Environmental Studies (Lower Primary Grades 1-3) have specific environmental education content (DANCED 2001:19).

In order to address the obligation reflected in the aims cited above (see section 2.5), the Ministry introduced a new subject called Life Science in the Junior Secondary Curriculum from Grades 8-10. Life Science was introduced as a main "carrier" subject for environmental issues (Tyldesly, 1997:51). According to Van Harmelen (2000:39) Life Science was also meant "… to spearhead the reform at Junior Secondary level".

Olivier (1994:4) notes that Life Science is "… based on a syllabus developed in Loudima College in Congo for South West Africa People's Organization (SWAPO) during the time of conflict". Life Science combines Biology, Agriculture and Ecology and was placed in the Natural Science area of learning in the Broad Curriculum (Ministry of Basic Education and Culture 1996a:Appendix A). Van Harmelen (2000:40) argues that the structure of Life Science was changed from its earlier structure when developed in Loudima. Life Science no longer includes Agriculture but consists of biology contextualized in horticulture and animal husbandry, environmental education, and human biology and health.

The Ministry of Basic Education and Culture identified specific aims for Life Science Grades 8-10 to clarify what is to be achieved by the learners studying the subject. Accordingly the Ministry of Basic Education and Culture reflected these aims in the syllabi of Life Science as follows:

> Learners will:
>
> - Develop an understanding of biological and ecological principles and interactions in the natural environment,
> - Be encouraged to use the environment in a sustainable way,
> - Apply basic scientific procedures in crop production,
> - Develop an understanding of the basic of the human body in order to attain a healthy life style, develop a responsible attitude with regard to family planning and sexuality,
> - Develop an attitude of curiosity and enquiry as well as a critical and problem solving approach to both everyday and scientific evidence,
> - Be encouraged to communicate and work together with other learners and members of their society in a democratic way, and
> - Be suitably prepared for vocational activities and academic studies beyond Junior Secondary level.
>
> (Ministry of Basic Education and Culture, 1995:3)

Life Science is defined in the syllabus (MBEC, 1995:1) as "… the study of dynamic interactions between organisms and their natural environment". It recommends a thematic approach which address the everyday problems and challenges of Namibian society. Olivier (1994) argues that Life Science was redesigned and contains a significant number of components, which focus directly on environmental issues (Olivier 1994:3).

The Life Science Grade 8 syllabus starts with Plant production as one of the themes. It deals with soil pH, pest, photosynthesis and crop farming. Learners can relate these topics to what they do in the school garden. In the Grade 9

syllabus, animal husbandry is one of the themes and learners are expected to maintain a small animal unit. Learners deal with nutrition, digestion and reproduction, and it is suggested that learners study these topics in relation to the animal they are caring for, for example a chicken. The practical activities in Grade 9 should be centred around the small animal unit at school. In Grade 10 the Life Sciences syllabus looks at human biology and how people use plants and animals for food. Grades 8-9 deals with the local environment and grade 10 deals with the global environment (see table 2.1 below). In interpreting the environmental focus in the Life Sciences, I consider 'environment' in its broadest sense, and include those aspects of human interaction that are dependent on natural resources (e.g. farming practices) and those social aspects which impact on the environment and people's ability to manage the environment effectively (e.g. HIV/AIDS). The Life Science grades 8-10 syllabus also includes topics which are focused on environmental *issues* specifically (such as pollution; soil erosion; deforestation etc).

Table 2.1: Topics and learning objectives in grades 8-10 syllabus dealing with an environmental focus.

GRADE 8	
TOPICS	**LEARNING OBJECTIVES**
1.0 People food and environment	• In this topic learners will recognize and discuss how people depend on and use their local natural environment for food production. • They should realize and discuss why the production of crop plants should be carried out in a sustainable way.
2.0 Plants, water and temperature	• Study the distribution of natural vegetation and crop plant in relation to the rainfall. • Realize that the water is one of the main limiting factors in Namibia • Examine the influence of extreme temperature on the plant growth
3.0 Plants and their biotic (living) environment	• Study how plant growth is affected by other plants and also by animals
5.0 Plant production in the school garden.	• How to establish a garden, they should sow and care for the growing plants, be able to keep a garden. Harvest and store for their own use
4.0 Plant reproduction	• Both sexual and asexual reproduction are dealt with in Grade 8

5.0 Ecosystem	• Food chains and food web • Food chain and decompositions • Cycling of all matters • Energy flow in food chain
6.0 Crop farming in Namibia	• Management systems • Limiting factors • Sustainable crop farming
GRADE 9	
1.0 People food and environment	• Give reasons why hunters and nomads became hunters today • Give examples of environmental problems that might occur when animal farming is not done in a sustainable way. • Explain how the population growth will result in an increased use of natural resources and possibly environmental problems.
2.0 Animals in the Namibian environment	• Study the effects of environmental factors on animals
2.1 Responses and adaptations to abiotic factors	• Relate some animal adaptations and responses to abiotic factors such as temperature and water
2.2 Responses and adaptation to biotic factors	• Relate some animal adaptations and responses to biotic factors such as other animals and food
2.3 Namibian environments	• Define biodiversity • Explain relationships between biodiversity and environmental conditions • Compare the biodiversity of different Namibian environments
3.0 Animal husbandry	• Develop practical skills and positive attitudes towards small scale animal production
3.1 How to plan, establish and maintain a small animal unit	• Motivate the choice of their animal unit • Give reasons for decisions made about the animal unit • Design a suitable format for recording information in a diary
3.2 Routines and management	• Determine daily whether animals are healthy or show symptoms of disease • Clean, feed and water the animals daily • Record their activities and findings in their diary • Catch and hold animals without hurting them
3.3 Health and diseases	• Explain how measures such as - provide fresh food and clan water - maintaining a clean living environment - isolating diseased animals - contribute towards disease prevention
4.0 Animals farming in Namibia	• Study the possibilities and limitations of different types of farming and management systems
4.1 Animals used for farming	• Name the most important animals used for farming and explain in which environments they thrive
4.2 Types of farming	• discuss the characteristic of - subsistence farming in communal area - intensive commercial farming - extensive commercial farming

4.3 Factors limiting animals farming	• Relate the potential for animal farming to the natural vegetation in Namibia by giving examples • Identify local examples of how drought limits animal production • Explain the causes and signs of anthrax and foot and mouth disease and indicate how these diseases limit animal farming in Northern Namibian environments
4.4 Sustainable management of vegetation	• Define stocking rate and carrying capacity and relate these concepts to sustainable animal farming • Discuss possibilities and limitations of the following management systems: - continuous grazing - rotational grazing - high density - short duration grazing - herding • with regard to the productivity of the natural vegetation • identify the possibilities and limitations involved in a management system combining grazers and browsers • …. The management systems of a local… with regard to environmental sustainability
4.5 The economic importance of animal farming	• Explain the economic importance of animal farming in Namibia • Discuss the economic and practical consequences of the Red Line.
5.0 Environmental problems related to animal farming	• Realize that unsustainable use of some natural resources leads to environmental problems.
5.1 Deforestation	• Define deforestation and explain its causes • Discuss relevant methods for reduction of deforestation and ways of increasing the production of wood
5.2 Soil erosion	• Define soil erosion and explain its causes • Suggest and discuss ways for reducing soil erosion
5.3 Bush encroachment	• Define bush encroachment and explain its causes • Discuss methods for prevention of bush encroachment and for removal of bush
5.4 Loss of biodiversity and decrease of productivity.	• Explain the combined effects of environmental problems on biodiversity and on productivity of the natural vegetation. • Explain the aims of nature conservation in Namibia and discuss how they are implemented.
GRADE 10	
1.0 Pollution of the local and global environment	• Realize that natural resources can be depleted and damaged by pollution. • Acknowledge that an understanding of pollution is important to safeguard the environment.
2.0 Littering and water pollution in Namibia	• Study Namibian example of littering and water pollution. • Study Namibian examples of pollution by toxic substances
3.0 Global warming	• Study how some gases create a greenhouse effect causing global warming.

	• Consider local and global ecological effects of global warming.
4.0 Depletion of the ozone layer	• Discuss the role and importance of the ozone layer to living organisms. • Recognize the CFC's deplete the ozone and identify human activities which release CFC's • Discuss how the use and release of CFC's can be reduced.
5.0 Nutrition	• Recognize the characteristics of the main categories of nutrients and discuss their functions in the body • Investigate the nutritional value of the most common food items to determine food items rich in carbohydrates, proteins and fats. • Understand how to divide the food in three different food groups ands plan a balanced diet for people of different age and sex, performing same or different activities. • Become aware of the relationship between nutrition and health
6.0 Infectious disease	• Study the common infectious diseases in Namibia and consider their social implications.
7.0 Prevention and caring of disease	• Recognize vaccination as a defense mechanism against infectious diseases. • Acknowledge the impact of the development of medicine on the curing of disease.
8.0 The primary Health care	• Learn about Primary Health Care Programme and realize its importance.
9.0 Family planning and conception	• Discuss the advantages of family planning
10.0 STD's including AIDS	• Describe the transmission, symptoms, effects and treatment of common sexuality transmitted disease (STD's) in Namibia. • Describe the ways of transmission of the HIV virus and the development of AIDS. • Discuss ways of preventing the transmission of STD's and HIV. • Realize that different attitudes towards HIV positive persons and AIDS patients exist. • Consider problems of HIV positive persons and AIDS patients.

Even though a broad range of environmental topics are included in the Life Science syllabus suggesting an integrated approach to curriculum development, Murray and Wilmot (2000:3) argue that the topics and themes presented in the Life Science syllabus are discreet and are not developed in an integrated fashion. Other research indicates that environmental education is not adequately implemented because it seems that the environmental education content in the various subjects is often too general to be locally relevant. A number of papers

and evaluation reports make reference to this problem including: Van Harmelen (2000); Murray and Wilmot (2000); Kristensen (1999), Squazzin and Van Graan (eds.) (1998) and DANCED (2001).

Murray and Wilmot (2000) argue further that although the syllabus elaborates what learners are expected to know, understand or be able to do in regard to each topic, the emphasis is primarily on the content rather on the competencies. That said, the content is comprehensive, detailed and broken down into a clear and logical sequence for grades 8, 9 and 10 (see table 2.1 above). The syllabi prescribe what will be taught each year. In this sense, the very structured nature of the syllabi is somewhat contradictory to the 'learner-centred' intentions of the Namibian reform process. A more 'learner-centred' curriculum would probably allow for more 'learner definition' of content, and may be one of the reasons leading to the superficial implementation of learner-centred education in Namibia.

2.4.2 Teaching strategies to foster environmental learning

According to the MEC (1993:119), learners should be taught to think critically and independently. Learners should be able to master strategies for identifying, analyzing and problem solving. It further states students must also learn to "… analyze, synthesize, imagine, explore, criticize, create understand and use" (see section 2.4.1 above). Enviroteach (1995:33) argues in support of the MEC and states that teachers should be able to create opportunities where learners investigate causes of environmental issues in order to develop critical thinking, problem solving and action taking skills. In this process learners should also be exposed to decision-making processes. O'Donoghue (2001:7) argues that learners should also be guided to seek information, undertake enquiries, engage in action taking and observe and report on environmental issues.

According to Stevenson (1987:75 cited in Fien, 1993:58)

> Teaching and learning are intended to be a cooperative process of inquiry and action on real environmental issues. Such an enquiry process demands that students actively engage in critical or complex thinking about real problems. The development of knowledge, skills and values is not only directed towards action, but emerges in the context of preparing for (i.e. the inquiry) and taking action… A function of knowledge in environmental education is immediate use for the social value of a sustainable and emancipated quality of life.

To address the complexity of environmental issues and risks (Beck, 1992), teaching strategies in environmental learning should enable learners to share experiences and actively participate in the classroom. There should be practical activities through which learners will gain first hand experience.

Fien, (1993) describes three approaches to environmental education:

- Education *about* the environment, which emphasizes that the learners should gain knowledge about the natural environment and how people should use the environment. Learners should be exposed to possible activities done by human beings and how to address these;
- Education *in or through* the environment, which emphasizes first hand experience of learning in the environment. This perspective implies that the learners should be taken out in the environment to experience the issues they talk about; and
- Education *for* environment, which promotes values education and action taking and sustainable living practices. Through education for the environment, learners are able to adopt lifestyles in which they use the environmental resources wisely.

A consideration of these approaches are useful to my research because I am particularly interested in the strategies used by teachers to foster environmental learning.

In environmental education, planning is very important. According to Enviroteach, (1995:33) planning is described as " … a continuous process which involves

decisions, or choices, about alternative ways of using available resources, with the aim of achieving particular goals at some time in the future". Enviroteach (1995:33) further argues that "… any trip, project, or investigation or indeed, any learning experience, stands a much better chance of succeeding if it is well planned". It should not only be the teachers that do the planning but learners should be involved in planning, because it is also a very important skill for every learner to learn. Through planning their own outings and investigations learners would also learn to be responsible for their own learning (*ibid*).

A further dimension of environmental education which is relevant to teaching strategies is the approaches used for assessment.

2.4.3 Learner-centred education and continuous assessment

Nott, (1998:7) argues that the approach of learner-centred teaching, with continuous assessment makes it possible for teachers to assess the learners abilities regularly and to correct their mistakes and improve upon their weaknesses. Within the learner-centred education system in Namibia, learners are assessed continuously throughout the year and different aspects of their activities are evaluated.

Lamberts (1997:257-258) also supported Nott's argument and claims that formative assessment is the process whereby information on pupils is gathered with the expressed purpose of evaluating strengths and weaknesses so that the future learning needs can be identified and organized efficiently. Lambert further argues that the knowledge and understanding of pupils is built up over time through the rational use of informal assessment which includes conversation and formal assessment which includes class tests (*ibid*).

As part of its education reform, the MEC (1993:124) noted that the Ministry is introducing new forms of criterion-based assessment at all levels. The assessment is intended to be used to:

- inform learners and their parents of progress and achievements;
- inform teachers of problems and guide ensuing compensatory teaching; and
- for promotion purposes.

Alberts (1999:130-131) in support of the MEC, writes that with independence in 1990, the Namibian education system was reformed, and with the reform the whole assessment and evaluation process was changed. He further argues that teaching and assessment should complement each other, and that teachers should apply strategies which allow for both formal and informal methods of assessment.

For example, in formal assessments, written and oral tests can be conducted in ordinary teaching situations. In more 'informal' assessment progress is observed through structured or unstructured observations while learners are investigating, interpreting data, applying knowledge, communicating, making judgements and demonstrating. Both formal and informal assessment acts are systematically recorded throughout the year for information purposes and are then used in summative assessment, evaluation, grading and promotion (*ibid*).

2.5 Conclusion

With the independence of Namibia, the Namibian Government has put in place policies that will help Namibians to implement educational reform. These include an emphasis on ways in which Namibians can begin to respond to environmental issues through education. Some of the policy implementation issues this research aim to investigates, relates to the reform processes in the education system, which are aimed at addressing the inequalities created by the previous system. With the reform of education a learner-centred approach was identified as a cornerstone of education transformation in Namibian schools. Life Science was introduced as a new subject to spearhead the reform. Environmental

education was also identified as a key priority in the reform process and has been integrated into certain 'carrier' subjects, particularly Life Science.

This research has been prompted by the fact that a number of studies that have been produced about learner-centred education, claim that there seems to be a problem in the Namibian school curriculum in the implementation of learner-centred education, and with the process of contextualising learning (DANCED, 2001). Environmental education also seems to be poorly implemented as a result of the strong focus on content in the syllabi and textbooks, which is often too general to be locally relevant.

Despite these problems there are certain schools whose performance is recognized as being above average. With this study I would like to investigate the strategies used by teachers teaching at these schools. In the next chapter I discuss the research methodology and methods used to investigate these teaching strategies.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter identifies and justifies the research methodology, and the instruments used to collect data. It explains how the study participants were selected. It also discusses how validity and ethical issues were dealt with and how I approached the data analysis.

This research is a qualitative, interpretive case study that is aimed at exploring strategies applied by teachers to foster environmental learning in four lessons that took place in two classrooms in two schools. The study also captures participants' personal perspectives and experiences of learner-centred education given that the study is situated in a context of educational transformation in Namibia (as outlined in Chapter 2). I have used thick descriptions of events and direct quotations from interviews, which permitted me to understand the phenomenon from the perspective of the respondents (Patton, 1990:40). The study focused on participants' experience and their views on learner centred education and the strategies they used to teach Life Science. I investigated teaching strategies by using only a selected sample of the teachers teaching Life Science in two schools in Swakopmund.

3.2 Selection of subjects

This research was conducted in the Erongo Education Region (where the town of Swakopmund is located). There are 32 schools offering Life Science in this region but for this study only two “successful” schools were selected for the case study. The criteria used to select the schools were that the school should have

an overall pass rate of 80% and the learners should achieve quality grade symbols A-E[1] in Life Science.

I selected teachers from two schools situated in Swakopmund town for the study in order to investigate their teaching strategies. My sample consisted of four teachers (T1, T2, T3, T4), three female and one male whom I interviewed and also observed (I observed one lesson taught by each teacher). Two Junior Secondary schools were selected and two teachers were drawn from each school.

The two teachers in each school teach the subject Life Science. The selection of the four interviewees was done by myself as the researcher. The main criteria used for the selection was accessibility. The teachers were also known to me because I have worked with these teachers for years as an Advisory Teacher for this subject.

These specific individuals were also selected for the potential they had to yield a diverse pool of valuable information as they are at different schools (see table 3.1 below). Two teachers at the same school teach the same grade, for example in school 1, teacher 1 (T1) and teacher 2 (T2) both teach grade 9, and the teachers also have different educational experiences.

Table 3.1: Summary of school and teacher profile

School	**Teacher**	**Grade teaching & lesson observed**
School 1 (Combined school, previously advantaged school, teaching grades 1-12)	Teacher 1 (T1) (HED) Teacher 2 (T2) (B.Ed)	Grade 9-10 (lesson on HIV/AIDS) Grade 9-10 (lesson on littering)
School 2 (Junior secondary School, previously advantaged school, teaching grades 8-12)	Teacher 3 (T3) (B.Sc) Teacher 4 (T4) (B.Ed)	Grades 9-10 (lesson on carrying capacity) Grades 9-10 (lesson on transmission of malaria)

[1] level of achievements in relation to the basic competencies in Namibian school syllabi is shown in letter grades ranging form A as the highest to G as the lowest.

3.3 Methodology and approach

In this section I will discuss the interpretive case study methodology applied in this study. I then (in section 3.4) discuss the methods used to collect data for the study, which include interviews, observation and document analysis. Lastly I describe how I approached the data analysis (see section 3.5), and how I considered validity (see section 3.6) in the context of this case study and how I dealt with ethical issues (see section 3.5).

3.3.1 Interpretive case study

Cantrell (1993:83) describes the purpose of an interpretive orientation to research. He notes that an interpretive orientation aims to "understand and interpret daily occurrences and social structures as well as the meanings people give to the phenomena".

Applying an interpretivist methodology in this study indicates that this research is based on contextual meaning making. I have selected to observe a small group of teachers in their classroom setting. I collected detailed information through in-depth interviews, observations and interpretations of documents (Janse van Rensburg, 2001:16-17).

Walker (1980:4) defines case study as an "…examination of an instance in action, it is a study of particular incidents and events". The case study approach was used because I intend to work on a particular case and I was able to collect information that is specific to the particular case (Stake 1995:4). Through this case study I wanted to gain an in-depth understanding using intensive descriptions and analysis (Merriam 1998:19). Neuman (1997:331) supports Meriam in this respect and argues that a researcher when gathering information goes in to greater depth to obtain more details on the cases being examined. Stake (1995:xi) argues that we study a case that is of special interest and we look for detailed interaction within the context in order to understand its activities.

Cohen and Manion (1994:150) note that "Case studies are a step to action, they begin in a world of action and contribute to it. Their insights may be directly interpreted and put to use…". Stake (1995:2) in similar discussion argues that, "… we do not use case study primarily to understand other cases but to understand that particular case under study". Yin (1989:13) also describes a case study as an empirical inquiry that "investigates a contemporary phenomenon within its real-life context".

Thus, in this research, I chose case study as an appropriate methodology because according to Yin (1994:3) "case study allows an investigation to retain the holistic and meaningful characteristic of real life events" In this case study I will investigate strategies used by teachers which are the 'real-life events' in the case.

3.4 Research methods

In this case study research process described above, I used the following techniques for data collection:

- Interviews,
- Document analysis, and
- Observation.

I will discuss these techniques briefly to show how they were used to collect data for this case study.

3.4.1 Interviews

I conducted four semi-structured interviews with the four teachers (T1, T2, T3 and T4). The interviews were conducted during April and July in the Erongo Education Region (see appendix A, figure 1 and 2).

An interview guide (see Appendix B) was drawn up and administered to guide me in finding a clear focus. The interviews were designed to assist me to investigate the perceptions, expectations as well as the achievements and struggles teachers experienced in using different teaching strategies in the Life Science curriculum.

Semi structured interviews were used to ensure free and rich conversations during which participants could openly explore their thoughts without the fear of being intimidated by closed questions. “Semi-structured interviews allow for both responding to pre-determined questions and free responses” (Lotz, 1996:96). Eliott 1991 cited in Lotz (1996:96) recommends that "a semi structured interview begins with the unstructured part, as many of the pre-set questions may be asked without them having to be explicitly raised by the interviewer". This helps to establish a climate in which the teachers will feel comfortable and will be able to respond more freely to the questions raised by myself as interviewer (*ibid*). I prepared the interview schedule to guide me in focusing the questions, but did not necessarily dictate how the discussion should go as most of the time questions could be followed up or explored in depth if things were not clear.

Both the interview and the observation schedules were piloted on one volunteer each. The idea of piloting the instruments was used to see if it was necessary to make some amendments to the instruments in order to capture the needed information. The pilot interviewee asked for some clarifications, as some of the questions were not clear. The questions were rephrased and with the help of the interviewee, questions were adjusted and became more clear and understandable (see Appendix C).

As I was physically present at the research site, I contacted the individuals targeted for interviews and observations personally, in order to secure permission for the use of a tape recorder and to arrange for other logistics. Different dates were set for different interviews based on the interviewees' preferences.

The appointments were made and the time was arranged to get together with the four teachers. One teacher was interviewed after school in his office at his school and the other three teachers were interviewed during school hours in their classrooms in their respective schools. In all cases all the conversations were tape-recorded and at the same time I took notes, noting the main ideas mentioned by the interviewees even though this was very difficult to do.

The tape recorder was useful in the transcription of the interviews, for direct quotations and unique expressions that needed to be captured. Using notes also helped me to put down my feelings, reactions to the experiences as well as what the interviewees expressed through body language, things the tape recorder could not capture.

When referring to the interview data, I have used the codes I1, I2, I3, I4 (see appendix D) for a full list of the interviews conducted). To ensure anonymity of the teachers (see section 3.7 below), I have coded my reference to the interviews and the teachers as follows:

- **I1** = Interview 1 with Teacher 1 (T1) at school 1
- **I2** = Interview 2 with Teacher 2 (T2) at school 1
- **I3** = Interview 3 with Teacher 3 (T3) at school 2
- **I4** = Interview 4 with Teacher 4 (T4) at school 2

A number of the interviewees were responding to my interviews in their second language. Thus, there are often grammatical errors in the way in which they express themselves. To ensure authenticity, I have quoted teachers words verbatim (which often includes these errors). To indicate that I am aware of these errors, I have used a strategy in the text in chapter 4, 5 and 6 to note that the teachers' words have been quoted as is. I use the words [quoted as is] in brackets to indicate where I have cited teachers work 'as is' with errors included.

3.4.2 Observations

I also used observation as one of the methods for collecting data. According to Cantrell, (1993:93) the purpose of observation is to give the researcher direct, first-hand experiences with the phenomena under study to “walk in the shoes” so to speak. The observations took place in teachers’ classrooms where teachers normally teach (Merriam 1998:94). Observations have also given me first-hand experience of the strategies teachers used. Through the interviews and observations I needed to gain the trust of the teachers. Fien (cited in Lotz, 1996:98) argues that there is a need to balance the degree of participation in fieldwork to obtain the trust of teachers with the constant monitoring of the effects of one's participation on these participants. Four teachers were observed for this data collection, two of these four teachers were observed in the school hall were they were playing games through role-play. I also had a chance to go to their classes to see what was in the classrooms. The other two teachers were observed in their classrooms while teaching the learners. For observation purposes I have used an open-ended lesson observation schedule (see appendix E). The observation schedule was piloted, but it seemed to be fine, so no changes were made.

When drawing on the observation data in reporting this research, I have used the codes O1, O2, O3 and O4, to indicate that I am referring to the four different observations. These are:

- **O1:** Observation 1 at School 1 (teacher 1): Observation of lesson on HIV/AIDS
- **O2**: Observation 2 at School 1 (teacher 2): Observation of lesson on littering
- **O3:** Observation 3 at School 2 (teacher 3): Observation of lesson on carrying capacity

- **O4**: Observation 4 at School 2 (teacher 4): Observation of lesson on the transmission of Malaria

3.4.3 Document analysis

A further data collection strategy involved the collection of materials and documents. This included the syllabi for Life Science Grades 8-10, teachers' preparation sheets and examples of learners' work. This provided documented evidence of what happened in the classroom and provided further insight into the strategies teachers were using. Yin, (1994:80) states that "… documentation is a stable source that can reviewed repeatedly". Document analysis is also very important because documents can provide information and understanding of what is happening in the classroom. (Hopkins, 1993:140). In this study documentation was used in conjunction with other sources of data. When referring to the document analysis process in the data analysis and reporting, I used the code (DA) in chapters 4, 5 and 6.

When drawing on the Teacher Lesson Plan data in reporting this research, I have used the codes TLP to indicate that I am referring to the teachers' lesson plan.

3.5 Data analysis

Once the data collection was completed, the interviews were transcribed. I then coded the information from the interviews, observations and documents which I collected from the four teachers using a system of colour coding to identify patterns in the data. Coding has been described by Merriam (1998:164) as "… nothing more than assigning some sort of short hand designation to various aspects of your data so that you can easily retrieve specific pieces of the data". Following this process of colour coding, I put the information into themes, which I later called categories. These were derived from the "recurring patterns that cut across my data" (Taylor and Bogdan, 1984:139 cited in Merriam, 1998:179). The

categories were used as a basis for identifying sub-categories, which then helped me to structure the discussions in Chapter 4 (see table 3.1 below). The categories and sub-categories all relate to the main research question that focuses on the different strategies used by teachers.

Table 3.2: Categories and sub categories used for the first layer of data analysis.

Category	**Sub category**
Teaching Strategy 1: Planning	• Working with the syllabus • Organizing and facilitating
Teaching Strategy 2: Working with information	• Explanations • Information used by learners
Teaching Strategy 3: Practical experience, excursions and clubs	• Involving learners in competitions and fairs • Excursions in the local environment • Clubs
Teaching Strategy 4: Involving the Learners	• Using background knowledge of learners • Learner participation • Giving clear instructions • Assignments and assessment • Using group work strategies
Teaching Strategy 5: Using visual aids and teaching materials	• Using a range of materials • Using old examination papers as teaching materials • Using textbooks
Teaching Strategy 6: Choosing topics with a local focus.	

A more in-depth analysis of the data, following this first 'layer' of analysis, lead to the identification of further themes. These themes were derived from further coding of the data, and consideration of the data in relation to the key objective of Namibian education reform: learner-centred education (as outlined in Chapter 2). These themes are discussed in Chapter 5, and include:

- Teachers' interpretation of learner-centred education,
- How strategies used by teachers reflect learner-centred education principles,
- Tensions emerging in fostering environmental learning in learner-centred ways, and
- Support for teachers.

Thus, as can be seen from the above, I applied a ‘multi-layered’ approach to the data analysis in this study. The purpose was to deepen the insights gained from the first layer of data analysis.

3.6 Validity in case study research

In order to ensure validity and trustworthiness I have used multiple sources of information. According to Maxwell (1992:282) "… all qualitative researchers agree that not all possible accounts of some individual, situation, phenomenon, activity, text, institution, or program are equally useful, credible or legitimate". In this study I have used four strategies to enhance the internal validity. They are as follows:

- **Triangulation** by using multiple sources of data collection like observation, interviews and document analysis (Lather 1986);

- **Member checking** by sharing interpretations of the study with the teachers to verify my reporting (Lather, 1986);

- I have also **clarified and reflected on my intentions** throughout, in order to address researcher's bias. (Meriam, 1998:204-206, Maxwell, 1996:93-94); and

- I have collected what is termed by Maxwell (1996:95) as "rich data" and have provided a **thick description**.

3.7 Ethics in interpretive research

In order to address ethical issues in the research, I wrote a letter to seek permission from the principals in the schools. I also found it important to inform the research participants and give them clear information about the purpose of

the research. I gave my draft proposal to the research participants to read through. At the same time I also informed the participants about the anonymity of the persons and gave the participants the assurance that no person will be exposed. Thereafter, when I started with my interviews, I again had to get permission to use the tape recorder. In this research I wanted to be on an 'equal footing' with the teachers and did not want the teachers to see me as Advisory Teacher that has come to test them on their knowledge of learner-centred education and the strategies they used in the classroom. It was therefore doubly important that I clarify the purpose and intent of the research with them prior to the interviews and observations.

3.8 Conclusion

In this chapter I have described the research design decisions I made, and I have described the various methods I used to collect the information needed to answer the research questions. Interviews, observations and document analysis were used. Data analysis was also done to be able to report on the recurrent issues.

This study employed an interpretive case study methodology which allowed me to choose a specific case at two schools. I have also considered the ethical issues, and I have also put certain measures in place to ensure that the research would be valid and trustworthy. In the next chapter I will report on my findings from the semi-structured interviews, observations and document analysis, as identified in the first layer of data analysis.

CHAPTER 4

STRATEGIES USED BY TEACHERS TO FOSTER ENVIRONMENTAL LEARNING IN LIFE SCIENCES

4.1 Introduction

In this chapter I will report on the findings gained from an analysis of the interviews, observations and documents that I collected from four teachers to investigate the teaching strategies used by teachers to foster environmental learning in Life Sciences.

The following categories are used as a framework for reporting the findings:

- Planning of teaching activities,
- Working with information,
- Using practical experience, excursions and clubs,
- Involving learners,
- Using visual aids and teaching materials, and
- Choosing topics within a local focus.

Each of these categories involves description of a strategy used by teachers. These strategies will be discussed in more depth below (see sections 4.3 – 4.8). The selection of the schools and the teaching processes are discussed first (see section 4.2 below) to provide background to interpreting the data.

4.2 The school context and lessons observed

4.2.1 The first school

T1 and T2 both teach at the same school. The school is a Combined School catering for Grades 1-12. This school is located in Swakopmund. It is regarded

as one of the previously advantaged schools but after independence previously disadvantaged learners were allowed to attend the school.

T1 teaches grade 8, 9,10,11 and 12. T1 has got a HED. She has an average of 40 learners in her classroom. English is used at this school as medium of instruction. T1 teaches both Life Science and Biology. T2 teaches some of the Grade 9 and10 classes. He has got a B.Ed degree and has an average of 40 learners in his class. T2 teaches Life Science and Commercial subjects.

I visited this school three times. The purpose of the first school visit was to arrange for the observations and interviews, and the second and the third school visit was to do the observations and interviews respectively. Two lessons were observed and the lesson observation schedule was used to guide these observations. Both lessons observed focused on instances of environmental learning in the Life Science curriculum. Environment is described by Miller (1992, cited in Enviroteach, 1995:27) as "… all external conditions and factors, living or non-living, that affect an organism or other specified system during its life time". The lessons that I observed do not represent a full environmental learning process; but are rather short 'instances' of environmental learning in the context of the Life Sciences subject. They represent the way in which many teachers deal with environmental learning; given the syllabus requirements and the time tabling realities of schooling in Namibia. As I was more interested in observing teacher strategies (rather than the substance or quality of the environmental learning processes) these lessons were chosen as a 'sample' of different lessons.

I now briefly describe each of the lessons that I observed, to contextualise the discussions in sections 4.3 – 4.8.

Teacher 1 at school 1, lesson on HIV/AIDS

Grade: 10

Number of learners: 40

Length of lesson: 40 min

Topic: STD's including HIV/AIDS

The lesson started at 10h15 on 18 June 2003. The teacher greeted the learners. For five minutes the teacher asked the learners about the ways in which HIV can be contracted and avoided. From answers given it appears evident that the learners are well equipped with knowledge of HIV/AIDS because the learners were eager and able to respond to the teachers questions. The teacher stressed that HIV is transmitted through body fluids. The teacher then introduced the game by saying "The aim of this practical is to convince you through a role- play of the risks and to get you not only to think about your behaviour but to change it!" The teacher also told the learners that "… your role is not what you would normally do – you are actors". Learners were also asked to indicate if they want to change from allocated roles or if they wish not to play the game. All the learners indicated they were happy with their allocated roles.

T1 divided the learners into groups. The teacher put the contact card on the OHP to explain the game on HIV/AIDS. Each person has one card and is expected to establish 'contact' with six other people. First you write down your role-card. After 'contact' you write down the partner's name, they sign, their role number and whether you used a condom. The teacher read out each one and made sure each card was understood. T1 indicated: "These are the choices – I think you will agree they sound realistic" (O1). The teacher implied that learners need to make their own choice because if they do not protect themselves this can "cost their life" (*ibid*). The learners then went on to play the game.

T1 was teaching about HIV/AIDS. HIV/AIDS is regarded as an environmental issue because it affects human beings socially and economically, and compromises their ability to interact effectively within the environment. For the

environmental focus to be fully developed, this lesson would need to be expanded further in other lessons. The teacher could talk about real issues facing Namibian society for example what will happen to the orphans that are left behind. Learners can also reason what effect HIV/AIDS might have on Namibian economy and what will happen if the productive population of Namibian society is wiped out by HIV/AIDS, and how this would impact on Namibian capacity to manage and interact with their environment in sustainable ways.

Teacher 2 at school 1, lesson on pollution (littering)

Grade: 10

Number of learners: 40

Length of lesson: 40 min

Topic: Pollution (Littering)

The class started at 11h30 on 18 September 2003. The teacher greeted the class and introduced me. The teacher recapped on the previous lesson by asking questions. The teacher also explained carefully what he expected the learners to do. Learners where divided into groups. The teacher let the learners leave the classroom for 10 minutes to collect litter. At this point it seemed as if the learners has brought the garbage already, because it did not take the learners long to come back with the garbage. The instructions read as follows:

> Collect the garbage.
> Sort the garbage according to the names.
> Note the letter of the alphabet that each piece of litter begins with, for example, paper, can, bag, and tick of as many letters of the alphabet as possible in this way.
> How many items can be given more than one name?
>
> (O2, classroom document).

The teacher then explained to the learners that this activity could be used as a vocabulary building exercise and as a way to clean up the environment.

After 10 minutes the learners came back with the garbage. After sorting the garbage and ticking of the alphabet the learners started to design anti-litter posters to put up around the school premises when the bell rang for the next lesson. Learners were asked to prepare an individual written report on the negative aspect of littering for assessment purposes.

This lesson is relevant to environmental learning because a polluted environment is a health risk. It has got negative effect both on people and the environment. To extend the lesson, the teacher could promote reuse through recycling or learners could visit recycling companies that buy used tins, glass paper and learn from them and the school could construct a garbage separation facility and sell the garbage to the recycling companies. Learners can use this opportunity to discuss where the garbage comes from and how it could be minimized. Learners could also be encouraged to write letters to the relevant authorities to complain about the product sold by the outlets contributing to the littering.

4.2.2 The second school

T3 and T4 are teaching at one school. This is a previously advantaged High School but has also been integrated to cater for the previously disadvantaged children. T3 is responsible for one Grade 9 Life Science class and also Grades 10-12 Life Science and Biology. She has a B.Sc degree.

T4 is teaching two Grade 9 and grade 10 classes, as well as other subjects. T4 has a B.Ed degree. This school is also using English as a medium of instruction. Two lessons were observed at school 2, using the observation schedule.

Teacher 3 at school 2, lesson on carrying capacity
Grade: 10
Number of learners: 40
Length of lesson: 40 min
Topic: Carrying capacity

The class started at 8h30 on 18 September 2003. The teacher asked the learners about a couple of concepts related to the lesson, and learners were given an opportunity to ask questions. The teacher explained to the learners what is expected from them. Learners were told that they should concentrate on what they need to do because they were going outdoors. Learners were divided into groups and different areas were allocated to different groups. Learners were then given graph paper on which they would plot the information collected.

Written instructions were given to the learners and it reads as follows:

- Each group is allocated 9m
- In your allocated area count the number of plants (for example grass) producers, the number of ants (or other herbivores) - primary consumers And the number of carnivores (for example birds) - secondary consumers
- Plot the collected information on a bar graph then turn the graph up-side down to get a pyramid.
- Use the same information to construct the food chain/food web

(O3, classroom document)

Learners then went outside to count:

- the number of plants (for example grass) - producers
- the number of ants (or other herbivores) - primary consumers
- the number of carnivores (for example birds) - secondary consumers

Learners then return to the class after collecting the information and started to construct the food chain/food web.

This lesson provided important ‘background concepts’ for environmental learning. The lesson could lead to a lesson on overgrazing and over browsing. If there are more animals than the ‘carrying capacity’ of the area could handle, it could result in land degradation. This is an important issue in Namibia, where the carrying capacity of the land is generally low, given the arid conditions.

Teacher 4, school 2, lesson on infectious disease

Grade: 10

Number of learners: 40

Length of lesson: 40 min

Topic: Infectious disease

Learners entered the school hall at 08h30 on 18 June 2003 where the learners meet when they do practical work and role-plays. The teacher greeted the learners. I was introduced as an Advisory Teacher from the regional office. Learners were asked to relax and to bring out the best they can. The teacher thoroughly explained what is expected from the learners. Learners collected the equipment and started to draw the outline of a human body to illustrating the blood vessels to show how malaria is transmitted by a mosquito and how it spreads in the blood stream. The teacher acted mostly as a mediator scaffolding and helping learners to play the game.

Malaria is a disease that affects many Namibians and therefore has environmental consequences. To take the environmental focus of the lesson forward, the learners could discuss the social implications of malaria and how to reduce the risk of malaria. As DDT is being used learners can also look in to the usage of DDT and the side effect thereof from an environmental point of view.

I turn now to a discussion of the different teaching strategies used by teachers in these lessons, drawing on the data from the observations, interviews and document analysis.

4.3 Teaching strategies

4.3.1 Teaching Strategy 1: Planning

Planning emerged as an important strategy used by teachers to foster environmental learning in the Life Sciences subject. This involved working

closely with the syllabus and interpreting its requirements; and structuring and organising the lessons. I discuss each of these dimensions of the planning process in more depth below.

4.3.2 Working with the syllabus

Findings suggest that teachers used the syllabus as a starting point for planning their lessons. The interview, observation and preparation books of teachers revealed the importance of the syllabus in guiding planning and preparation. All four participants did thorough preparation for their lessons (TLPs). When interviewed they all noted that planning and preparation was an important tool of teaching they all acknowledge that teaching must start with preparation. T2 [quoted as is] notes "One must be prepared always, your preparations is very vital and make a difference in making a professional presentation" (pers comm., I2). T2 further notes that "… failing to prepare equals to preparing to fail so it is important to set objectives and your objectives must be specific, measurable and they must be realistic and attainable" (pers comm, I2).

I have summarized the teachers planning frameworks in the form of table (see Table 4.1 below).

Table 4.1: Summary of teacher's planning.

	Themes/ Topics	**Learning objectives**	**Basic competencies**	**Method**	**Teaching resources**	**Homework /classwork**
T1	STD's including AIDS	*Learners will:* Describe ways of transmission of the HIV virus and the development of AIDS	State and discuss different ways of HIV transmission	Role play	Learners Starch solution, milk Iodine solution, cards	Read the textbooks
T2	Littering and water pollution in Namibia	*Learners will:* Study Namibian examples of littering	Describe and discuss the causes and negative effects of littering and	Practical activity	Poster Koki pen Garbage (litter)	Poster must be completed and put on most

			water pollution on the people and environment			polluted areas Writing up of individual report on negative aspect of littering for assess-ment on19/9
T3	Pyramid of numbers	*Learners will:* Count the number of producers, herbivores and carnivores	Learners to understand what is pyramid	Field work	Pen, coloured pencil, ruler and graph paper	Draw a graph on the graph paper and indicate on graph paper pyramid numbers
T4	Infectious diseases	*Learners will:* Study how malaria is transmitted by mosquito and how it spread in the blood stream (liver)	Describe how malaria is transmitted by mosquito and how it spread	Role play	Floor, chalk colour round paper and learners	Read textbook

From the above table it is obvious that teachers plan for their lessons by drawing on the syllabus. All planning was done from the syllabus (see table 2.1), except the lesson on the 'pyramid of numbers'. This was done as an introduction a lesson on overgrazing/over-browsing, which is a syllabus requirement (TLP).

Planning appeared to be an important dimension of doing practical work. For example, T3 mentioned [quoted as is] "… without planning and preparation it is difficult to do practical lesson outside with a group of forty learners so if you want to go out in to the school yard you should be very careful not to disturb the other classes, so you have to be very much organized" (pers comm., I3). T3 states "… you have to give the learners instructions in writing this also takes a lot of preparation before hand". She concluded by saying that a teacher must be well prepared for lessons out of the classroom (pers comm., I3)

Planning also appeared to be collaborative. In the schools I observed that the teachers share certain class groups for example T3 teaches two grade 9 classes and T4 teaches one grade 9 class. T3 notes that the teachers are doing cooperative planning. They [the teachers] are also drawing up the same tests, and it appears to be this reason that is influencing teachers to plan collaboratively (pers comm., I3).

Teachers also seemed to view planning as important to ensure that learning takes place. T4 believes that "… with a lot of preparation and input from the teachers, the learner will do what is required from them [learners]" (pers comm., I4). T4 [quoted as is] notes that " … the teacher should be there to guide learners and to say now you have to look at this paper, fill in that way, make sure that you understand this part of the work so that you can answer this question. Lot of preparation will definitely help the teachers" (pers comm., I4). T2 also believes that teachers should prepare the questions that will be asked of the learners and through that teachers are able to "… get the learners more involved in a lesson" (pers comm., I2).

4.3.3 Organizing and facilitating for learner interaction

Organizing and facilitating makes teaching in learner-centred education easier. The data gathered shows that teachers are aware of some of their roles in a learner-centred education approach. They commented that in any teaching and learning situation a teacher's role is to facilitate the activities of learners. When learners participated in the role-plays the teacher also organized the learners. For example T1 organized the venues where the STD game and was going to be role played (O1) and T4 organized the venues where the learners will role play to show how malaria is transmitted in the blood (O2). T3 measured the area where learners would do their activity (O3). All teachers organized the equipment that was to be used by both themselves and the learners before the time (pers comm., I1, I2, I3 and I4).

Planning and organizing for groupwork also seemed to be an important focus of teachers' work. T1, T2, T3 and T4 all divided learners into groups to participate in the role-plays or other activities (O1, O2, O3, O4). T3 divided the learners into groups and allocated a different area in the schoolyard to each group. The learners collected the equipment they would use for their practical. They were asked to count the producers (grass), herbivores (ants) and (birds) they observed. After collecting the information, learners came back to the classroom. Learners were asked to plot the information they collected on a bar graph (O3). The teacher then went outside with the learners to help them to find the right information and also facilitated the learning process in the classroom. T4 divided the learners into groups called 'blood vessels' and 'liver' to show how malaria is transported in the blood. She also facilitated the game by moving around and helping the learners (O4). T2 also divided the learners into groups. Learners were given an instruction to collect litter around the school and to note the note the letter of the alphabet that each piece of litter begins with. Learners were asked to design anti litter posters. The teacher moved around to assist the learners and to see whether the learners were busy with the given task (O2). T1 divided the learners into two equal groups to play the AIDS game. The teacher facilitated the activity by moving around to see whether learners were following the instructions. T1 also continuously encouraged the learners not to rush (O1). In learner-centred education as much as the preparation is important, teachers also need to organize and plan the activities (O1, O3, O4).

4.4 Teaching Strategy 2: Working with information

Working with information emerged as an important strategy in the lessons. This involved teachers providing explanations and learners working with information resources.

4.4.1 Explanations

In all the lessons that I observed, it seemed that teachers see information giving as a very important part of teaching. All teachers observed started their lessons (whether in the class or out in the hall) with explanations of the objective and the content of the lesson, and what is needed from the learners, what the teachers expect from the learners. Learners were also given information on the topic for example T1 explained what learners will gain through playing the AIDS game, she also discussed the meaning of their roles with the learners (O1 & DA). T2 explained the aim and the content of the lesson by revising the previous lesson. The teacher explained what the learners would gain from doing the lesson. Learners were also given an opportunity to ask questions if the explanations were unclear (O2 & DA). T3 revised the concept by explaining what carrying capacity meant and why it is an important environmental issue. The teacher also asked learners to explain concepts and to clarify so that everybody understands (O3 & DA). T4 also explained to the learners what was expected of them. She asked the learners to draw the outline of the body on the floor with chalk and the learners should indicate the blood flow (O4 & DA).

From the above, it is clear that these explanations involved a) explaining the objectives and processes associated with the lessons and b) providing information on the topic being studied.

4.4.2 Information used by learners

One of the sources of information provided to learners, is through interactions with other resource people (on excursions, or by inviting visitors to talk to learners). For example, T1 notes that “… learners can find out things for instance at the aquarium, often we will find some things we do not know what it is and we will send it or visit them and asked them to tell us what organism it is so we do have contact with other people” (pers comm., I1). T1 notes further "… we very often asked them [nurses] to help us and to the doctors to help us with questions

learners have about HIV/AIDS and different type of diseases" (*ibid*).

Textbooks were also used as source of information. T2 and T4 referred the learners to read their textbook as reference material (TLP, O2, O4). Television is also used as a source of information. For example T1 notes "I have a lot of videos that I show the learners and if there is something on T.V. that brings up the topics I tape it and try to show the learners" (pers comm., I1). Learners were also provided with worksheets to assist them with following the instructions (O2, O3).

4.5 Teaching Strategy 3: Practical experience, excursions and clubs

All teachers indicated that they use practical experience, excursions and clubs as strategies to foster environmental learning in Life Sciences.

4.5.1 Involving learners in competitions and fairs

Participation and competitions appear to be a popular teaching strategy amongst Life Science teachers. All teachers involved in this study, encourage their learners to participate in the World Wetland competition each year, and they also enable learners to participate in the Science Fair at both regional and national levels where projects are displayed. For the Science Fair teachers also encourage their learners to choose subjects from their own environment as a focus for their project work. T4 stated "… they (learners) have to choose a local issue, they cannot choose anything that is far, they should concentrate on some aspects in their own environment" (pers comm., I4).

4.5.2 Excursions in the local environment

The data revealed that the teachers take the learners to different places in the local environment for different purposes. Learners are, for example, taken out to the Fisheries and to the Rossing Uranium mine 75 km away from Swakopmund

on the main road to Windhoek. According to T2, T3, and T4 people from the community are also invited to give information to the learners. T2 says "It is always interesting to see how learners interact with the other people and members of the community are always helpful if we need information or help from them" (pers comm., I2).

T4 explains how the local environment can be used to teach different topics in Life Science. She says

> We are also lucky because we have got the sewerage works in Swakopmund very close to our schools. We go there and explain to the learners how human waste are disposed of and made safe. Before you go you have to phone the municipality and obtain permission but they are quite good about this. The municipality will provide some body that will go with you. There learners will also see that this smells awful and that it looks awful but that is their waste they are producing and that it is expensive to treat it. Learners should also know how to actually treat sewerage so that everybody can have much safer environment (pers comm., I4).

The purposes of these excursions seem to be to a) provide learners with additional information and b) to provide practical / real life insights into the Life Sciences syllabus topics. For example, T2 stated that "… teachers should take out the learners from the classroom setting to the environment and show them practically as much as possible how the things they have studied are applied in nature" (pers comm., I2).

4.5.3 Clubs

One of the schools involved in the study, extended environmental learning in Life Sciences through clubs. T4 stated that their school has got an AIDS awareness club and has also got a very active ‘Save the Lion’ club. The Lion Club was started by one teacher who has links with the ‘Save the Lion’ center, and anyone can join the club. Twice a year they go up to the Kavita Lion Lodge and they clean up the area, they build fences and they look at what people do to keep the

lions.

From the above, it seems clear that the participation in fairs and competitions; undertaking excursions in the local environment and club activities are all used to strengthen environmental learning in Life Sciences. These strategies appear to foster a more practical, localized focus in Life Sciences, and through this, teachers appear to want to interest and involve the learners. Involving the learners in learning processes, however, seems to involve more than just taking them out into the environment (see 4.6 below).

4.6 Teaching Strategy 4: Involving the learners

As indicated above, involving the learners involves more than just taking them out into the environment, or encouraging them to participate in clubs or other activities. It involves drawing on their background / prior knowledge; actively fostering their participation; using groupwork strategies; giving instructions and undertaking assessment activities with the learners. I discuss each of these in more detail below.

4.6.1 Using the background knowledge of the learners

Teachers regard background knowledge of learners as a very important part of teaching learners. In our discussion it transpired that all the teachers involved in the study try to draw on the background knowledge of the learners before they start with a lesson. T3 mentioned that in teaching Life Science likes to use examples which the learners know already. T3 stated [quoted as is] that she "… will take animals that they know and activities what they do that is familiar to them". She also stated that "… the teacher is also led by the class, because different learners may react differently to certain topics" (pers comm., I3). In the lesson that I observed, T3 asked the learners what kind of examples they could give about a food chain. After getting an example from one of the learners, she then talked about that example and showed them what would happen if that

particular animal drank too much water or eat too much grass. She also noted that when she teaches about pollution she uses the example of fire and the smoke because all the learners are familiar with fire and smoke (air pollution) that comes up (*ibid*). It seems that teachers use real examples because the real life examples are realistic and learners already have some understanding of these, which aids further understanding (*ibid*).

In a similar vein, T4 [quoted as is] notes that "… learners should relate what they have done in the classroom with more to everything that happens around us all the time and then the learners get a wider background and then they can apply their knowledge. I think that is what learning is all about". This quote reflects a belief that learning is more meaningful if it is 'connected' to contextual knowledge (or what the learners know about the world around them).

4.6.2 Learner participation

All four of the teachers involved in the study see participation of learners as very important in learner-centred education. T2 involved the learners by making a mind map on the blackboard where all the thoughts of the learners are noted (O2). This was used as a starting point, and questions were asked of learners on the topic. T2 also involves the learners in discussions in order to get the views of the learners. Learners were involved through drawing up questions and the teacher also asked questions (O2). T 2 notes further that learner participation is encouraged through essay competitions where specific topics are chosen and learners can win prizes.

All four teachers mentioned in the interview discussion, that their approach is that learners must be active, for example, T4 [quoted as is] notes that "… the learners must all be active with what they are being taught. Teachers should give learners activities to do" (pers comm., I4). T4 goes on to explain some of the strategies that she uses to ensure that learners are actively involved. One such activity involves drawing, in which learners have to "… look and draw, and look and

draw” (*ibid*). T4 notes [quoted as is] that this teaches them to observe and concentrate on what they see “ … because their brains and hands are active and they are able to learn that is helping them to become more systematic and clear in their own thinking and you have to teach that from Grade 8 onwards” (pers comm., I4). T4 also notes [quoted as is] "the skill training is a very important tool which learners can make use of in any situation” (*ibid*).

In my experience, many teachers see writing notes on the board so that learners must copy it in their notebooks as participation. In this research, T3 and T4 both strongly spoke out against writing of notes on the board so that learners just copy the notes. T4, stated that [quoted as is]"… it is unacceptable to let learners copy notes form the blackboard, instead you teach learners to write notes. In the beginning you can dictate and leave out words and you say okay now what word must come here how should you express it, the teacher and the learners are making the notes together" (pers comm., I4). T4 further argues that the learners have to think, and they should “… not just copy what the teacher is saying or what is written on the blackboard" (*ibid*). According to T4 [quoted as is], teachers should “… make the note taking a bit complicated in Grade 9 and more complicated in grade 10 then by the time they are in Grade 11 they can actually take wonderful notes no problem what so ever” (*ibid*). T4 is emphatic about the need to teach note taking, and that teachers need to check the notebooks of the learners to see whether the notes are systematic, that they have underlined the headings and that they have correctly considered what belongs to what (pers comm., I4)

Skills development also seems to be an important dimension of learner participation. T4 commented that skills development is an essential part of her lessons and that she uses little things like measuring the temperature using the thermometer to develop learners’ skills. She describes this in more detail, noting that they (learners) also draw lines so that they can measure and see what the difference is between centimeters and millimeters, measuring hand spans and writing the measurements down, compiling a statistical table, and graphically

representing the data. T4 further notes [quoted as is] that

> … you can let them observe a picture or over head projector or two different animals or whatever plants and then tell the difference and similarities and put in the table and that is extremely helpful. If you taught a subject with lot of information, teach them at the end to make a table and categorize the information in a table so that they can learn easily from the table (pers comm., I4).

T4 further notes [quoted as is]:

> … learners should be active in their own learning that is number one. If you as a teacher have to first of all think about what to you mean by activities, then you must see that each learner is actually benefiting from those activities and check on him or her how is he progressing and how is he doing and what is he doing, does he understand what he has to do. So the teacher has to be around and busy all the time. One of the things in teaching Life Science is also that you must try and teach the learners like a little bit more realistic and scientific approach to life and not just trying to get magical thinking. Life Science should also teach unprejudiced and objective thinking, you should adopt more realistic approach (*ibid*)

Learner participation, is however, not only about activities and skills development through activity. Learners also participated by listening attentively and answering questions asked by the teacher. For example, T1 notes that [quoted as is] "…as a teacher I believe in giving learners my experiences of my own life and also those of my children and bring it back to them and I think they relate more to it and I think that is a very, very important thing" (pers comm., I1).

From the data above, it would seem that learner participation in environmental learning processes in Life Sciences may involve (amongst other processes): drawing on the thoughts of the learners through discussions; active involvement of learners in activities which require them to both do and think at the same time (e.g. the drawing activity); skills development; and listening to teachers and answering questions.

4.6.3 Giving clear instructions

In the lesson observations (O1, O2, O3, O4) the importance of clear instructions for fostering learner participation became clear. All teachers involved in the study gave learners verbal and written instructions. As reported above, giving instructions seemed to be an important part of the lessons, and it appeared that this process was important for establishing a relationship with the learners. All teachers gave verbal instructions, and also read the written instructions out to make sure that the instructions were well understood. The learners were also given their own written instructions to follow when they started playing the game or working in groups to collect litter. Written instructions seemed particularly useful for activities that required learners to work outdoors, or to go somewhere else to complete the activities (O2, O3).

4.6.4 Assignments and assessment

According to the book '*A Guide to Life Science Teaching'* (Nott 1995:7) continuous assessment throughout the year should be done using different activities by the learners. In our interviews it surfaced that teachers see assignments and assessment as a very important part of teaching. They commented that teachers need to set the examination papers so learners have to be directed towards the writing of examinations (pers comm., I1, I2, I3). According to T1 and T4, teachers are under pressure to complete the syllabi because of the examination system (pers comm., I1, I4). T1 [quoted as is] notes that "… the Grade 10 examination is set externally and we must complete the syllabus. I have always problem of completing because the syllabus is overloaded" (pers comm., I1). It was clear from this that teachers really are in a rush to complete the syllabi. T1 feels strongly that learners need background knowledge to understand issues in order to use it when they write examinations, and that is also one of the things that makes it difficult to complete the syllabus. T2 also notes that he believes that when teachers do revision the teachers should make use of quizzes and competitions, he notes "… learners like to take

part in quizzes and competitions and it works very well for examination preparation". Through writing of assignments and examinations learners are involved in the application of skills, knowledge and understanding. Learners are also able to evaluate themselves.

4.6.5 Using group work strategies

A further dimension of involving learners, is the use of group work strategies. As indicated earlier, teachers in this study all used group work in their teaching (O1, O2, O3, O4). All four teachers observed divided the learners in to the groups to either play a game or to do an activity. Learners in their respective groups were then able to work together or were able to discuss issues and help each other to do what was expected of them. An important dimension of involving learners therefore seems to be the process of creating opportunities for learners to work together, and learn from each other.

Learners where interacting when they were put into groups (drawing a poster and constructing a food chain and sorting the garbage according to the alphabet). The teacher also used this method for learners to develop skills of finding information, (searching for insects, littering) and learners also had an opportunity to help each other to find information (asking questions of each other).

From the above it would seem that involving the learners is a multi-dimensional process. Teachers in this study involved the learners by drawing on, and using learners' prior experience. They felt that it was important to make connections to 'real life' experiences of learners. They also involved learners by focusing carefully on different kinds of activities that developed learner's skills. Giving clear instructions seemed an important facet of enabling learner involvement, and group work strategies appeared to be important for enabling learners to learn from each other. Assessment would appear to have the potential for involving learners, but given the fact that the Namibian education system is still very examination driven, this appeared to be something of a barrier to learner

involvement, as teachers were compelled to ‘rush’ the syllabus to ensure that everything was covered for the exams.

4.7 Teaching Strategy 5: Using visual aids and materials

In this study, all the teachers used visual aids and teaching materials in their teaching. During the interview T2 noted [quoted as is] “In order for learners to learn Life Science I believe in making use of visual aids as far as possible because I believe that the people will rather retain what they have seen then what they have only heard” (pers comm., I2).

4.7.1 Using a range of materials:

T1 notes, [quoted as is] that:

> … we, the teachers make work definitely very interesting to the learners, I talk about things that happen outside in the world around us, have you seen this on TV, and when I see a program on TV that I think that links up to the work that I will do in the class I will tape it and bring it to the school will show the learners. Learners rely on just normal textbooks but fortunately we have a lot of videos that I show the learners (pers comm., I1)

In the lessons that I observed a range of different materials were used to support learning. Learners were asked in the lesson to design the anti-littering poster. To do this they were given blank posters and permanent marker pens. T1 and T4 used role-play. In the role-play on the transmission of malaria learners were acting as the arteries, veins and the liver. Chalk was used to draw the outline of the body with blood circulation and liver on the concrete floor. Coloured round papers were used to indicate liver and other parts. Learners had to walk through the body to indicate how mosquitoes transmit the malaria and how it spread in the bloodstream (liver) (O4). T3 used the natural environment to collect insects and count bird as the ‘materials’ in her lesson (O3). T3 asked the learners to count the number of producers, herbivores and carnivores. Learners then had to

construct a food chain to show how animals depend on each other. Learners were also required to draw a graph on the graph paper indicating how many insect and bird they could count in a specific area and to draw pyramid on a separate graph paper (O3). Learners used colour pencils to draw the graph. Teachers also used textbooks (see 4.7.3 below). This gives some indication of the diversity of materials used for the environmental focus in the Life Sciences subject.

4.7.2 Using old examination papers as teaching materials

From interview comments, it would seem that there is a common practice amongst teachers to use old examination papers as teaching materials. These are used to get learners to 'practice' the examination in advance. T4, however, cautioned against giving learners old examination papers to work out. She notes [quoted as is]:

> I personally are very much against that because you cannot study an examination paper, but you can study your work that you have done in the class by rather relating that more with everything that happens around us all the time. Learners get wider background they can apply their knowledge because that is what learning is all about these days that for example I must not know how heart function but how does it work in the rest of my body so it is not only the heart by itself (pers comm., I4).

Further discussions with teachers indicated that a problem associated with using old examination papers as learning support materials may lead learners to think that they can work out an examination paper and they are going to do well, but at the end of the year people do not use old examination papers. The examiners set new questions and the learners do not know how to handle the new questions. Teachers indicated that old examination papers should be used to show the learners how a question is answered and not as a method of learning for examinations, or as a basis for guiding teaching and learning activities.

4.7.3 Using textbooks

Textbooks are widely used in Namibia as learning support materials. In the lessons on HIV/AIDS and infectious diseases T2 and T4 used textbooks to give the learners the needed background information (TLP, O2, O4). In the lessons I observed T2 and T4 asked the learners to read the textbooks as homework (O2, O4). Learners also mainly used the textbook to study for the examination.

From the above, it seems that the use of materials and visual aids is an important teaching strategy used by teachers to support learning. Some materials (such as the textbooks) are used to provide background information; other materials (such as the graph paper and coloured pencils) are used to assist learners to complete activities; and other materials (such as the old exam papers) are used inappropriately and can be a barrier to learning.

4.8 Teaching Strategy 6: Choosing topics with a local focus

Three of the four teachers confirmed that environmental learning is an integral part of Life Science and that choosing local topics in teaching the subject helps learners to understand and remember better. T4 reported that she talks a lot about environmental topics because learners need to understand the earth they live on. She notes that [quoted as is]:

> … if we do not tell the learners this things, learners will basically not know it, so many time we just accept that the learners will for instance understand when you tell them about pollution. Learners think that there will be some people behind them to clean up. There will be somebody else to do it instead of them (learners) taking responsibility for things that I do. … We (teacher and learners) should appreciate the environment and the world we live in and our resources and everything we take for granted so easily (pers comm., I4).

T4 also argues that [quoted as is]:

> … you cannot separate environment from Life Science because, Life Science is about the environment, it might be about living organism in the environment but they are also dependent on environment so you definitely need to teach about the environment all the time, it is also basis for the entire approach to Life Science, you must established linkage between the student and his intermediate or immediate environment (*ibid*)

T2 mentioned that when teaching about pollution for instance she will take the learners to certain areas in town, which are very dirty and polluted or she will take the learners to the beach to pick up rubbish and clear up certain area of bottles and papers. She reported that learners are amazed to see how much rubbish comes from the sea as well as from dustbins that are full. She notes that through this, learners become aware of the real problem instead of reading about the problems in books only (pers comm., I2). T1 said that they (she and the learners) talk a lot about HIV/AIDS and she tries to show them pictures, and tries to tell them about problems that are not always visible. She says they discuss the nice pictures and the normal things, but she also gives them the 'real hard shocking information', and she shows them different things like male condoms and femidom, and how these are used (pers comm., I1). She notes that the game she uses, where learners can see how easy AIDS can be transmitted is a very effective game. She notes that learners tend to think that AIDS is an 'overblown' story and that people emphasize it too much but through the game it is easy for the learners to see that it is easy to get infected, and through this they can better remember how to avoid getting infected (*ibid*). This discussion shows both T1 and T2's concern for 'real issues' that affect the lives of the learners.

T4 also uses topics with a local focus and notes that [quoted as is]

> … by taking the learners to sewerage works you can teach them health aspects, cleanliness, hygiene, the use of water all of that can be brought in to this lesson that will be about pollution. How we pollute the environment and hygienic part. Learners can also be taught in this lesson about the pollution of water if we allow the sewerage to run into the see

and just into our environment (pers comm., I4).

During the interview, T4 briefly reflected on the topics that are linked to the environment. She commented that [quoted as is]

> … many topics in the syllabus are directly linked to the environment for instance Pollution and its consequences, nutrition and health concern and the immediate environment of the learners so in doing through Life Science learners understand about themselves which is their own personal environment. They will understand their immediate environment which is maybe their house and garden, and then their town in which they live and of course later on they will be able to link it to the Namibian environment which is the national environment and later maybe to a global environment. Teachers must get students to understand that he is part of the environment and he [sic] cannot separate himself [sic] from his immediate environment but later he [sic] has to see in the Namibian context and also later if he [sic] can understand it that he [sic] would also responsible for global environment (pers comm., T4)

In a similar vein, T2 notes that:

> Life Science is very interesting and very life-like. One can always include or refer to the reality as proof example, this is not like numbers and figures. It call for creative teaching and incorporating of your previous experience these all contributes to the success that we achieved in the subject (pers comm., T2).

From the above, it seems that teachers closely relate the environmental focus within Life Science with real life issues that affect learner's lives. They also emphasise the 'reality congruence' of the subject. Thus, drawing on topics with a local focus that brings this 'reality' into the subject appears to be an important strategy for enabling environmental learning in Life Sciences.

4.9 Conclusion

In this chapter I described the two schools, the four teachers and the four lessons that I observed. All four teachers used activity based teaching as a way of fostering the environmental learning focus within Life Science. T1 used practical

activity where by learners played an HIV/AIDS game; T2 used group work where learners collected litter and designed anti-litter posters. T3 use group work were learners collected information in the natural environment and used it for the lesson. T4 used a practical activity where learners demonstrated how a mosquito transmits malaria and how it spreads in the blood until it reaches the liver.

Through observing these lessons, and by interviewing teachers to find out about their teaching strategies, I was able to identify six different strategies used by teachers to foster environmental learning. These include:

- *Teaching strategy 1: Planning*

  Teachers used the syllabus to plan their lessons. Teachers also plan their practical activities before doing the activities in the classroom. Teachers also organize and facilitate the activities of learners.

- *Teaching strategy 2: Working with information*

  Teachers in their lessons take time to explain the requirements to the learners. Learners were also given opportunities to ask questions if the explanations were not clear. Verbal and written information either on the worksheet or on the blackboard was given to the learners.

- *Teaching strategy 3: Practical experience, excursions and clubs*

  Learners are encouraged to participate in competitions and science fairs. Learners are also taken out on excursions where they observe and are exposed to different things in their surroundings. Teachers also make use of members community to teach the learners. The learners have also established different clubs (AIDS awareness club) through which they try and address environmental issues.

- *Teaching strategy 4: Involving Learners*

  Teachers involved the learners through drawing on their background knowledge and teachers regard the participation of learners as very important. Teachers also give clear instructions to the learners. Assessment and assignments are used as teaching strategies. Learners are divided into groups to work together and learn from each other.

- *Teaching strategy 5: Using visual aids and materials*

  Teachers used visual aids (TV, Auto video, OHP) in their lesson so that learners can ‘see and hear in order too remember better’ (I4). Teachers cautioned against the use of old examination papers as a strategy for teaching. Learners are also asked to consult the textbook when they do their homework.

- *Teaching strategy 6: Choosing topics with local focus*

  Teachers used local examples in their teaching. In order to do this learners are taken out of the classroom to the environment, teachers believe that that the use of ‘real things’ and visual objects will help the learners remember better.

In the next chapter I will discuss the use of these strategies further, within the broader policy framework of learner-centred education in Namibia (as outlined in Chapter 2).

CHAPTER 5

TEACHING STRATEGIES AND LEARNER-CENTRED EDUCATION

5.1 Introduction

In Chapter 4 I discussed a range of different teaching strategies used by the four teachers involved in this case study, for the teaching of environmental learning in Life Sciences. In Chapter 2, I described the way in which the Namibian education reform is focused on learner-centred education as a key strategy for enabling transformation in schools. I also indicated how environmental education processes require active learning strategies, which are congruent with learner-centred education. I also reviewed research, which indicates that learner-centred education is not being well implemented in the Namibian education system.

In this chapter I discuss the findings reported in Chapter 4 in more depth. I consider the strategies used by teachers in the light of the above-mentioned policy requirement for learner-centred education in Namibia. Through this, I hope to provide further perspective on the implementation of learner-centred education in Namibia, and also to provide further insight into the teaching of the environmental focus in Life Sciences.

Through a 'second layer' of data analysis (see section 3.5), I have identified the following themes for discussion:

- Teachers' interpretation of learner centred education;
- How strategies used by teachers reflect learner-centred education principles;
- Tensions emerging in fostering environmental learning in learner-centred ways; and
- Providing support for teachers.

5.2 Teachers' interpretations of learner-centred education

As indicated in Chapter 2, learner-centred education was introduced by the Government of Namibia to be used as an approach to transform education in all schools (MEC, 1996, MEC, 1993 Nott, 1998). In this study there was clear evidence that teachers are trying to implement the learner-centred education policy. This is shown primarily by the way in which teachers are using **different methods that aim to involve children in the learning process in different ways** (section 4.2). It is also shown by the fact that teachers are choosing topics with a local focus (section 4.8), which shows that they are concerned about relevance of the learning to the learners' experience and life world. The kinds of visual aids and materials (section 4.7) also show that teachers are trying to be more flexible and responsive. Drawing on learners' background knowledge (section 4.6.1) also shows evidence of teacher engagement with learner-centred education approaches.

In the interviews T2, T3 and T4 acknowledged the difficulties they experience in using learner-centred education (large groups of learners, examinations, timetabling and many more). In spite of these difficulties, T2, T3, and T4 all said that learner-centred education works and that they are using "*the method*" (emphasis mine) in their teaching (pers comm., I2, I3, I4). This emphasis on 'method' confirms the finding in Chapter 4 that learner-centred education appears to be interpreted by teachers primarily as new / different 'methods' of teaching.

T1, however, said that learner-centred education does not work but yet in her activity on HIV/AIDS she used a role-play. Similar findings were found by Van Graan 1998:54, (see section 2.2.1) where she indicated that there is evidence in Namibian classrooms that shows elements or features of learner-centred approaches. Such features were identified by Van Graan (*ibid*) as: teachers determining the background knowledge of the learners before starting with the lesson, checking whether learners are progressing in studies, teachers and learners participating in demonstrations and other activities. Her research (*ibid*)

noted that while all these strategies support learner-centred approaches, teachers do not necessarily perceive these techniques to be learner-centred.

From the evidence presented in this study, it would therefore seem that teacher interpretations of learner centred education are primarily focused on **changes in teaching methods** (T2, T3, T4); or that the exact meaning of learner-centred education is not clear (T1).

Teachers appear to be interpreting learner-centred education as a 'change in methods' only, and it seems that they are not clear on the underpinning epistemological changes (social constructivism) that have been introduced by learner centred education in Namibia (see chapter 2). The interesting finding in this research appears to be the evidence that teachers are applying different strategies that better enable them to use these 'learner-centred' methods (e.g. local relevance; different learning support materials; group work strategies; and practical experiences and activities) while there is little evidence that they have a good understanding of the central assumptions of learner-centred education, which are social constructivist (see section 2.3). While there is some evidence, however, that teachers are using strategies that reflect aspects of this orientation (e.g. drawing on learners background knowledge and paying attention to local relevance), one could argue that these are not in-depth enough. In a learner centred approach, learning should start with the learners experience and prior knowledge; and should be centred on local context and exploring new knowledge from within this context (Janse van Rensburg & Lotz-Sisitka, 2000; Van Harmelen, 1998). In looking at what the teachers in this study did, they all planned their lessons starting with the syllabus (not the learners' experience or life world) and then tried to make the learning more relevant by using local experience and different interactive methods.

This appears to be a problem not only of teacher understanding, but of the way in which the system is structured (e.g. It still expects teachers to follow a structured syllabus and to use pre-determined textbooks and write examinations). All of

these structural influences prohibit teachers from implementing a truly 'learner-centred' approach to education, and they are then left with the option of implementing the learner-centred policy framework at the level of method only.

To me, this points to the difficulties of transforming education systems which are still linked in many ways to 'old' positivist views of knowledge and behaviourist approaches to teaching (even though there are new policies). It is difficult to shake off the past and it seems that is does not really help to simply introduce new 'rhetoric' into policy. It would therefore seem that a deeper understanding of learner-centred education is needed in the Namibian education context. This understanding would need to address 'old' problems such as the influence of the examination and prescribed syllabi on structuring the learning opportunities of learners.

5.3 How strategies used by teachers reflect learner-centred education principles

From evidence presented in the four lessons that I observed, and through interview interactions with teachers, and as outlined briefly above, teaching strategies reflected some of the principles of learner-centred education, as outlined by Namibian education policy (see section 2.2.2). In the table 5.1 below I reflect on how teachers have been applying these learner-centred principles in their teaching practice, by drawing on the data generated in the four lesson observations; documents and interviews with teachers (see table 5.1 below).

Table 5.1: Ways in which teacher practice reflects learner-centred education principles.

Learner centred principles	Teaching practice
• The starting point at each stage of a learning process is the learners' existing knowledge, skills, interests and understanding derived from previous experience in and out of school.	**T1, School 1**: Lesson 1. T1 Question and answer method were used to ascertain how much learners know about the topic before starting to teach about the topic. Learners were able to respond to the questions so they have got substantial knowledge on the topic. This also makes it easy for learners to play the game. **T2, School 1:** Lesson 2. T2 also made use of questions to recap on a previous lesson which formed part of the activity that the learners were going to do. Learners answer the couple of questions asked by the teacher. **T3, School 2:** Lesson 3. T3 asked the learners about concepts related to the lesson. Learners were able to answer the concepts that the teacher asked them. **T4, School 2:** Lesson 4. Since this was a continuation of a previous lesson that was revisited through a role-play. The teacher did consider the learners previous knowledge and the start of the lesson.
• The natural curiosity and eagerness of all young people to learn to investigate and to make sense of a widening world must be nourished and encouraged by challenging and meaningful tasks.	**T1, School 1:** T1 let the learners play the AIDS game so as to find out how easy it is to be affected. **T2, School 1:** Learners were given an opportunity to construct a food chain. **T3, School 2:** Learners were given opportunity to explore interdependencies amongst different living organisms through a practical activity. **T4, School 3:** Learners investigated the transmission of malaria which is regarded as one of the killer diseases through a practical activity.
• The learners' perspective needs to be appreciated and considered in the work of the school.	**T1, School 1:** Learners were asked questions to give their view on HIV/AIDS. And learners should make their own choice, whether they want to protect themselves or not. Learners were also asked whether they are comfortable with their roles allocated to them when playing the game. **T2, School 1:** Learners were given opportunities to express their view through designing of anti-litter posters. **T3, School 2:** Learners were exposed to a question which

	stimulated them to think about what would happen to environment when the food chain is broken. **T4, School 3:** Learners were given opportunity to do the drawing of the body themselves.
• Learners should be empowered to think and take responsibility not only for their own, but also for one another's learning and total development.	**T1, School 1:** Through this game learners were asked not to Only think about their behaviour but to also change it, and to consider the implications of having relations with others. **T2, School 1:** When they were designing the anti-litter posters learners were given opportunity to think for themselves what they wanted to do and engaged in the activity as a group. **T3, School 2:** Learners were asked to construct a food chain/food web this gave learners opportunity to use their thinking skills. **T4, School 3:** Learners were given a chance to play the game together.
• Learners should be involved as partners in, rather than receivers of, educational growth.	**T1, School 1:** Learners should be responsible for their own lives and choices. **T2, School 1:** Learners were learning to clean up the environment in which we live. **T3, School 2:** Learner participated by doing and did not just receive form the teacher. Learners went out in the environment to count the producers, herbivores and carnivores to construct the food chain. **T4, School 3:** Learners to show how malaria moves through your body by acting or role-play.
• In learner–centred education a variety of teaching strategies can be used, such as direct questioning, eliciting, explaining, demonstrating, challenging the learners' ideas, checking for understanding, helping and supporting, providing for active practice and problem solving.	**T1, School 1:** Teacher asked questions about HIV/AIDS. Encouraging learners to play the game. **T2, School 1:** The teacher used questioning and answering method to recap the previous lesson. Thorough explanations were also done. **T3, School 2:** Questioning and answering method were used before the lesson started. Explanations were also done. **T4, School 3:** The teacher started the lesson with explanations. Teacher supported the learners scaffolding and helping the learners to play the game.

From the above table, it seems that most of the teachers drew on learners' prior knowledge at the start of the lesson. Only one teacher (T4) did not do this, in spite of the fact that the lesson was following on a previous lesson. What is notable, however, is that the 'starting point' for drawing on learners' knowledge is 'syllabus defined' because it starts with the syllabus topics that are defined for each lesson.

Teachers all tried to encourage learners' natural curiosity and meaningful learning through practical activities, using a number of different interactive teaching methods and materials.

It would seem that all the teachers involved in this study tried to find ways of encouraging learners to contribute to the lessons through sharing their own views, or thinking critically, or making their own choices. The lesson on malaria allowed the children to participate technically, but did not allow much room for them to express their own views.

All of the activities had 'built in' ways of encouraging learners to 'think' and to consider others. The group work strategies were an important way of encouraging learners not only to think of themselves, but also of others, and to work together.

While the learners were all involved in the lessons, and were therefore able to be 'partners' in the learning experience, and not simply 'receivers' of knowledge, their learning processes were still heavily directed by the teacher's planning and input.

A wide variety of teaching strategies were used, including questioning, participation in role-plays, working together with others. There was however, very little evidence of critical engagement with learners' views and perspectives, or problem-based approaches to learning.

From the above review, it would seem that the teachers involved in this study are implementing a number of the principles of learner-centred education as defined in Namibian policy. It would seem, however, that there are areas for improvement and a need for a deeper understanding of processes such as drawing on learners' prior knowledge and experience in ways that are more contextually situated, and less syllabus directed. Critical engagement with learners' point of view and emphasis on problem-based approaches to learning appear to be other areas that could receive attention. Given that these were merely 'snapshots' of teacher practice, this facet would require further research, and longer term ongoing observation of practice.

5.4 Tensions emerging in fostering environmental learning in a learner-centred way

As indicated in Chapter 2 (see section 2.4.1) Life Science has been known as a carrier subject for environmental learning. In Chapter 2 I indicated that environmental learning requires active approaches to learning and should involve learners in developing, organizing, implementing and managing learning. Teachers need to create opportunities for learners to explore and find out things. Teachers should also consider what learners know already, before starting to teach.

In the interviews, some of the teachers acknowledged the tensions that exist when teaching the environmental learning focus in Life Sciences in learner-centred ways. (see chapter 2). T4 for example, noted that [quoted as is]

> … people have misconception of what learner-centred education really is because if we have to sit back and ask the learners to experience and to find out lot of things then we waste a lot of time, and at the end find that they do not know the work and you in any case you do it over … that's where the time factor comes in, because teachers are complaining that they do not have sufficient time for teaching in learner-centred approach. (pers comm., I4).

The above mentioned quotation from T4 indicates that there are different interpretations of learner-centred education (some view it as simply leaving the learners to experience and find things out, while others, like T4 feel that the teacher needs to have a more pro-active role). In spite of her reflections on these tensions in learner-centred approaches he notes that "… learner-centred education really, really works" (pers comm., I4). T1 similarly agrees that learner-centred education works, when he notes "I used learner-centred education all the time" (pers comm., I1).

T2, T3, and T4 also noted the lack of resources as a very big problem. T1 notes that "… lack of resources is a big problem that hampers the development of leaner-centred education and teaching of environmental education" (pers comm., I1). The teachers also expressed concern at the lack of textbooks. Murray and Wilmot in earlier research on learning support materials also found this to be an issue in enabling learner-centred education in Namibia (see section 2.2.4). They noted that there is a shortage of textbooks in some classes because of the poor management of learning support materials. T1 [quoted as is], in commenting on problems associated with resourcing the curriculum, notes that:

> We set out ten textbooks and at the end of the period or by the end of the weeks time there is only eight and in couple of weeks they are fewer and by the end of the year you have no resources left … [and] …the library is there but is not updated and we have problems of getting the resources that the learners can work from to do self-enrichment … [and] … Learners are also not committed if you give them books and ask them to find things out so that we can discussed it later when you get to them they talk about weekends parties, the learners do not see that they really has to do work (pers comm., I1).

This quotation from T1 reveals that issues associated with resourcing the environmental learning focus in learner-centred education are complex and multi-facetted. The issues are systemic (not enough textbooks are distributed to schools), practical (the library is not updated) and cultural (children prefer other cultural activities) in nature. However, in resourcing the environmental learning focus in the Life Sciences lessons that I observed, teachers used the natural

environment as a resource, pencil, graph paper, blank posters, marker pens and textbooks. From the above it seems that resource materials are very important in teaching environmental learning in Life Science.

Further tensions emerged around supporting environmental learning processes with large groups of learners. T1, T3 and T4 all noted that teaching in learner-centred ways is difficult in big groups. T4 [quoted as is] further notes that "… it is difficult for teaching a big group of learners which you do not know".

From my observation I could see that the teachers did cope with the big group because teachers did not waste time in grouping the learners and it went quite fast. The only problem in my observation was that eight learners were put in one group without giving the learners certain task to perform and some learners seemed not to be doing anything. Hopefully this will be addressed through the individual reports that will be submitted to the teacher for assessment purposes. (O2). In environmental learning learners should combine the theory with practice so it is vital to group learners in such a way that each learner should participate actively in the given task.

Another tension seems to be linked to learners' prior experience of learner-centred approaches. For example, T1 suggested that:

> … learner-centred education should be introduced in the primary school in the right way and children grow-up with the learner-centred education it must be done in the correct way then we will find a wonderful system, but you cannot try and introduced it in Grade 10 or 11 if they do not know. (pers comm., I1).

This issue reflects on some of the difficulties of changing an entire education system in a short period of time.

There were other tensions and challenges associated with the strategies teachers used to implement the environmental focus in the Life Sciences

curriculum. These are summarized in the table 5.2 below:

Table 5.2: Tensions associated with the strategies used by teachers

STRATEGY	**TENSIONS**
Teaching strategy 1: Planning	If teachers take out a big group of learners they must be well prepared not to disturb other classes. Teachers need to limit themselves in a certain time frame to finish the lesson.
Teaching strategy 2: Working with information	Learners are asked to use textbooks to discuss issues, but learners talk about parties, weekends they do not see the need to use the textbooks after school (T1). If teachers sit back and ask learners to find out things from the textbooks they 'waste lot of time' (I1). The education system is still examination driven and teachers teach to complete syllabus in order to meet the examination requirement. The amount of work teachers are loaded with is also a constraint (overloaded syllabus). Teacher writes the notes on the blackboard and learners just copy the notes from the blackboard.
Teaching strategy 3: Practical experience, excursions and clubs	Teachers claim that big groups are difficult to deal with in learner-centred education. There is not enough money to take out big groups on excursions, because the transport needs to be paid and most of the learners are unable to pay for the excursions.
Teaching strategy 4: Involving learners	Learners were mostly involved in answering questions that centred around the particular topic, and participating in structured group work activities.
Teaching strategy 5: Using visual aids and teaching materials	Lack of resources hampers learner-centred teaching. Teachers give learners old exam papers to learners to study (memorize), learners should not study exam papers but rather the work they have done in the year.
Teaching strategy 6: Choosing topics with a local focus	The biggest problem is to bring learners' 'reality' to the classroom, and to contextualise learning within learners' prior knowledge and experience. It is also difficult to get the necessary visual aids concerning the topic or to go out and show the learners in environment.

The above tensions provide useful insights into some of the issues associated with implementing the environmental focus in the Life Sciences subject in learner-centred ways.

5.5 SUPPORT FOR TEACHERS

From the discussions above, it is clear that there is much more to enabling educational reform in Namibia, and to including an environmental focus in the Life Sciences curriculum, than simply changing the kinds of teaching methods used by teachers, or the educational policy frameworks of the country.

The MBEC & Ibis (1997:37) reports that approximately 1550 teachers of Life Science teaching at 450 junior secondary schools with approximately 80,000 learners had been reached through 148 Life Science workshops (of more than one day) were conducted. For in-service teacher training, 130 cluster meetings were conducted by the Life Science advisory teachers (per year). Qualified teachers, which had previously not taught Life Science were offered 5-day in-service workshops to meet the needs of the teachers in order to acquaint teachers with the subject content and methodology, and most Life Science teachers have attended several workshops over the years. The Advisory Teachers received their training through national and regional workshop each year. The role of Advisory teachers is to run the in-service training on subject knowledge and methodology.

As indicated above, the fundamental nature of the transformation needs to be engaged in supportive interactions with teachers, and teachers need to explore the issues associated with environmental learning in the Life Sciences curriculum in more depth. When interviewed, teachers acknowledged that support has been rendered to them in the form of workshops, but it appears that this support is inadequate.

For example, T1 notes [quoted as is]:

> … there were two Life Science workshops I attended in the introduction phase but these workshops were mainly for Grade 10 because I never

> taught lower grades than grades 10. For Grade 9, I came up with my own ideas [to] work out something to teach them and study (pers comm., I1)

In a similar vein, T3 notes [quoted as is]:

> I think there where courses offered at Teacher Resources Centred (TRC) that you could attend, this workshop has stopped that is something that is lacking especially when you are a new teacher. When I was a new teacher it was there for me because the system was also change, now the new teachers are relying on experienced teachers inside the school to teach them (pers comm., I3).

T4 notes [quoted as is]:

> When Life Science Project was very active I attend quiet a few workshops and many of the strategies simply come with experience, you eventually knows what works and what the learners enjoys and how they learn better and so on (pers comm., I4).

T2 has recently starting to teach Life Science and is quite new. T2 [quoted as is] notes that

> I have never receive any of these strategies or teaching courses, I was deliberately asked to present these subject due to a lack of teachers this is not actually my area of specialization so this is just due to my experience in my subject which is commercial subjects (pers comm., I2).

From the above, it seems that support for teachers is erratic, and inconsistent.

From my analysis of the data in Chapter 4, it seems that teachers require additional support in the following areas:

Table 5.3: Additional support required by teachers

Teaching Strategies (as outlined in Chapter 4)	**Additional support**
Planning	Teachers should involve learners more in the planning. Learners should plan their own work for example investigations. Community members can also be involved in planning lessons. Most planning is currently based on teacher interpretations of the syllabus. Teachers also appear to require additional support for planning with large groups
Working with information	Teachers should be supported to be able to draw up their own worksheets and other information sources (and not give learners old exam papers to learn from) Teachers should be supported to find different ways of involving learners in working with information (not just expecting them to use the textbook after hours).
Involving learners	Teachers should be supported to draw on learners prior knowledge and experience in ways that are contextual, not just syllabus based. Teachers appear to need support to encourage learners' views, and to engage more critically with learners views. Strategies for involving learners while working with large groups also seems to be a further area for providing support.
Visual aids and materials	Teachers should be encouraged to use visual aids and materials in ways that involve and engage learners, rater than to 'show' and 'talk' to learners.
Topics with a local focus	Teachers will be supported use the local environment when teaching environmental topics, and to contextualise this within the learners prior knowledge and experience. Teachers appear to need support to engage more with problem-based learning approaches in local context.

The above suggestions for teacher support would strengthen the social constructivist underpinnings of the educational reform initiative in Namibia (see section 2.3), given that it would encourage teachers to draw much more on learner experience and prior knowledge in context, and would encourage a more contextual approach (Lotz-Sisitka & Olivier, 1998) to the Life Sciences curriculum, making it more 'learner-centred'. Given the challenges of

transforming towards a learner-centred education system as outlined above, and the challenges of implementing the environmental focus within the Life Sciences curriculum, it would seem that teacher support requires much more attention within the context of this case. Given that I am an Advisory Teacher in this context, this would be an important dimension of my work (and was the purpose for undertaking this study). I may also be able to use this work to provide support to other teachers.

5.6 Conclusion

In this chapter I have discussed the findings in chapter four in more depth. I have discussed the way/s in which teachers appear to be interpreting learner-centred education. I have considered this critically in relation to the social constructivist theories that are guiding educational reform in Namibia (Van Harmelen, 1998). I have also considered how structural issues in the system (such as the examination system and time tabling) almost 'forces' teachers to interpret learner-centred education at the level of 'change in method'. The findings of the study do, however, show learner-centred education principles are being used by the teachers in their teaching to a certain extent.

These findings extend and verify the findings on the way in which teachers are interpreting learner-centred education. Some principles are being implemented, and some principles are not being adequately addressed. I have also discussed tensions emerging in fostering environmental learning in learner-centred ways. Lastly, I have discussed the support that was rendered to the teachers in teaching Life Science in a learner-centred way, and have indicated that this has been sporadic and inadequate. I have considered possible areas for further support, based on the analysis in chapters 4 and 5, and have indicated that this is an important facet of my work as an Advisory Teacher in the context of this case study, and more broadly in the Swakopmund area.

Given that I have studied what has been considered to be 'successful schools',

and given the challenges that have been raised through this case study, it would seem that much attention needs to be given to the issue of teacher support. In the next chapter, I make recommendations that are grounded in this case, and that may be considered by advisory teachers and others wishing to provide support to teachers to implement the environmental learning focus in the Life Sciences curriculum.

CHAPTER 6

SUMMARY AND RECOMMENDATIONS

6.1 Introduction

In this chapter I will summarise the study. I do this by reflecting on the research question. I provide a brief review of the different chapters of the study and I make some recommendations based on my findings in the context of this case, in which I observed the practice of four teachers in two 'successful' schools in Swakopmund.

6.2 Aims of the study

This study aimed to investigate the teaching strategies used by teachers to foster environmental learning in Namibian Life Science. As indicated in chapter 1 (section 1.2), I wanted to understand how teachers used strategies prescribed by the Ministry of Education through the introduction of learner-centred education. Through this I wanted to identify different teaching strategies that foster environmental learning in Life Science, with a view to informing my work as an Advisory Teacher for Life Sciences.

6.3 Summary of the study

With the independence of Namibia in 1990, and with the reform of the education system, the Namibian Government introduced a policy entitled '*Education for All'.* The central focus of this policy is the provision of learner-centred education. This represented a fundamental change in education in Namibia from apartheid education which was based on positivist views of knowledge and behaviourist learning theory. Van Harmelen (1998) indicated that the move to learner-centred education in Namibia reflects that social constructivism is the preferred theory of

learning underpinning the Namibian educational reform effort. A number of research studies have indicated that there are a number of problems associated with the implementation of this new transformation initiative, for example, that while teachers show signs of implementing learner-centred education in their practice, they do not reflect that this is what they are doing (Van Graan, 1998). Other problems identified include materials that are not designed to be learner-centred (Murray & Wilmot, 2000) and other structural issues such as timetabling and the examination system (Wilmot, 2000).

As noted in chapter 2, the Namibian Government was (and is still) committed to address environmental issues in Namibian Society. In the educational context, this is done through the subject Life Science, a new subject introduced after independence in 1990. This subject is known as the 'carrier subject' for environmental issues. A Broad Curriculum and Life Science syllabi were put in place through which the environmental education is to be addressed in schools (see section 2.4.1).

In order to answer my research questions I used an interpretivist case study (see chapter 3). Through this case study I wanted to understand the strategies used by four Life Science teachers in two 'successful' schools in Swakopmund. I employed different methods of data collection strategies including semi-structured interviews, observations and document analysis.

The study provided a 'thick description' of teacher practice in the context of the four lessons that I observed, and drew on interview data generated in interviews with the four teachers. Through this, I was able to identify a number of teaching strategies used by teachers to foster environmental learning in the Life Sciences curriculum. These include:

- *Teaching strategy 1: Planning*

Teachers used the syllabus to plan their lessons. Teachers also plan their practical activities before doing the activities in the classroom. Teachers also organize and facilitate the activities of learners.

- *Teaching strategy 2: Working with information*

Teachers in their lessons take time to explain the requirements to the learners. Learners were also given opportunities to ask questions if the explanations were not clear. Verbal and written information either on the worksheet or on the blackboard was given to the learners.

- *Teaching strategy 3: Practical experience, excursions and clubs*

Learners are encouraged to participate in competitions and science fairs. Learners are also taken out on excursions where they observe and are exposed to different things in their surroundings. Teachers also make use of members community to teach the learners. The learners have also established different clubs (AIDS awareness club) through which they try and address environmental issues.

- *Teaching strategy 4: Involving Learners*

Teachers involved the learners through drawing on their background knowledge and teachers regard the participation of learners as very important. Teachers also give clear instructions to the learners. Assessment and assignments are used as teaching strategies. Learners are divided into groups to work together and learn from each other.

- *Teaching strategy 5: Using visual aids and materials*

Teachers used visual aids (TV, Auto video, OHP) in their lesson so that learners can ‘see and hear in order too remember better’ (I4). Teachers cautioned against the use of old examination papers as a strategy for teaching. Learners are also asked to consult the textbook when they do their homework.

- *Teaching strategy 6: Choosing topics with local focus*

Teachers used local examples in their teaching. In order to do this learners are taken out of the classroom to the environment, teachers believe that that

the use of ‘real things’ and visual objects will help the learners remember better.

Through a more in-depth analysis of these strategies in relation to the educational reform intention of providing learner-centred education in Namibia, I was able to gain further insight into:

- *Ways in which teachers interpret learner-centred education*

Teachers appear to be interpreting learner-centred education at the level of ‘change in method’. In one case, a teacher was using new methods, but did not see this as ‘learner-centred’, which illustrates that learner-centred education may also be poorly understood. From the evidence presented, it seems that the social constructivist underpinnings of learner-centred education in Namibia are not thoroughly considered by teachers or in the system more broadly (given the impact of the examination system).

- *How teacher practice reflects principles of learner-centred education*

An analysis of teacher practice in relation to the principles of learner-centred education revealed that learner-centred principles were being implemented to a certain extent. It revealed, however, that there was still room for improvement, even in the ‘successful’ schools.

- *Tensions experienced by teachers in implementing the environmental focus of Life Sciences in learner-centred ways*

These tensions ranged from struggles with large groups; difficulties in contextualising learning, different views of what learner-centred education is, and poor resourcing of learning. A number of tensions were also identified in the strategies used by teachers.

- *Support for teachers*

Evidence in this case study indicates that support for teachers in implementing the Life Sciences curriculum requirements is sporadic and limited in nature and extent. From the analysis of the strategies used by teachers, a number of key areas for support were identified, all of which have

implications for Advisory Teachers like myself, who are responsible for providing in-service training and support to teachers.

The study not only identified strategies used by teachers, but also issues associated with these strategies in relation to the learner-centred intentions of educational reform in Namibia. Recommendations are made below to strengthen the implementation of the environmental learning focus in Life Sciences in the context of this case.

Generalisation of these recommendations is not assumed, but it is hoped that they will inform the practice of other Advisory Teachers in other areas in Namibia.

6.4 Recommendations

6.4.1 Teachers' interpretation of learner-centred education

Teachers' interpretation of learner-centred education is one of the important findings of this study (see section 5.2). It would seem that learner-centred education is being interpreted by teachers as 'change in method' only, and by some teachers, there appears to be little understanding of their own practice as being 'learner-centred' (T2, see also Van Graan, 1998). There are also factors in the system (such as the examination system, timetabling, and syllabus-driven implementation) that affects learner-centred education. Teachers are also not in agreement whether learner-centered education 'works'.

This study recommends that Advisory Teachers continue providing teachers with support in the form of in-service training to help the teachers:

a) understand learner-centred education better (this would include understanding the social constructivist nature of the reform process), and
b) understand how the methods they use reflect / do not reflect learner-centred education.

This will require Advisory Teachers to work with teachers to help them [teachers] to recognize when they use learner-centred education methods and strategies.

6.4.2 How strategies used by teachers reflect learner-centred education principles

Since this was small-scale research, only some strategies could be observed. These strategies reflected that to a large extent, teachers are implementing the principles of learner-centred education. From the data gathered it would seem that more attention is needed to develop more ways of drawing on learner's prior knowledge and experience so that these are more contextually situated, and less syllabus directed. Critical engagement with learners' views and emphasis on problem-based approaches to learning appears to be other areas that could receive attention.

This study recommends that further attention is paid to ways in which teachers draw on learner's prior knowledge and experience in lessons. This should not just be syllabus directed, but should consider the learners' context and experience as a starting point for learning (currently the syllabus appears to be the starting point).

This study recommends further research to explore the full extent to which teachers are considering the principles of learner-centred education.

6.4.3 Tensions emerging in fostering environmental learning in a learner-centred way

The findings indicate that a number of factors such as a lack of resources and big classes impede the fostering of environmental learning in a learner-centred way.

This study recommends that Advisory Teachers should liaise with teachers to manage the use of textbooks more effectively. Advisory Teachers can also request that NIED ensure that the libraries are up-dated each year so as to be used by teachers and learners for study purposes.

The study recommends that further support is provided to teachers to deal with large classes in learner-centred ways.

6.4.4 Support for teachers

In the review of different studies on support rendered to the teachers, it is obvious that teachers do receive support, but that the support is sporadic or insufficient. Findings indicate that teachers still need support to implement the environmental focus in the Life Sciences curriculum.

This study recommends that Advisory Teachers (such as myself) should continue to provide in-service support to teachers in their classrooms. Workshops could also be run for new teachers mainly on the use of learner-centred strategies.

This study recommends that support is provided to teachers, as outlined in table 5.3 (included below again).

Teaching Strategies (as outlined in Chapter 4)	**Recommended additional support**
Planning	Teachers should involve learners more in the planning. Learners should plan their own work for example investigations. Community members can also be involved in planning lessons. Most planning is currently based on teacher interpretations of the syllabus. Teachers also appear to require additional support for planning with large groups.
Working with information	Teachers should be supported to be able to draw up their own worksheets and other information sources (and not give learners old exam papers to learn from). Teachers should be supported to find different ways of involving learners in working with information (not just expecting them to use the textbook after hours).
Involving learners	Teachers should be supported to draw on learners prior knowledge and experience in ways that are contextual, not just syllabus based. Teachers appear to need support to encourage learners' views, and

	to engage more critically with learners' views. Strategies for involving learners while working with large groups also seems to be a further area for providing support.
Visual aids and materials	Teachers should be encouraged to use visual aids and materials in ways that involve and engage learners, rater than to 'show' and 'talk' to learners.
Topics with a local focus	Teachers should be supported to use the local environment when teaching environmental topics, and to contextualise this within the learners prior knowledge and experience. Teachers appear to need support to engage more with problem-based learning approaches in local context.

As these recommendations have been defined within the context of the case study, further research to explore additional strategies used by teachers to implement the environmental learning focus in Life Sciences is recommended.

The study also recommends that further research is needed to consider appropriate ways of supporting teachers to use a range of strategies for implementing the environmental learning focus in the Life Sciences curriculum in Namibia.

6.5 Conclusion

Life Science is a subject taught in all schools from grades 8-10 in Namibia. At the time of writing this research, I am employed as an Advisory Teacher for Life Sciences. My task is, amongst others, to provide in-service training to teachers and to assist teachers to implement learner-centred strategies in their classroom teaching. In this research I investigated the strategies used by four teachers in two 'successful' schools, to foster the environmental learning focus in the Life Science curriculum. I employed an interpretive case study approach and conducted interviews, observations and document analysis to collect data. The research has provided me with useful insights into a) the strategies used by teachers and b) the issues associated with using these strategies in an educational context which is transforming towards learner-centred education. As these two schools represent only two of the 32 schools currently offering Life Science in Swakopmund, I am hoping that the findings and recommendations of this study will inform my ongoing work with all of these schools.

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APPENDIX A

FIGURE 1: MAP ON NAMIBIA INDICATING ERONGO REGION

FIGURE 2: ERONGO REGION

Adapted after MEC (1992:38)

APPENDIX B

INTERVIEW GUIDE FOR TEACHERS

Date……..Time…….Interview no……..

Environmental Education: Investigate the teaching strategies used by teachers to foster environmental learning in Life Science Curriculum.
A case Study.

Personal Data

All your answers will be utilized anonymously in the research report. However, provide me with some personal data that could help me with analysis.

Name:……..
Position in school:……..
Qualifications:…….
Subjects Taught:……..
Teaching Experience in Life Science:…….
Classes taught:…….

Status of Environmental learning in Life Science Subject

1. Do you teach about environmental topics in the Life Science Subject?

……
……
……

2. In your opinion, How does life science help learners to learn more about the environment?

……
……
……

3. What are some of the activities you used to teach about environmental topics in Life Science? Which one works the best & why?

……
……
……

4. Give and describe an example of a successful lesson/activity that focuses on environment in Life Science.

……
……
……

5. Does your school have any links to, or use of environmental centres? Describe how you used environmental centres and why?

……
……
……

6. What difficulties are you currently experiencing with teaching Environmental education in general?

……
……
……

7. Could you suggest any ideas for improvement that you have about teaching environmental learning?

……
……
……

8. Have you had any orientation workshop or training in which you were officially introduced to teaching strategies if no how did know to what you are doing?

……
……
……

9. What are your views on learner-centred Education?

……
……
……
……
……

10. Do the approaches prescribed by the LCE help learners to learn? If not, what do you do to help your learners to achieve the results?

……
……
……
……

Thank you for your valuable time!

APPENDIX C

Modification of the interview schedule

The interview schedule was modified after pilot study. Following changes were made to let the schedule to be clear and understandable to the teachers. Item four was initially phrased as Give and describe an example of a successful lesson/activity focus on environment in Life Science, I was then advised to add "which" and the sentence now reads as Give and describe an example of a successful lesson/activity which focus is on environmental learning in Life Science? Item 6 read as follows what constraints do you associate with the teaching the environmental topics in your class? Constraints seems to be not well understood by the teachers so the sentence was reformulated and reads as follows: What difficulties are you currently experiencing with teaching of topics that focus on environmental learning in general? Also four new questions were added to the interview schedule.

APPENDIX D

Teacher 1(T1) Interviewee 1 known as I1 18 June 2003 at 10:15

Question 1

Yes, we talk a lot about it because they need to understand the work and they need to understand the earth they live on and if we do not tell them this things they will basically not know it so many times we just accept that they will be for instance when you tell about pollution there will be people behind us to clean up they will be somebody else to do it instead of me taking responsibility for things that I do appreciate the environment world we live in and our resource and everything we take for granted so easily. So for instance pollution I will for instance make them attend of certain areas in town which are very dirty and polluted or we can go to beach and pick up and rubbish and clear up certain area of bottles and papers and then they are amaze to see how much rubbish actually even comes from the sea or whether it is from dustbin that are very full that they become aware of that that's on pollution

Question 2

And HIV and we talk a lot about it that and I try and show them pictures. I try and tell them about problems that we do not always see, we see the nice pictures and we see the normal things but the real hard shocking information try and give them as well and I you know I show them different things like the condoms the femidoms what it is used for and how it is used also there is a game that we play we call it the aids game and where they can see how it is transmitted how easily it is transmitted and it is a very effective game.

The AIDS game because learners tend to think that AIDS is a blown over story and people emphasized it too much. In this game we started of with for instance fifteen learners in a class and we have a mixture of liquid and they have to play a game, role play and every time they mix their fluid and at the end they test it and

you asked them at the end by playing your role do you think you will have AIDS and they say no and then we will test the thing and will see they are positive and they can see how easy it can be transmitted and I really think that they can remember that.

Question 3

This issue has been addressed in question 2

Question 4

HIV/AIDS activity

Question 5

No we do not have any specific links except that we take part every year in this world wetland competition and then we are in contact with the people who organized it we do not have much more through the science fair we have a lot of people we can contact from fisheries and from Rossing and always interesting to see how we interact with them and they are always very helpful if we need information or help from them, you do not go to established centers that you could find out things from for instance the aquarium and the people that worked there very often we will find some things we don't know what it is and we will send it to them or visit them and asked them to tell us what organism it is you know some thing like this so we do have contact with them but not official contact but for sure we can come into contact when we need them.

Also get them into helping them about the characteristic of organism and things need to be explain and with the blood transfusion we always have blood transfusions and very often we ask them also to help us and to the doctors the questions the learners have about HIV/AIDS and different type of diseases and they can help us.

(Outside help) W e have not visited hospitals as such because you know it is a big group of learners and it can always be difficult to do that but we take the grade 10 - 12 to the sewerage works so that they can see what happens there and how the whole purification system works and they also find that it is interesting.
I think actually we have discussed some of this, if we discussed for instance sewerage works and how those experience of going there help them a lot to understand what they do and AIDS game.

Question 6

When it comes to there is always time to do everything you want to do with grades 10, 11 and 12 I think it is easier also because it is work that they understand, and I would say that are more interested in, because it is something new in the grade 11-12 a syllabus more new work you actually know it every day life but you never study it and then they enjoy it like the sewerage, like population the increasing populations all this can the environment that work around you but I unfortunately think that we also hade a problem with specifically grade 9 where it is very much agriculture and they the learners don't actually like the grade 9 syllabus, and I think most of us as teachers are also find it difficult to teach it because I haven't been a farmer and I don't always, have that information and what we do finds little and I think one of the important thing is that it does not link up with anything else in the syllabus in Biology or life science.
Ja time because there are such interesting aspects in for instance the interactions of the organisms but the syllabus is so full that you don't have time to carry on and really take them out to places where they can see what happens so you have to very much rely on just normal textbooks and fortunately we have lot of videos – I have lot of videos that I show the learners and if there is something on T.V. that brings up the topics then I tape it and try and show them if they haven't seen it. This is more for grade 11 - 12, the grades 10, 11 and 12

syllabuses where the time is short grade 9 we have enough time but the topic is the problem in grade 9 is the topic. Exam based comment, you have to set the exam they have to be directed toward exam so you cannot always teach what you want

and what you think the most important things learners need to know or to cover the most important but to make it interesting you need to go much further and then if we come to exams they find it difficult topics on environment are usually very, very difficult because they don't always have the background we don't a time to refer to the background and they don't do very well in the exam specifically this relate to grades 10 – 12.

You do teach them to write the external exam you have to cover the syllabus and it's beautiful, I find it very, very difficult to complete the grade 10 syllabus because I always want to give then little more so that they got more background and I run into problems at the end to try and get the syllabus done because the exam paper is not set on the textbook it is set on syllabus, and therefore if you used different textbooks you got different information and that makes very, very difficult to cover everything that you need to cover and give them background they really want.

Question 7

I really think we need assistance from the outside world from the public sector because aspect of this and it is impossible for teacher to know everything and I think we can get more involvement from companies then we can maybe you know do better.

Ministry

There is not much I think it has to do with what the teacher does and maybe little bit more. I think maybe a course to show teachers how to teach, give them more ideas of how to teach the environmental topics because I don't know something I cant teach it, but if somebody gives me a hint and a help then I can go on and I can try to improve on that and than of course that is now something big and that is changing of syllabi and specifically grade 9 syllabus because if we could do a

way with the agricultural part, then we can put more emphasize on actual environment and Biology that it actually flows into the higher grade because we see that in the topic when we write exam in grades eleven and 12 they for instance set questions on the fish that their learners did (meaning Cambridge system) in grades 8-9 and then they assume that everybody has done that, and by the time our learners learn about the fish for instance or the frog is the first time in the grade 11 so according the syllabus you must do what syllabus tells you and they asked questions beyond that where our learners don't have the background.

Biology and environmental topic that they need further in their courses should be started in Lower Primary. No progression especially grade 9 syllabus unless you change it slightly because thy do reproduction of animals, they do nutrition of animals but they do it at such animals that you could link up to the grade 10 syllabus you can, do that but you got to do on all the other animals and that is what very confusing it is very difficult because the learners do not know all those animal because they all do not grow up on farms and you got the grade 8, the plant and that type of a work and suddenly agriculture grade 9 and grade 10 you or back at the human physiology so grade 9 seems to be a problem.

Question 8

Well, there were one or two life science workshops, in earlier years of introduction and then I think I attended two of them but this was mainly grade 10 because I never taught lower than that you know grade 9 I just have, you have to come up with your own ideas – work out something to teach them and study.

Question 9

I still think that people have misconception of what LCE really is because if we have to set back and asked the learners to experience and to find out lot of things than we waste a lot of time, and at the end find that they don't know the work and you in any case you do it over and that is where the time factor comes in. I think at the end LCE is not always very, very helpful, and a big problems that we have is resources and extra textbooks, We set out 10 textbook and at the end of the period or by a weeks time there is only 8 and in couple of weeks they are fewer and by the end of the year you have no resources left so that has always a big problem the library is there but is not updated and we have a problem of getting the resources that they can work from to do self-enrichment. Lack of resources hampers the development of learner-centred Education in any case. Ja, very often they see it as soon as you start working with them and you say there are textbooks there are books find out this, look this up so we can discussed it later you get, to them they talk about parties, weekends they don't see it that they really need to do that work.

I think that learner-centred Education if it was introduced in the primary school in the right way and children grow-up with the LCE but it must be done in the correct way then we will find a wonderful system, but you cannot try and introduced it in grade 10 or 11 if they don't know.

There are always few learners that will do the work and they will benefit from it because they bring up more about topic than of what they actually need but the majority of learner do not see it as a learning experience they see it as free time.

Learners should grow up with LCE to know what to do and how to use the library how to use different recourses that you can just keep on building up on it.
-I try and make the work as interesting as possible to them.
-I very definitely every day I talk about thing that happen outside in the world around us, have you seen this on TV. that is why I have said just now when I see

a programme on TV. That I think that it links up to the work I will tape it and bring it to the school and I will show to them.
-I use experiences on my own life and or my children and bring it back to them and then I think they relate more to it.
-and I think that is a very, very important thing.
-In other things like for instance discussing the heart and the lungs which is not environmental that much, but I would for instance get the heart get the lungs and I will blow it up, I will cut out so that they can see it, everything imperative should helps to make them understand to make different models and wherever I can bring in something.

Question 10

I think also lot of learners and teacher, give the learners old exam papers to work out. I personally are very much against that because you cannot study an examination paper but you can study your work that you have done in the class by rather relating that more to everything that happens around us all the time the learners get a wider background and then they can apply their knowledge because that is what learning is about these days that I must not know how the heart function but how does it work in the rest of my body so it is not only the heart by itself and learners also seem to think that they can work out an exam paper and they are going to do well, but at the end of the year people don't use old exam papers they set the new questions and they (learners) do not know how to handle it. So an exam paper should be used to show them how a question is answered and not as a method of learning for exams. Trying the practical and show them in the environment around them as much as possible how the things they have study are applied in the nature.
Teachers should take out the learners from the classroom setting to the environment and show them practically as much as possible how the things they have study are applied in the nature.

Teacher 2 (T2) Interviewee 2 (I2) 18 September 2003 at 11:30

Question1

Right, in the Life Science syllabus (Grade 9 syllabus) environment topics are included examples quoted out the syllabus is the sustainable management of the vegetation, limiting factors in animal farming, environment problems related to animal farming which includes deforestation, soil erosion, biodiversity, bush encroachment, desertification just to quote few.

Question 2

Right, activities included in teaching environmental topics. I try to incorporate examples from the reality I asked questions learners to get their background I try to, I make or do a mind mapping on the blackboard where all the thoughts are being noted down and there after I try to rearrange these thought logically from which was brought up by learners and then recap or review on these thoughts in order to continue with these topics.

Question 3

Activities where one gets learners involve. I try to be more learner centred that mean get the views from learners as mention preciously by having a mind map where all the thought are being noted down and use it as a starting point. Questions are asked to learners instead of and having also discussions in order to get the views from the learners I believe in standardizing visual aids by making use of visual aids as far as possible because I believe that people will rather retain what they have seen than what they have only heard, an other activity incorporated in the lesson are pre-prepared for learners and as lesson continue teacher is asking this questions this mean get learners more involve in the lesson. I also believe in the case of revision by making use of quizzes, learners like to take part in the competitions and that work very well for preparation of

examination, by getting them involve they draw up questions and teacher is also asking questions that is refer to in questions no 4 different activities use in a lesson.

Question 4

I have mention the activities in the previous question.

Question 5

As far as my knowledge is concern I am not aware of any environmental education centres that we are having or getting any information from or having any links, but as an excursion not that we are having links I use to if we discussed topic we are having in our town the aquarium and where one can take learners to and that is basically all, we are offering the science fair where projects are being displayed by taking learner out to these events or places they can acquaint themselves and also their knowledge and field of knowledge can be broaden.

Question 6

I think the biggest problem in our region or where we are teaching is to bring the reality to the classroom, because it is difficult for instance certain topics in environmental or environmental topics where I believe in visualizing to get the necessary visual aids concerning the topic as well as the reality to go and show learners about the specific topic can sometimes be a difficulty.

Question 7

Right, Yes I first of all I think I can start of by saying one must be prepared always be prepared your preparations is vital and make a difference in making a professional presentation so failing to prepare equals to preparing to fail so it is

important to set objectives and your objective must be specific, measurable and they must be realistic and attainable as I previously mention on a previous question if is important to get the pre-knowledge of the learners by making use of the mind mapping where thoughts were be dotted down on the blackboard and one proceeds by rearranging these thoughts that you have written on more logical or in a logical order and there after you review what you have done before continue to a new topic. Also to make teaching more successful I believe in making use of visual Aids and by making use by visual aids you try or one must try to put the content as simple as possible that mean you use single words to give headings or you make use of short statements, use diagrams or graphs where possible to present figures use different colours when making or when constructing presentation that means a lesson I tried to first of all have different structure I am specific by using a specific structure first I am doing a introduction by trying to get the attention and the interest of the individuals or the learners, there after I do the content part where I will bring across the topic, the content the facts and very important is the action part that follows the action part that mean that is doing part of the learners that is when assignments are being given on the topic or questions are being asked on the specific topic where learners are involve by doing this question on the work discussed.

Question 8

Orientation

To be honest in the subject of the field of the studies I haven't receive any of these strategies or teaching courses I was deliberately ask to present these subject due to a lack of teachers this is not actually my area of specialization so this is just due to my experience in my subject which is my subject of expertise which is commercial subject but I find Life Science as a subject very interesting and very life because one can always include or refer to the reality as proof example this is not like numbers and figures – creative and incorporate your previous experience an that I think contribute to even the success that I achieve in the subject.

Question 9

LCE

I think that it is of utmost important first all to get learners involved get them interested in the subject and the only way that you can do this is to making them an active part in the teaching process as I have stated by getting their views on topics mind mapping to start off by that to get then interested. How will you get them interested? to get them involve, and how will you get then involve? is by letting them do that means the action part and that is what I believe were make a difference in education. In general, I am very must positive and that is I can say where ever I can include LCE, I do so in all the subject that I am teaching and that work 100%.

Maybe I can just rap up by making summery first of all LCE what is learner centred getting learners involved this in the things that I am doing and very importantly to making use as far as possible of visual aids because as I have stated before a person remember something longer what you have seen that just of what you have heard, so as far as possible get learners involved get the background on a topic take their views and rearrange it making use of visual aid – revision is very important try to do things in revision, what learners like to do like having games as mentioned before having quizzes and indirectly they like these fun activities.

Question 10

Yes, because they are involve they are interested by getting their attention and interest they are becoming more aware and they would like to share their knowledge as well so I believe that these achievements and results are due to including learners in whole education in general.

Teacher 3 (T3) Interviewee 3 (I3) 18 September 2003 at 8:30

Question 1

Yes, definitely, I think it is also in the syllabus, in because of the syllabus in grade 11-12 we also pay a lot of attention. I am doing it from grade 8 on what's and then even in grade 9 although they doing then the animals connect animals to the environment but I think lot of emphasis is put on that.

Question 2

I think they realize you know more on what they hear on TV. and maybe on the news they realize now maybe more how it works because you try and connect this to basic principle of what they learn in the class so reality is for them more realistic.

Question 3

I would say I like to take example, which they know. Animals that they know and activities what they do that is familiar to them and also to be let by the class, because different learners may react different, asking what kind of examples can they give, about say a food chain and then you know talking about that example and showing them what will happen if that get influence by drinking more water, and eating more grass what ever also like pollution they know about fire making and the smoke that comes up you can talk about that by taking real life example is probably for them also realistic.

Question 4

What I have done practically is go out and do little bit of counting with them say for a food chain for instance so we cannot maybe primary producers and see that they are really much more in that small area, then the primary consumers feeding

on them so you know for the first time they thinking about numbers and then maybe also about size how they see ants are so small I can't compare that to the one tree that they eating so by doing it in the real life is also for them even though sometime it is a very difficult to let them, but group activity like that you can even do it at the back of the school ground.

Question 5

I think we participate a lot in science fair and then participating in them it is also very much emphasize on environment aspect by a you know for them going for instance to this sewerage dam for or whether have the Walvis Bay they have now a new they have build this whole thing to treat all the waste and you have to go there and actually show them how it's working also sometimes trigger the interest to participate more in the science fair maybe special in that, and then I think lot of them are actually using their mind because you are definitely referring to the mine and then with them it is a good environmental section, so I think on my own and as a project lot of them had parents or relatives that work there they also I think you will not directly go to a place although I like so we are discussing this in a class we have gone to the sewerage work and so on, but you would also use then the other sectors in a society too, for them you know it take the interest and they go. So we go there I usually take my group and we say somebody else will no give you notes and I want you to make your own little notes about this and then when we come back to the class they have to tell one another or in a group tell what have they learn or what come up how does the sewerage work in Swakopmund? After collecting it so is not the teacher it is also for them a shift they usually used to having it from the teacher all the time, so now it is a little bit of shift where the different person is giving it and maybe in a different way maybe talking a little bit above the head or little bit simple what are but that doesn't worry them because initially we come back or eventually we come back and discuss it in class.

Question 6

I think it is always difficult to do this practical things in the outside with the group of say I have a big class for instance that 40, so if you want to go out into the school yard you should be careful to have to disturbing maybe the other class so it have to be very much organize you have to have something doing actually you have to give them papers, so it takes a lot of preparation before hand, to let them do a lesson like that where you know they get a lot of practical experience and ja so you also sometimes loosing a learner then because in a group some people will participate and them the rest will just take along so I think that's major constraints that you not sure that you have everybody. I think also another thing will be maybe 'you know' the money, we can't organize a big group take a bus and go to place that is far away or further away like the Rossing mine because it is little bit of money involve there and lot of learners would not be able to afford if we want the learners to pay and the school can obviously not afford for a big group, so we do have groups that every year we have excursion with grade 9s all the grade 9 to go to Aus and they do lot of environmental things in there which is nice in the open in the environment and then we take again the grade 11s to Rock Lodge where they also have a lot of environmental work and the group activities so they 'you know' do get the chance but it's for per group one big times in the year so to speak so the school did put lot of money onto that but you can now also in a class put them in the individual groups. All the grade 11 go but they have to pay a certain amount, but we do give them time during the year and say okay if you really now you must let them act they must ask the teachers to wash their cars and the teacher will give you N$10 and they get together their N$100.00 or N$200.00 that they have to pay for going, so its 'you know' prevents to do that just once is enough.

Question 7

I was once at one in Windhoek for physical science for a week long but that was now 1995 you know I think with the changing of our syllabi and so on but apart

from that I think there was also at the TRC for Life Science specifically. There were few workshops that you could attend, but now I think since the new curriculum was established there is fewer of these things and that is something that is lacking especially when you are a new teacher. When I was a new teacher it was there for me because the system was also change but now maybe it is lacking and they relying on teachers inside the school to teach.

I tell you its really in the school from other teachers you know that are working so my subject head is a very much trained and had a lot of experience. So what I used to do is in my off lessons I use to go and in her lesson to see what she was doing and we have also this relationship where we should share things at work and the other one would also trying that, so I think that is nice to have life science teacher for instance what we also have in schools is we have at least once in a term we have what the call teacher development and we have one afternoon we decide on a topic and then we might ask one teacher that we know is good in that area we will ask her to prepare something and we can also come with questions so one we have for instance graphs, how do we draw graphs and we have all the teachers input 'you know' from the mathematics and the physical science and the life science and everybody is saying this is problems what we experience how do you handle that and this is actually first time that you discuss it in real life that the others had the same problems or they are different or that why you have the problem because now we find out that in mathematics we have to do the graph like this (showing a curve graph with her hand) were as in life science we always draws for instance a straight line were in mathematics they have the curve line and then you realized okay that's why the learners wants to make curve line you realize where comes the problem and you address it and it makes easier in the class. We also sitting with whether especially with us because we have now different teachers teaching the same grade and then we try to go on in the same way, so that we can write the same tests and so on then there is lot of discussion and planning done but even in between you know we are so busy with that. The topic no take longer than what we thought we changing it but you know we carry on with the topic until it’s understood.

Question 8

"Ja' I think the emphasize is indefinitely going on towards the teacher being more of the facilitator and the learners becoming more involve and trying to find their own information and the teachers definitely mot sitting and doing something else but an active facilitator seeing that every body is on the right track and so on and we definitely using that in our classes we are 2x trying to use that more and more in the classes. It's obviously difficult in a big group which you don't know the learners because is upon that you have right people together in a group where you have some people that know what's going on so that they can help others.

Question 9

I think what we have by having vision what is needed at the end and with what learners have problems with I think than emphasize is put on to that and practice all the time so we say there's never a time were you finish teaching you can't get to the end of the topic and say now I've cover this I have finished with this we try to obviously limit ourselves in a time you have to finish that topic, but then say at the end of the term like now the kids are asking are we working until the end then we say we are working until Thursday, Friday we will have our assembly and we will go home, but bring your books until then because there is now time to do more practical things, let them draw graph and let them discuss things and make drawings and so on because they don't want to hear now only but those skills are so important so instead of wasting that time we let them sit and still draw and still make you know experiments and draw conclusions from that and discuss questions like that so just the fact that you constantly working with the life science they become' you know', that's the time when they learn the most in the class and you must make sure that they all the time in the class are busy.

Question 10

I think so 3x but with the lot o preparation and lot of input from the teacher, one thinks that no learner has to do thing which is not the case if the teacher is not there to guide them and to say now you have to look at this paper, you have to fill in that way and you have to make sure that you understand this part of the work, so that you can answer this question, 'you know' so I think there is lot of preparation then for the teacher, then that will definitely help the you to that (teacher).

Teacher4 (T4) Interviewee (I4) On 18 June 2003 at 08:30

Question 1

Yes, I teach a lot of environmental topics because you cannot separate environment from Life Science I mean Life Science is about the environment. Might be about living organism in the environment but they are also dependent on environment so you have definitely need to teach about the environment all the time. Yes there also should be the basis for the entire approach to life science and you must establish a link between the student and his intermediate or immediate environment and later in a national environment and later maybe a global environment so you must get student to understand that he is part of the environment and that he cannot separate himself from his at the moment maybe immediate environment but later he has to see the Namibian context and maybe later if he can understand it that he would also be responsible for global environment.

Question 2

Many topics in a syllabus are directly link to the environment for instance pollution and it’s consequences nutrition and health concern the immediate

environment of the students so they in doing Life Science they understand about themselves which is their own personal environment and then they will understand their immediate environment which is maybe their house and garden, Swakopmund and the town in which they live and of course later on they will be able to link it to the Namibian environment.

Question 3

Well, you have sort of the activities I haven't mention any or I you know maybe I need to think about it specific special activities, what if the first most important, (a learner) allow the learner to link any kind of topic that you are going to teach with their own personal experience that they have already and then allow them to discuss it and ask questions about it so that they are also become interested in what you are going trying to teach and then from there on that is a start and you can then carry on so story telling and allowing time for questioning and discussions and introducing strange or foreign concept only after that you know sort of link it to the experience they have had and so that also slowly the students might get use to the new idea but always try and link his own experience to the new ideas.

Question 4

I have now taking the one example for instance going to the sewerage work in Swakopmund that's what we always do and there we explain to the learners how human waste are disposed of and made safe and if you do that you have to phone the municipality and obtain permission but they have quiet good about this they will provide somebody to go with you and the learners will also see that this smell awful and that is actually look awful but, that is their waste they are producing and how that is cost money and that is expensive and how do we actually treat sewerage so that everybody can have much more safer environment . I find that very good. You can teach then in this lesson health aspects cleanliness, hygiene the use of water all of that can be brought in to this

lesson that will be about pollution. How we pollute, hygienic problems and about pollution of water if we could allow the sewerage to run into the see and just into our environment.

Question 5

We participate in science fair both in regional and national level. We encourage our learners to choose subject of their own environment. They have to localized, they can not choose anything that is far or some “pronkpop” or so they should concentrate on some aspect in their own environment and then our school also participate in essay competitions and we have an AIDS awareness club at the school and the school has also a very active save the lion club. One teacher has got links is friendly with instance with the save the lion centre and she had now established the club and anybody can join and twice a year they go up to the Kavita Lion Lodge and they clean up they build fences and they look at how people you know what people do so on.

Question 6

The biggest constraint is simply I think the big classes, if you have 35 learners and more it makes very difficult to take learners out to experience the environment first you can take them to sewerage we can walk there and we can go down to the beach and that is possible but if we want to drive anywhere you know further away then it becomes very, very expensive you know most learners cannot afford these expenses and outings big classes has also got discipline constraints it becomes difficult to control the activities of all learners so that all can benefit from such experience. You know if you have such big class even 35 going down to the beach half of them are not doing what they are supposed to do that is I think just the big classes to me are enormous constraints.

Question 7

It is difficult to do anything extra so it taking the children out to the environment or so, if you got to complete the syllabus and if the learners are writing say the external paper at the end of grade 10 you got to see that you finish the syllabus that's more important because they need to pass but in grades 8-9 I think you have little bit of more lieu way where you could actually take them out on outings now the big classes are definitely a constraints if you have smaller group if will be more manageable and the expense is an other so if the companies could sponsor you know outing for school once a year to some place, I mean Gobabib are 100 km from here and learners could, because Gobabib is actually a nice environmental Education Centre if we could take our learners there it could be wonderful, if somebody can sponsor that most of the learners cannot afford that trip, you know that will be bus trip there and back, we also do not have busses the Ministry could also supply maybe a buss and it need to be , we can take say all grade 8 there, that's over a hundred learners there is not a space there and hundred learners don't benefit because of that there will be just big chaos and they will just have fun and learn nothing so one need to take smaller groups out and then again it expensive the cost there should really be more time for the learners to be in the environment and do something. I also find that just simply the amount of work that each teacher is loaded with we are so tired of taking a class out for a weekend or even for a day is a major thing.
We also take learners out to aquariums.

Question 8

Teaching strategies how?
Well you know maybe a little bit more of introduction in that way of thinking when INSTANT project was here and in the begin of the 1990's just before we introduce the Cambridge system that has already help me to think in that line and the life science project was also active I attended quiet a few workshop and of

course many of the strategies simply come with experience you eventually knows what works and what the learners enjoys and how they learn better and so-on.

Question 9

I think that my own personal view of what LCE is maybe slightly different from what many people think, what many people think is allowing learners to discover everything by themselves and more or less living them to themselves so that they can find out their own things that I could not agree with at all because I think nothing really, especially in science when many concepts are difficult and they will not learn anything from that my own personal view on LCE is to make learners the most important being in the class but different from just leaving him and I do my own work here and they carry on you know you sit them together in groups and get them something to do and then I go and mark and that I don't, and many people understand that, that is LCE but it me learner centred education is making the learners participate, they must do all the work they must participate they must be active they must draw and discuss and observe, and ask questions and do all things so as long as they are busy with what I am trying to teach them, then I think that is learner-centred education whether I am standing in front or in a middle or go though the rows that doesn't make any difference to me in any case, I am you now always in two minds about this LCE I must be quiet honest.

Question 10

Ja, first of all I always, the basis of my teaching approach must be discipline and then the second approach is the learners must be active, and they must all be active with what I am trying to teach them and they must have some activity now the activities be many. I can mention a few, they can for instance draw something, you know even if you put a diagram on a overhead projector and teach them how to draw and occasionally in the lesson you asked them to draw something that does not need to be complicated just simple little diagram so that

they practice drawing and also that they have to look and draw, and look and draw that teaches them to observe and concentrate on what they see because ja their brains are active hands are active and they are seeing and so on and making notes for instance are helping them to make notes that teaches to become more systematic and clear in their own thinking and you have to teach that from grade eight onwards and you teach first of all. I don't go with this thing that you must write notes on board and they must just copy it that to me is unacceptable you teach them some things and then you say lets now make notes, and then beginning you can dictate and leave out words and you say okay now what word must come here how should you express it, so that the learners see how you are making the notes, you are making together with them and for them they have to think they just not have to copy what you are saying or you know, you leave out words the important words like during photosynthesis the ….takes up now what the word that comes in here now and so you can make it a more complicated in grade 9 and more complicated in grade 10 and by the time they are in grade 11 they can actually all take wonderful notes no problem what's so ever but you have to teach it and you have to check their books that the notes are systematic that they have underline headings and what belongs to what, and it's not that is not chaotic I cannot read, 'ja' then you know little things like helping to measure things, what I do is take a beaker of water and I go around and everybody put his finger in and tells me what they think the temperature is and they have to write down, and I then take the thermometer put it in and they have to read it of and compare what they thought was the temperature and the real temperature so and also making drawing lines so that they measure and see what a difference between centimeters + millimeters, all these little things that they can do you know, you can do little experiments that in physical science as will whether measure the hand spans and write it down and then you can carry on from there you know how to do a statistical table and carry on graph they are quiet interested in their hand span or their height or their shoe size or whatever so you know they coming really scientific and measuring and of course with the observation while you can make them observing a picture or Over Head Projector or you know two different animals or what ever plants and then tell the

difference and similarities and put it in to a table and that is actually extremely helpful, if you know taught the subject especially with lot of information teach tem at end to make a table so that it all you now categorize so that they can easily learn from that.

Yes is think, if you say that the learners should be active in their own learning process I think that sort of No. 1. If you as a teacher have to first of all think about what to you actually mean by activities and you, you cannot sit at one side you must actually see that each learners is actually benefiting from those activities and check on him or her how he/her is progressing and what is he doing does he understand what he has to do so you have to be around and busy all the time. One of the thing teaching life science is also that you must try and teach the learners like a little bit more realistic and scientific approach to life and not just trying to get of these magical thinking you now that to me and unprejudiced thinking that is also what life science should teach and objective thinking, that is also what life science should teach and objective thinking, how to become objective, unprejudiced and scientific you know more realistic approach to life

APPENDIX E

OBSERVATION SCHEDULE

Name……Grade……

Date……..Time……

Environmental Education: Investigate the teaching strategies used by teachers to foster environmental learning in Life Science Curriculum.
A case Study.

Participation by the teacher (What are they doing and why?)	
Participation by the learners (What are they doing and why?)	
What materials are being used?	
Where the materials appropriate for the learners? Explain.	
How did the teacher use the materials?	
What activities are done by the learners and how are they involved?	
How do the activities link to the curriculum?	