

ENVIRONMENTAL EDUCATION IN NAMIBIA: A CASE STUDY OF THE BIOLOGY TEACHERS

By

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DECLARATION

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ABSTRACT

The focus of this study is on Biology teachers in selected Namibian schools. The researcher seeks to understand how Biology teachers implement Environmental Education (EE) as part of the Biology curriculum as is mandated in the curriculum policy. Literature indicates that the EE curriculum and the science curriculum are underpinned by different philosophical and pedagogical perspectives. This prompts the research questions, and the subsequent research reported on in this thesis.

During a case study guided by a qualitative interpretive paradigm, Biology teachers and Biology advisory teachers are interviewed about their experiences and actions and invited to make suggestions. In addition curriculum document analysis and observation are used. The data point to the aspects that can facilitate the implementation of EE in the curriculum,

However the implementation of EE is associated with many obstacles and challenges. Teachers struggle to implement EE because of an inadequate understanding of EE and its underlying philosophy. Further enhancement of EE will also require the reduction of tensions between policy and practice, logistic barriers, and the gap between EE and science, while increasing the involvement of teachers in curriculum development, collegiality among teachers and principals, teachers and advisory teachers' knowledge of EE, teachers and advisory teachers' curriculum understanding and professional support.

Teachers cannot achieve the objectives of EE unaided; therefore the establishment of EE co-coordinators in schools is suggested, since schools have failed to implement EE without such support. In addition, it is suggested that activity systems be studied in totality and that boundaries be crossed to enrich the outcome of EE. . Subject advisors are mandated by the government to support teachers experiencing problems, and it is suggested that ideas linked to the activity systems and activity theory be investigated and implemented to solve the problems. This should improve the implementation of EE as part of science teaching in the schools where the study was conducted and in other schools.

OPSOMMING

Die fokus van hierdie studie was op biologie-onderwysers in geselekteerde Namibiese skole. Die navorser probeer om te verstaan hoe biologie-onderwysers Environmental Education (EE) implementeer as deel van die biologie van die kurrikulum wat in die kurrikulum beleid mandaat. Literatuur dui daarop dat die EE kurrikulum en die wetenskap kurrikulum word ondersteun deur "anders" filosofiese en pedagogiese perspektiewe wat die navorsing vrae gevra, en die daaropvolgende projek berig in hierdie tesis. Het egter Biologie-onderwysers se pre-diens onderwys sluit nie EE.

Tydens 'n gevallestudie gelei deur 'n kwalitatiewe interpretatiewe paradigma, is biologie-onderwysers en biologie raadgewende onderwysers ondervra oor hul ervarings, aksies en voorstelle. Kurrikulum dokumente is ontleed en waarnemings van onderwysers in klaskamers in Benewens onderhoude en dokument-analise is gebruik.

Data dui daarop dat die implementering word omring deur baie struikelblokke en uitdagings. EE is beperk tot opvoeding oor die omgewing en word gelei deur wetenskapsfilosofie. Dit lyk asof daar 'n gebrek aan begrip van EE en sy onderliggende filosofie deur onderwysers. Die meeste onderwysers noem baie struikelblokke as struikelblokke tot die implementering en dit sluit in logistieke hindernisse, en die gaping tussen EE en wetenskap, 'n gebrek van die betrokkenheid van onderwysers in kurrikulumontwikkeling, 'n gebrek van kollegialiteit onder onderwysers en skoolhoofde, gebrek aan onderwysers en raadgewende onderwysers se kurrikulum begrip en professionele ondersteuning. Terwyl, dokument-analise het gewys op die spanning tussen beleid en praktyk,

Verdere data wys na die aspekte wat kan ondersteun as die inlywing van EE in die kurrikulum EE implementering, Biologie word gesien as 'n goeie voertuig vir EE, onderwysers benaderings is kennis van leerder, onderwysers se houding teenoor die implementering is positief. Advisory onderwysers kennis van hul algemene verantwoordelikhede, maar hulle lyk nie te verstaan hoe dit is van toepassing in EE weens gebrek aan EE kennis.

Onderwysers kan nie die doel bereik sonder hulp, dus die vestiging van EE mede-koördineerders in skole word voorgestel, aangesien skole het misluk EE te implementeer sonder ondersteuning. Daarbenewens word dit voorgestel dat die aktiwiteit stelsels in totaliteit bestudeer word en dat die grense oorgesteek om die uitkoms te verryk. In hierdie verband, vakadviseurs mandaat deur die regering om onderwysers te ondersteun wat hindernisse ervaar, en daar word voorgestel dat die idees gekoppel aan die aktiwiteit en aktiwiteit-teorie ondersoek word en geïmplementeer word om die hindernisse aan te pak. Dit moet EE implementering te verbeter as deel van die wetenskap-onderrig in die skole waar die studie gedoen is.

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LIST OF ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
BETD	Basic Education Teacher’s Diploma
COL	Commonwealth of Learning
DANIDA	Danish International Development Agency
DRFN	Desert Research Foundation of Namibia
EE	Environmental Education
HIV	Human Immunodeficiency Virus
MASTEP	Mathematics and Science Teachers’ Education Programme
MBESC	Ministry of Basic Education and Culture
ME	Ministry of Education
MET	Ministry of Environment and Tourism
NEEN	Namibia Environmental Education Network
NGO	Non-Governmental Organisation
NIED	National Institute for Educational Development

PACSICOM	(Pan-African Conference on Sustainable Integrated Coastal Management)
PD	Professional Development
RDDA	Research Development Dissemination Adoption
SDF	School Development Fund
SIDA	Swedish International Development Cooperation Agency
TEYLS	Teaching English to Young Learners
UN	United Nations
UNAM	University of Namibia
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation

CHAPTER 1

BACKGROUND AND INTRODUCTION

1.1 Background and Introduction

The biophysical environment, in some instances and contexts, suffers as a result of human action which impacts on it in various ways (Reddy 2008:168). Human action and its resultant impact on the environment become more apparent as the human population increases. This increase has led to the need for more food, more housing, and an increase in business and industrial activities to cater for and accommodate the larger population. In order to satisfy these increasing needs, production styles needed to change from the manual way of doing things to the technological way, and from the natural to the scientific (Reddy 2008:168) as science-led technology is able to turn out products faster. However, the transformation also causes an increase in environmental problems. It cannot be denied that the increase in the application of science and technology increases environmental problems.

Janse Van Rensburg (1994:3) also identifies features related to modernity (uncritical belief in science, uncritical belief in material progress, the prevalence of the notion of the individual, the preoccupation with the structure of phenomena as determinants of their function) which she claims aggravate the environmental crisis. One of these features is directly related to science as a cause of environmental problems. White (1998:49) substantiates this view by noting that environmental problems increased after 1850 when the whole world adopted the use of science and technology. White (1998:49) observed and noted smog problems in London around the year 1285. The smog was caused by the combustion of fossil fuels. According to her, combustion of fossil fuel now has an even greater effect than before. Other resultant problems are problems related to waste disposal, loss of biodiversity, deforestation, desertification, global warming and general environmental degradation.

In Namibia environmental problems were witnessed during both the colonial and post-colonial eras. In her speech at the official opening of the scientific symposium on biodiversity and development in Windhoek, Minister Netumbo Nandi Ndaitwah of the

Ministry of Environment and Tourism remarked that, “We have really been experiencing negative things recently”. She mentioned that the destruction of the environment is a national loss and referred to recent problems such as the killing of lions and the landing of a helicopter on Mercury Island which killed many birds and destroyed their eggs and nests (Shigwedha 2010:1). This has shown that the neglect of the environment by the global human population is not something that Namibia is immune to and there have been urgent calls for action both in Namibia and elsewhere.

Therefore, there should be a good relationship between human beings, other organisms and the entire environment, but if the relationship contract is broken, the system breaks down and that affects everyone in it. The overuse of natural resources mentioned in the first paragraph shows that the mutual-commensalistic relationship is interfered with and disturbed by human action.

It seems that initially not much attention was paid to the impact of human action on the environment because of the perception that scientists are capable of solving environmental problems through the application of scientific and technological means (Gough 1999:1). However, these human expectations were not met and the trust of some people in science faded as people became more aware of the limitations of science through the writings of early researchers such as Rachel Carson (Gough 1999:1). That led to the search for a better way of addressing environmental problems.

Many international conferences have been organised since 1970 in order to address these problems. They are mentioned below in the order in which they took place:

- The International Union for the Conservation of Nature in Nevada USA in 1970
- United Nations Conference on the Human Environment in Stockholm 1972
- The Belgrade UNESCO Conference on Environmental Education 1975
- The Tbilisi Intergovernmental Conference on Environmental Education 1977
- The Moscow UNESCO-UNEP Congress in 1987
- The Rio de Janeiro UN Conference in 1992
- The Johannesburg UN Summit 2002

At many of these conferences education was identified as a way to address environmental problems. This has also been the case with other common problems

such HIV/AIDS, teenage pregnancy, religious problems, gender and so on. For example, the first conference in Nevada, USA in 1970 resulted in the defining of environmental education as “ the process of recognising values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man, his culture and his biological surroundings” (Loubser 1992:92; Gough 1993:8; Bornman 1997:58).

Huckle (1996: xii) assert that societies can attain sustainable living in a short time through education. However during the conferences that took place before the 1978 conference, it was believed that environmental problems could be solved through education by using scientific approaches. It was said that “education utilising the findings of science and technology should play a leading role in creating awareness and a better understanding of environmental problems” (Gough 1999:1). Gough however also said that later there was deliberation on a better way of educating people on the environment.

1.2 Problem statement

There have been sharp increases in the prevalence of ecology in formal education since 1970 (Robottom 1983:27, Ashley 2000:275). According to Le Grange (2001:40) “In many of the early education responses the concept of “environment” was perceived to signify “nature” or, as in the discipline of Ecology, the focus was mainly on biophysical surroundings”. This, Le Grange (2001a) says is a narrow understanding of EE and it is contested. According to him many environmental educators now acknowledge that “environment” includes interactions between social, economic, political and biophysical dimensions. Biology as a science subject also has an EE component (Ecology).

In discussing the links between EE and science, both Ashley (2000:273) and Hart (2002:1241) state that in order to understand the bond between environmental education and science it is important to understand what underpins each. Hart (2002) indicates that clarifying this concept is imperative because adding environmental teaching to the teaching of science involves a change in philosophical and practical perspectives that goes far beyond the simple addition of an environmental science unit to a science curriculum.

Hart (2002: 1247) describes science as a discipline which is restricted to theoretical knowledge, is experience-based and is restricted to cognitive information. Cognitive values according to Ashley (2000) involve 'accuracy, consistency, scope, simplicity and fruitfulness which are the process-oriented values that allow us to judge scientific theories'. For scientists, the truth depends upon the availability of evidence to prove if something is correct (Ashley 2000:273). Science is taught using approaches typical to it and active learning is not included in these approaches (Hart 2002:48).

The values in EE are not related to the cognitive as described in the previous section (Ashley 2000:273). In EE, values are contextual and EE favours practical ways of knowing which are however also based on research and effective knowledge. Therefore the curriculum supporting EE should be shaped by approaches listed by Hart (2002:1247) as 'student engagement, personal experience, student reflection and action-oriented group activities in natural settings'.

Since the introduction of EE in the form of Ecology in science (Biology), teachers have embraced it, but they taught it using the philosophy developed for teaching Science and linked to ideas of the discipline of Science (Evans 1988:136). That was the reason why Robottom (1983: 27) argues that science subjects are the wrong place to teach environmental education because sciences are taught differently from the way EE should be taught. Teachers should be acquainted with the ways in which EE is best taught.

Methods of education need to change to accommodate the new EE chapter or orientation. This led Koichiro Matsuura, the Director General of UNESCO, to plead that education be structured in a way that can address the social, cultural and environmental problems that the world is experiencing in the 21st century (Robottom 2007:90). Other voices have called for education which is able to train learners to be critical agents who can change the world in which they live and emancipate themselves (Huckle 1996:106; Lotz Sisitka 2002:100; Lane and Wilke 2005). Since this type of thinking is not usually encouraged by Science teachers, there should be a change to an inclusive form of education, if the education goals mentioned above are to be achieved.

In formal education, the role of the teacher is very important if education is to address environmental issues. Fullan and Hargreaves (1992:28) say that teachers influence the life and development of the children. They reinforce this by saying that the moral role of teachers is more important today than it was before because school is the only social institution left. They say further that the realisation of the importance of teachers in bringing about changes, results in more attention being focussed on professional development so as to provide teachers with the knowledge they need to do what they are trusted to do. They also feel that teachers can only succeed in performing their role if the whole school is involved because teachers don't work in isolation.

Thus, any obstacle that hinders teachers from incorporating EE in their curriculum should be identified and addressed with immediate effect to simplify the teaching of EE. It was at a conference in Johannesburg (South Africa) in 2002 that the United Nations declared a Decade of Education for Sustainable Development. Countries were encouraged to double their efforts to achieve the required education targets (<http://www.unesco.org/en.esd/>). The targets include improving the state of environmental education by ensuring that EE is introduced both in teachers' education and in schools. In response to the demands of the "Decade," some colleges have introduced EE in teachers' education while some countries introduced EE as part of their school curriculum.

To be more specific, EE is incorporated in the curriculum in Namibia, and curriculum documents favour the combination of science and EE, stating that teachers should aim "to understand the importance of the endangered natural environment and how the problems related with it can be solved" (Ministry of Education 2009:23). The Biology curriculum, in addition, has an EE component (see appendix B). The introduction of EE can be regarded as the fulfilment of the demand by the Decade of Education for Sustainable Development (DESD).

Prof Kasanda of UNAM describes the situation of environmental education in Namibia in the following way: Namibia has made an effort to include EE in the curriculum as some subjects have EE components while subjects like Life Science (a grade 10 subject) are introduced to cater for EE (Kasanda 2009:150). He also mentioned some challenges

which are faced in Namibian schools which might hamper the implementation of EE. He said that the primary education teachers are trained in EE but the training is very basic, and probably not enough to enable the teachers to convince the learners about the importance of EE. He also pointed out that UNAM's faculty of education does not prepare teachers in secondary school for EE, and therefore little attention is paid to EE at secondary level.

The four colleges of education in Namibia have introduced EE although the University of Namibia (UNAM) has not yet done so. (Kasanda 2009:153). UNAM is responsible for training Biology teachers who are the focus of this study. Although I realise that there might be a gap in the knowledge of EE, I have been hesitant to generalise and state that all the UNAM graduate teachers including Biology teachers, teach EE with of EE implementation, namely, **“How do biology teachers in Namibia implement EE in their teaching?”**

In the light of the above discussion and the research question, an attempt will be made to address the research question by using the following sub-questions:

1. How do science teachers respond to the inclusion of EE in the curriculum?
2. How is the implementation of EE supported?
3. How were teachers involved in curriculum development?
4. What are the general views of Biology teachers and advisory teachers on the incorporation of EE in the Biology curriculum?

Sub-question 4 was developed because O'sullivan (2002:227), Ministry of Basic Education Sport and Culture (MBESC 2004:10) Leu, Hays, Leczel and O'Grandy (2005:15), and some government documents such as ME (013:1-2) indicate that the advisory teachers are the main source of teachers' professional support in Namibia and that they monitor the implementation of the curriculum. My interpretation of their duties is that they should also be able to support the teachers of EE because it has become part of the curriculum. This means that teachers do not work in isolation but they have

advisory teachers as their mentors. Thus, a study that deals with how teachers implement the curriculum cannot ignore how teachers get support.

1.3 Significance of the study

This study was motivated in the first place by the knowledge gap I experienced during my studies. I was admitted into the field of curriculum studies with the intention of continuing with Biology, the subject I taught for seven years. Unfortunately, Biology was not offered at Stellenbosch University in the BEd Hons programme in 2009, therefore, I was introduced to Environmental Education. Even though I experienced EE as difficult and I did not perform as well as I did in other subjects, I was able to recognize my lack of knowledge. It was because of that lack that I decided to take up EE at the master's level as I like learning new and challenging things.

In May 2010, I paid a visit to a welcoming Mr Samson at the National Institute for Educational Development (NIED) in order to obtain information on environmental education in Namibia. Although not much was discussed due to a lack of time, I received an official invitation to attend a meeting related to environmental education at NIED, Okahandja. I attended the workshop which ran for three days with the purpose of finding a topic for my study from which I could formulate a research title. Nothing attracted my attention until the last day. Towards the end of the workshop, the participants criticized UNAM for not showing up at workshops related to EE as they perceived UNAM as not serious about EE.

Incidentally, I had graduated from the same university with Biology as a major subject but during this workshop I realised that my teacher's education did not prepare me to teach EE. That realization therefore answered the question which had remained unanswered for the whole of 2009, that is, why EE was new and very challenging to me. I decided to focus my research on this area. At that point, I still did not know whether EE was part of the curriculum but I knew for sure that I had never taught EE in the way it should be taught and I did not know that the ecosystem aspect of Biology was associated with environmental education Prof Chris Reddy (my supervisor) advised me to study the curriculum document and I found that EE is part of the curriculum in many ways. Therefore, with his help, I narrowed the scope down to Biology. I became more

motivated because the subject taught for seven years also surfaced in my study. I was to study how EE is introduced into the Biology syllabus.

In addition to the motivation, I was convinced that if I returned to the classroom, I would teach environmental education in a better way because of my involvement in this study. Thus, I hope that other Namibian teachers who have not studied EE as part of their training will be inspired by the research to revisit the way they understand and teach EE and thus improve their teaching of EE. In other words, this study is motivated by the will to study and to empower others who may still experience the same knowledge gap that I did. Mentoring others to improve their teaching of Biology has been part of my activities during my spare time in both Ruacana High School and other schools in the region and I intend to use my expertise in EE to empower my Namibian colleagues.

Most secondary school teachers in Namibia are graduates of UNAM, the only institution in the country which trains teachers for senior secondary education (Grade 11-12). One of the aims of the study is to find out how teachers who are not trained to teach EE, teach it, but also to assist UNAM to make an informed decision on whether it is important to implement EE or not. It is in a sense a provocative research that could help UNAM to speed up the process of introducing EE, based on the need identified in this research. However, the study cannot be limited to Biology teachers and teachers in Namibia or to UNAM, but is applicable anywhere in the world where similar experiences are manifested.

In summary, this research project has been motivated by the desire to understand Environmental Education and Education for Sustainable Development from the perspective of Biology education at the secondary school level in the Namibian context. The study is important in the following ways:

1. It is important to understand environmental education which is required in all the learning areas including natural science which includes Biology, the subject I teach.
2. The findings of the study can help institutions of higher learning which did not introduce EE, to consider how teachers experience the incorporation of

environmental education, and to make an informed decision on whether to incorporate EE or not. In this way, teachers will benefit from the study.

3. When the subject of environmental learning has been identified and rectified where necessary, it could benefit the country and its environment, and thus, the whole world.

1.4 Methodological framework

The interpretive paradigm helped in the interpretation of teachers' and advisory teachers' responses which were collected through interviews and classroom observations. This is possible because it is assumed that human actions are guided by reasons which are shared through language and other forms of symbolism (Conole 1993:7). This assumption enabled me in respect of these case studies to operate within a combination of methods. The case study as a research method design provides the opportunity to employ many methods of collecting data (Babbie & Mouton 2001:281). The process was initiated while trying to abide by the research ethics in general as well as the requirements of the research committee of the University of Stellenbosch, in order to validate the outcome of the research. The data collected is therefore analysed using the thematic form of data analysis (Chapter 3 contains the detailed plan).

1.5 Scope of the research

Kanyimba (2009:18) refers to delimitation as "the boundary set by the researcher and the aspects that he/she imposes on the study in order to facilitate its implementation". This refers to measures put in place to narrow down the coverage of the study in order to make it manageable. EE can be taught formally as well as informally, but in this study the focus will be on formal education. Only biology teachers trained at UNAM and the advisory teachers for Biology in government schools in the Khomas and Omusati regions will be interviewed during this study. The content of the study will be limited by the research question and the sub-questions posed.

1.6 Chapter outline

Chapter 1 – is a brief description of the background of the study, the problem behind the study and the motivation which encouraged the study.

Chapter 2 – This chapter comprises a Literature review

Chapter 3 – In this chapter, the research procedures planned are presented. The text includes methodology and research methods suitable for collecting data and for analysing data in the context of this study. Measures ensuring the reliability and validity of the study are also covered.

Chapter 4 – In this chapter data that emerged from the analysis is presented, interpreted and discussed.

Chapter 5 – In this chapter conclusions are drawn and there is further discussion.

Chapter 6 – Since this research cannot solve all the questions related to the subject, recommendations for further studies are made in this chapter. Other recommendations are also made about how EE implementation can be improved in Namibia. Also included in this chapter, are reflections on study methods, problems faced during the study as well as the perceived successes.

In the next chapter (Chapter 2), literature related to the field of environmental education, curriculum and EE, and science and EE issues will be reviewed. The review will serve as a backdrop to the study and will inform the discussion and interpretation of data, as well as the conclusion.

CHAPTER 2

LITERATURE REVIEW AND DISCUSSION

2.1 Introduction

In this chapter, literature related to the main ideas in this research project will be reviewed. These include environmental education as well as ideas linking science and environmental education and a review of curriculum documents related to teaching EE as part of the biology curriculum in Namibian schools.

2.2. Defining Environment and Environmental Education

Environmental Education (EE) is recognized as a new approach to teaching (Loubser 1997:24; Lee 2000:96). Unfortunately this contributes to its being underdeveloped and unstable in the way it is integrated into curricula (Bornman 1997:57). Other factors closely related are the misunderstanding of EE and how it should be taught. Thus, it is important to define the concept of environmental education and make it understandable for those who are not familiar with it. . Clarifying what environment means will be done before Environmental Education is discussed as a concept

2.2.1. Environment

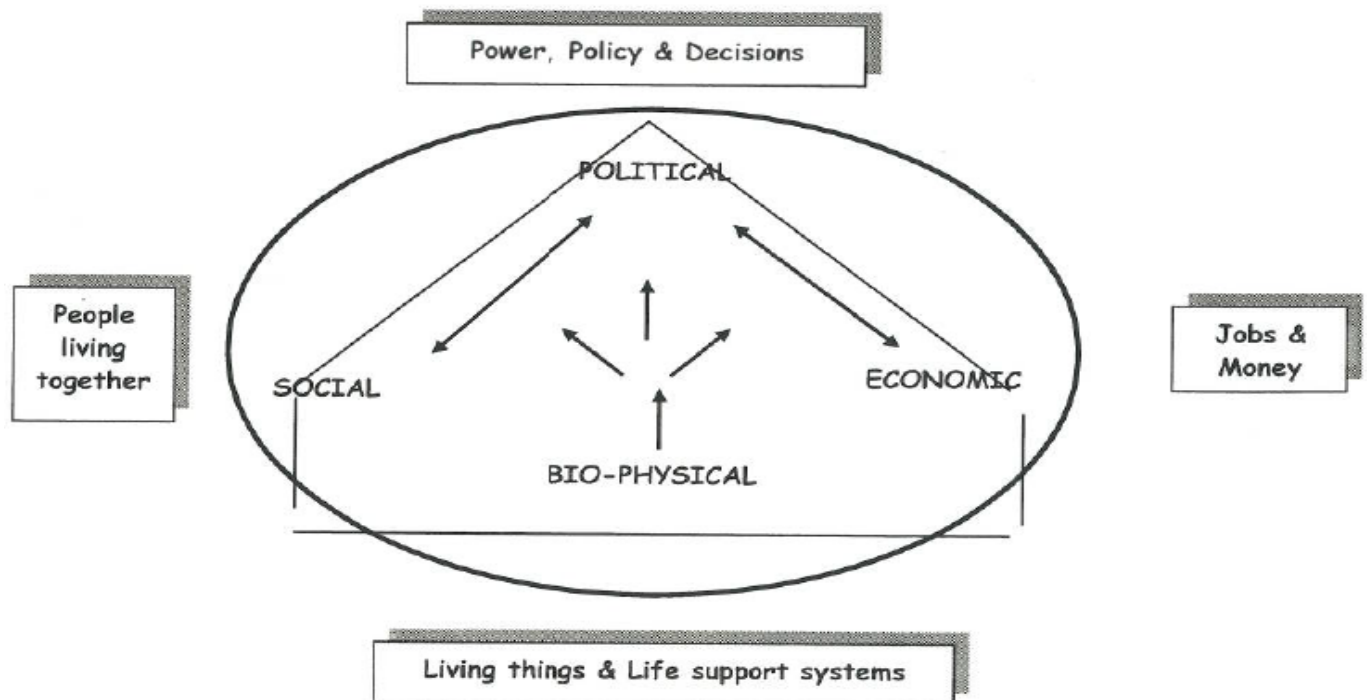
Humans initially considered things in their surroundings to be part of the environment and excluded themselves. Loubser (1992:92) asserts that the environment is sometimes seen as the people's "personal sphere". He states that humans do not consider themselves to be part of the environment but as superior to it, and in control of the other components of the earth. Dreyer and Loubser (2005:144) also affirm that everything surrounding human beings is part of the environment, that is, both "natural and human made", which also suggests that humans are excluded from the environment. This means that people who look at the environment in this way, look around themselves to pinpoint things which surround them, thus describing the environment and excluding themselves.

It is however understood nowadays that everything in the environment including human beings are part of the environment. According to Gough (1993:7), humans cannot be disconnected from the environment. Loubser (2005) also argues that even if human beings are considered the heart of the environment, the environment also includes other

organisms and non-living structures and factors which affect them. This view implies that humans are part of the environment just as other components of the environment are, because the environment is a space where all the living organisms live and interact with non-living factors.

It can thus be seen that our understanding of what constitutes the environment has passed through various stages of consensus and disagreement and that it changes every day. New things are produced and manufactured and they become part of the environment. The environment therefore not only consists of the physical elements and those biological in nature but also of various aspects linked to human activities. The following diagram which shows the environment as a relationship between biophysical, economical, political and social factors implies that the construct environment is a product of these interactions (Janse Van Rensburg 1994:1; O' Donoghue 2002:133; De Vries 2005:6; Reddy 2008:167; 2011:7).

Figure 1: Interaction dimensions of the environment



Source: O'Donoghue and Neluvhalani (2002:133).

In the diagram above, various dimensions of the environment are indicated and these are briefly explained below:

- Economy – involves jobs, money and the exploitation of resources;
- Political – is linked to issues of power, policy and decisions;
- Social – concerns the interaction between people in their communities and daily lives/
- Biophysical – refers to the natural environment including living organisms and non-living factors such as air, soil and water (Van Rensberg 1994:1; De Vries 2005:6; Reddy 2008:169).

According to Reddy (2011:7), Figure 1 above shows that:

Environmental problems have multiple and interacting dimensions and that the biophysical dimension forms the base that supports all life and all human activity, manifesting in the interacting social, economic and political dimensions. The environmental problems described above are largely evidenced as a consequence of negative socio-ecological interactions. These have been linked to humankind and are often seen as contested problems with varying interests, and are therefore described as environmental issues.

The interaction between these dimensions and the negative consequences of the human-nature relationship is often seen as the cause of multiple environmental problems perceived as the environmental crisis (Janse Van Rensburg 1994:3).

2.2.2 Environmental Education

The increase in the intensity of the real or perceived environmental crisis has focused attention on the need for education to include and focus on the environment. This led to the connection of the term environment with education to produce environmental education. This link was concluded, conceptualised and reinforced at many international conferences which strove to remedy or reduce environmental problems. So far, there is no one “universally” used definition of environmental education (Squazzin, 1998:13). Moreover, some researchers such as De Vries (2005:5) find it difficult to define environmental education, as they fear that doing so might narrow down how EE may be viewed. This seems to indicate that EE is a sensitive phenomenon/subject and is prone to debate regarding what is included and excluded. Nevertheless, the researcher finds it

important to attempt to define environmental education as the definition provides a particular perspective on environmental education, which many teachers, especially those who did not study it as part of their pre-service training, are unfamiliar with.

Environmental education is often defined according to its aims and objectives. The narrower the aims set for EE, the narrower it is defined and vice versa. When the components of the terminology are defined, the term itself can also be defined and it can be adjusted to suit the situation and the aims. The definition may also be left open to interpretations, debate and new developments on purpose. Different aims and definitions of EE will be examined in this chapter.

The first definition of EE developed by UNESCO (1968) is “ the process of recognising values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man, his culture and his biological surroundings” (Loubser, 1992:92; Gough, 1993:8; Bornman, 1997:58). The definition developed at Tbilisi a decade later is not very different from the first. The 1968 definition, and later definitions say much the same thing using slightly different words. The Tbilisi definition states that “EE is a learning process that increases people’s knowledge and awareness of the environment and associated challenges, develops the necessary skills and expertise to address the challenges, and fosters attitudes, motivation and commitments to make informed decisions and take responsible action (UNESCO, Tbilisi declaration: 1998).

Using the definitions given above I understand EE as the act of equipping students with knowledge and skills to be observant and vigilant of their own actions and those of others at all times, to discover any social, political and economic disturbance of the environment, to engage critically in collaboration relationships with others to prevent new environmental problems and to resolve environmental problems in their communities and in the world as a whole. My understanding is inspired by Ashley (2000:278) who argues that learners in the twenty-first century should be prepared to be critical of science which has been implicated as part of the cause of environmental problems and of any other cause of environmental problems, known or not yet known. It

is also inspired by Le Grange and Reddy (1997:13) who noted that EE is intended for social change; thus, it should be shaped by critical and creative thinking.

2.3 Understanding of Environmental Education in the Curriculum

The understanding of EE has gone through various developments over time. According to Ajiboye & Silo (2009:142) the understanding and knowledge of EE determines how it is taught. They state that, “the schools’ interpretation of EE had influenced their epistemological and pedagogical discourse”. At present, three views or orientations to environmental education, as outlined by Lucas (1972) in his PhD dissertation, are recognized by scholars in the field. They are education *about*, *in/through* and *for* the environment. In order for teachers to make an informed choice about which one or which combinations of the three is the best for teaching EE, their knowledge of these views is imperative. I outline core ideas related to each in the sections below.

2.3.1 Education about the environment

Robottom and Hart (1993: 20) and Dreyer and Loubser (2005: 138) say that the more desired field of environmental education should include the following principles which are considered successful in environmental learning:

1. Learning should be based on knowledge about environmental problems.
2. Learning should involve the development of skills required by learners in their EE studies and in solving environmental problems.
3. Environmental learning should be linked with the affective domains such as attitudes, values and commitment.

According to Robottom and Hart (1993:20), the knowledge part of environmental education is referred to as education about the environment. They say in addition that “there is need of a continuous emphasis on teaching of information about the living and non-living components of natural and human made systems of various kinds, and their interrelationships”. The importance of learning about the environment according to Robottom and Hart (1993:20) is to prepare students to work as “national park rangers, outdoor centre operators, teachers of environmental education and so on”. These students learn information about ecological concepts, nature and ecological systems.

Robottom and Hart (1993:20) additionally suggest that the content learned by students is to be found in subjects like Biology, Geography and Natural Resources Management where the content exists as a component of the curriculum. These components are developed by drawing up learning objectives followed by translating objectives into “instructional reality”. The objectives, according to Robottom and Hart (1993:21), are developed using the environmental education aims to guide the curriculum development which is done through the positivist way of knowing which follows the processes of Research, Development, Dissemination and Adoption of the curriculum (RDDA). Through this process of curriculum development, experts develop the content and curriculum materials. The development according to Robottom and Hart (1993) excludes the local communities, thus teachers transfer the knowledge which is prescribed to them without the input of the local people.

Other researchers also point to education about the environment as cognitive based environmental learning. Cognitive processes are processes which involve the memorisation and mere recall of the knowledge and information (Killen 2004:67). Le Grange (2001:37) refers to education about the environment as “...the knowledge about natural systems and processes”. It also “... aids the acquisition of knowledge and understanding, helping in the development of sensitivity and awareness of the environment on a local, national and global basis” (Bornman 1997:60). This can be understood as getting acquainted with the information on what is happening to the environment. In formal education, information is mostly gained through reading, classroom engagement with others, and through lecturers.

Some of the researchers however describe how difficult it is to use memorised information to develop values in learners. For example Dreyer & Loubser (2005:139) and McClaren & Hammod (2005:276) argue that learners experience difficulties in transferring the knowledge and skills learned into solving problems around them, but they acknowledge at the same time the importance of information. On the other hand Le Grange (2001:38) states that the end product of education about the environment is simply knowledge and understanding which are suitable for the preparation of learners for employment, and which does not have an impact on values.

2.3.2 Education in/through the environment

Learning in the environment refers to taking field trips and excursions during which learners go out into the environment. Robottom and Hart (1993:22) summarise education in the environment as:

1. The best knowledge of environmental knowledge is the environment itself, not the systematic body of information found in textbooks and formal lectures, in which experts set objectives to be learned
2. The best way of environmental learning is through interaction with the environment
3. Learners learn “empathetic insight, emotional commitment and understanding of particular environmental situations.
4. The important outcome of environmental education is acting morally and effectively in preserving the environment.

These points made by Robottom & Hart (1993) describe environmental education as learning through the lens of the environment for the purpose of acquiring skills which students may need to preserve the environment. Learning in the environment is similarly defined as gaining skills which can be used for problem-solving and decision-making (Bornman, 1997:60). These refer to going beyond the knowledge and understanding of the information to gaining knowledge through hands-on activities related to the environment. This is normally done by engaging learners in field excursions during which they relate what they learned theoretically to the real life situation.

McMaughton (2007:632) and Ballantyne & Packer (2002) are concerned because for most teachers an excursion means travelling long distances. The trips are costly and therefore not often undertaken. McMaughton (2007) advises that teachers should be prepared to consider the local environment as an important learning environment and reduce costs.

2.3.3 Education for the environment

In order to achieve the broader aims of EE, the purpose changes from teaching nature and conservation to involving other dimensions of environment such as the social and political (Janse Van Rensburg 1994:1; Johnson and Mapping 2005:3; Reddy 2008:168). They refer to the change from education *about* and *in* the environment to education *for* the environment. Johnson and Mapping (2005) also describe the education for the environment approach as the creation and application of environmental knowledge for social, civic and political action which can lead to behavioural change and policy formulation. Robottom and Hart (1993:23) indicate that education *for* the environment refers to “the development of a commitment to work personally and cooperatively for a better physical and social environment and to apply the knowledge and skills acquired in action programs”. They indicate that, knowledge and skills are also important but they are best achieved through investigating real environmental issues. Robottom and Hart (1993:24) in addition support a curriculum which has the following characteristics:

- It is based on real problems,
- It clarifies values,
- It makes use of both ecological and interdisciplinary skills and concepts,
- It is socially critical,
- It is action oriented,
- It encourage the development of a sustainable environment and
- It involves students working together in groups.

The curriculum which Robottom and Hart say should be developed is a collaborative relationship between students, teachers and the community to investigate real environmental issues in the local environment (Robottom and Hart 1993:24; Le Grange 2001:38).

This approach to curriculum development and teaching is new to students, teachers and the community. Robottom and Hart (1993: 24) state the following about the new roles of these stakeholders:

“This form of environmental education curriculum gains its authority not through reference to other disciplines such as biological science, geography, natural resources management and behavioural and social psychology, it gains its authority from the strongly educative processes of collaborative, critical self-reflection within particular practical situations. In a sense this implies a changing role for students, teachers and community agencies, including professional development agencies.”

Dreyer and Loubser (2005:127) note that EE has been understood as teaching in the environment. They however point out that, even if this is considered a good methodology, the purpose of using such a methodology will not be clear until the understanding of education for the environment becomes clearer. Then the best approach to teaching EE can be adopted.

2.4 Incorporation of Environmental Education in Formal Curriculums

Dreyer and Loubser (2005:127) indicate that it is not clear which is the best way to implement EE in formal curriculums. This realization prompted a continuation of the debate. There are different options for the inclusion of EE in the curriculum and four options are recommended, namely, 1) EE as a local problem-solving curriculum action; 2) EE as a component within subjects; 3) integration within subjects; and 4) specialist/distinct causes (Clacherty 1995; Lotz-Sisitka 2002:106; Dreyer & Loubser 2005:128). The options are discussed below but more attention will be paid to the integration option because it was recommended for formal education at the 1992 summit in Rio de Janeiro, and as a result many countries have implemented it.

2.4.1 Environmental education as a local problem-solving curriculum action

In some cases, EE is incorporated into the curriculum of schools by engaging learners in participatory problem-solving of the actual and local environmental issues (Clacherty 1995:4). This can be a collaborative effort between the school and the community. Clacherty (1995) notes that involvement in real situational problem-solving, requires teachers' commitment and enthusiasm. In addition to teachers with these characteristics, the improvement of the school curriculum also needs the involvement of school management and teachers' engagement in environmental action research. As mentioned earlier, commitment and enthusiasm are a major indicator of the success of this approach. Therefore Clacherty (1995) notes in addition that this approach might not

materialize in schools, but in schools where it has materialized, major positive developments have been recorded.

2.4.2 Environmental education as a component within a subject

Certain subjects have a special relationship to the environment, e.g. biodiversity makes up an important part of Biology and therefore, biodiversity conservation becomes an environmental component in Biology. Other subjects also contain environmental components. Teachers may however not be aware of the actual purpose of these components in the curriculum, as they appear in the curriculum without any special distinction being made between them and other components. Consequently, teachers are likely to end up teaching EE components in the same way as other components in the curriculum, using traditional methods. Lee (2000:97) and Kasanda (2009:153-154) note the use of traditional teaching methods in Namibia and China respectively, and conclude that this may affect the teaching of EE. Clacherty (1995:11) argues that the components of EE in subjects should be taught in a holistic way and rejects the view that the production of more technology can solve environmental problems. The Biology curriculum includes Ecology which is seen as environmental education. Reddy (2008:169) who has worked on the Life science (known as Biology in Namibian) curriculum of South Africa observes that biophysical issues are taught as part of EE in Biology while other subjects such as Geography also have topics related to EE.

2.4.3 Infusing environmental education across the curriculum

At the Tbilisi conference of 1977 it was recommended that EE should be viewed in a holistic way. The holistic approach is defined as an education process which considers the environment in total (Tilbury 1995; Bornman 1997:63). Bornman (1997:63) adds that education in terms of the total environment should include the ecological interdependence and take into account the socio-economic, political and cultural processes that affect nature. She notes in addition that apart from the consideration of the total environment, the learners should also be educated in totality by receiving theoretical knowledge, practical knowledge and assistance in the development of values, personal responses and action so that they can solve environmental issues.

This implies in the first place that problems cannot be solved without considering their causes; hence, the holistic view supports education which is based on the identification of problems and all the factors affecting the environment. Secondly, it supports the inculcation of students with all types of knowledge and skills which enable them to develop positive personalities with the capacity to solve problems. Thirdly, it is also true that the holistic view includes educating the whole world population, because no matter what subject combination a learner has taken; environmental education is still experienced as part of the formal curriculum. As stated, the EE curriculum is developed “To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment” (Palmer & Neal 1994:13; Bornman 1997:58).

Many countries have implemented EE in the cross-curricular manner because of the reasons explained above as recommended by the Tbilisi conference. This involves using a theme across all aspects of the curriculum, that is, as a cross-curricular theme. Many educationists continue to debate on how to include EE in the curriculum. Even though the cross-curricular approach is now accepted by most educationists, there is still no clarity on how the EE implementation in formal education should be done (Dreyer & Loubser 2005:127). The cross-curriculum approach is “new” to educators, and the way it is explained by different authors sometimes renders it more confusing. The confusion arises because environmental education has taken a new teaching route in terms of the approach and methods, and teachers are not familiar with it. Moreover, many of them were not taught EE when they were students and some are not trained to teach in a cross-curricular way.

The cross-curricular topics connect a number of subjects (Loubser 1997:25). According to Loubser and Lotz-Sisitka (2002:106), three aspects are related to the cross-curricular approach, namely the integrated approach, the interdisciplinary approach and the multidisciplinary approach. Loubser (1997:25) refers to the integrated approach as the common characteristics between subjects. On the other hand, the interdisciplinary approach draws on the specific content of each discipline to make it holistic, that is, it focuses on bringing together the themes through the lenses of many other subjects. The multidisciplinary approach is described as the situation in which disciplines draw

information from other disciplines. The integration-, interdisciplinary- and multidisciplinary approaches all involve information shared between disciplines.

Hungerford and Peyton (1994:10) associate the interdisciplinary approach with the subject compartment (single subject) and the multidisciplinary with the infusion of a theme in many subjects. The Oxford Dictionary defines the word “inter” as between or from one to another while “multi” refers to more than one. Therefore, since both the interdisciplinary- and the multidisciplinary approaches involve a theme shared between subjects, the two terms imply integration and may be used interchangeably to mean “across the curriculum”.

It is argued that when EE is introduced in formal education through a multidisciplinary approach, teachers who are not committed may not implement it, whereas if it is introduced through the single subject approach, learners may not see how important it is (Le Grange 2001:36; DRFN 2008:24). In the case of environmental education, a number of teachers may currently act as if they are uncommitted because they are not knowledgeable in the field which is new in some countries while in other countries, it is implemented only in theory. I am not trying to give the impression that all teachers are committed, or that all are uncommitted, but that the uncommitted group might seem large at present because many teachers do not understand the teaching of EE and do not implement it for that reason.

Several scholars have mentioned some disadvantages and advantages associating with implementing EE across the curriculum (Hungerford & Peyton 1994:10; DRFN¹ 2008:24; Ajiboye & Silo 2009:142). They claim that it is expensive to implement EE in all the subjects because all teachers will require training and all learners have to be involved in activities. It is also difficult to evaluate the successful implementation since no examination is involved. On the other hand, it is easy to integrate EE into the already existing curriculum because if the approach is properly used, transfer is possible. Another advantage is that training teachers to teach EE does not take as long as in the single subject approach.

¹ The Desert Research Foundation of Namibia

2.4.4 Incorporation as a single subject

Environmental Education may also be part of the curriculum through a single subject implementation. Implementing it as a single subject is common because the subject Environmental Studies has long been taught in the lower primary schools. The upper primary and secondary curriculums could also incorporate EE in a single subject way either as a compulsory subject, e.g. Life Science as is done in Namibia (Clacherty 1995:9) or as an optional subject, e.g. Environmental Studies or Environmental Science as was done in England before 1988 (Gayford 1996:105). Gayford argues that when EE is optional, it is marginalized, as students opt for other subjects in the curriculum and EE is often taken by only a few students. It is observed that the learners who opt for EE are usually those with lower performance ability. It is also argued that if EE involves examination, it will be memorized and forgotten (DRFN 2008:24).

Hungerford and Peyton (1994:10) and DRFN (2008:24) have also studied the advantages and disadvantages of implementing EE using a single subject option. They state that it is easier to evaluate the effectiveness of EE programmes when examination is involved. Single subjects are also easy to implement when the curriculum is not overloaded. On the other hand, a single subject is only appropriate for secondary education and the tertiary level but not for the elementary level. A single subject cannot lead to transfer because there is no link between what learners do in other subjects; and the money spent on a single subject depends on the number of people registered for the course and the number of outdoor activities organized (Hungerford and Peyton 1994:10; DRFN 2008:24).

Although a single subject approach seems easy to implement and guarantees EE a place in the curriculum, it may reach few people if it is not selected. On the other hand, the purpose of EE cannot be achieved by providing answers to environmental education questions posed in an examination but only through active environmental literacy. Thus, personally and for the purpose of this study, I do not agree with EE being implemented as a single subject.

2.5 Environmental Education and the Science Curriculum

There is a long list of the benefits that the human community and the environment receive from science. What humans and the environment have benefited from science

is very apparent nowadays. Jones, 1994:225 says “medicine has enabled people in many parts of the world to live longer as fewer people die young, more children are produced and more of these children survive” (Jones 1994:225). She also mentions how availability of machinery, fertilisers and pesticides increases food production to cater for the increased population (Jones 1994: 230).

However, science is also the major suspect when talking of the cause of environmental disasters (Ashley 2000:275; Le Grange 2001:40). The crisis has been witnessed in the modern period and there is little evidence of its roots in pre-modern times (Le Grange 2001:41). For example, environmental problems are very apparent in the United States of America because its high population results in an increased need for industrial development and house construction (Mueller & Bentley 2009:53). Some of the problems associated with science are mentioned by Le Grange and are as follows:

Human rights violations during clinical trials, infringement of codes of ethics when working with animals, social and moral issues of cloning and genetic engineering, the use of life supporting systems and euthanasia, organ transplants, environmental degradation, weapons of mass destruction (Le Grange 2001:44).

Ashley (2000:275) points out that people cannot ignore the fact that their actions cause environmental problems. Since environmental problems have been witnessed, Ecology has been introduced in schools to make people aware of such problems. Ecology is a branch of the science subject Biology which deals with the relationships between organisms and their environment. Although EE was at first only part of the formal science curriculum and initially only dealt with organisms and the physical environment, it grew to include other parts of the modern environment and their effects (Robottom 1983:27; Le Grange 2001:40; Mueller & Bentley 2009:59).

Hart (2002:1241) claims that in order to understand the bond between EE and science, an understanding of each is crucial (see also Ashley 2000:273). Hart further notes that the understanding is imperative because adding environmental teaching to the teaching of science involves a change in “philosophical and practical considerations, and goes far beyond a simple addition of an environmental education unit to a science curriculum, is grounded in the historical, cultural and moral values which educators need to

understand". For Ashley (2000:275) the philosophical belief depends on what is perceived to be the truth, which may change from time to time. What is true in Biology curriculum philosophy however may not be true in EE. The characteristics of the philosophy expounded by both Ashley 2000 and Hart 2002 are discussed in the next subsection. In this section I will explore the characteristics of EE and those of science, and the tension between them, as well as the importance of science and Biology in EE and later take a stand on whether science should be used as a vehicle for EE, after exploring dual views on the integration of EE into science, and into Biology in particular.

2.5.1 Characteristics of science philosophy

Hart (2002: 1247) describes science as a discipline which is restricted to theoretical knowledge; is experience-based, and of which the knowledge base is focused on cognitive information. Cognitive values, according to Ashley, involve "accuracy, consistency, scope, simplicity and fruitfulness which are the process-oriented values that allow us to judge scientific theories". For scientists, the truth depends on the availability of evidence to prove that something is correct (Ashley 2000:273). Such truth evolves over time as new theories are continuously succeeded by other theories that are developed depending on the available evidence (Saez & Carretero 1998:725-726). They also argue that there may never be an absolute truth since theories are not consistent. These facts are verified through scientific methods including:

The raising of a problem; the definition of the problem; the expression of a hypothesis; the design of the research to be carried out; the performance of the experiment itself; the recording of data; the interpretation of the data and the comparison of the latter with the hypothesis and finally the confirmation or the rejection of the hypothesis.

According to this worldview, science teaching means transmitting science knowledge in the classroom Robottom (1983:27). Robottom (1983:27) identifies some characteristics which are typical of science education such as "disciplinary structure, authoritarian teacher-student relationship, classroom-bound locus of operation, avoidance of controversy, and text based didactic pattern of instruction". The process is dominated by a teacher-centred approach and it is verified through experiments (Saez & Carretero 1998:730). What is referred to as the learner-centred approach in science, is when they

look for the information from the sources by themselves (Saez & Carretero 1998:732). What is learnt then is exposed by learners as they reproduce what they have been taught, for example, by repeating the experiments in groups or individually. This proceeds from the demonstration of the pre-knowledge of facts learned in previous classes related to the theme of the day (Saez & Carretero 1998:730).

The curriculum based on such philosophy is responsible for promoting “ideologies such as those of the superiorities of reason, individualism, hyper-consumerism and cultural views that ideologically disconnect people and their environments” (Mueller & Michael 2009:54). According to Mueller and Bentley (2009:54), this type of curriculum is promoted in countries such as the USA and is accompanied by examinations to test how well students are prepared for the ‘workforce’, as emphasised by the “no child left behind” scheme. It may be difficult to include EE in a well defined science education.

2.5.2 Characteristics of environmental education philosophy

Mueller and Bentley (2009:54) regard the economic-driven curriculum as a “short term goal” compared to the environmental problems facing the globe. In their opinion cognitive knowledge cannot solve the world’s problems. The values which are not related to the cognitive as described in the previous section are the contextual values and these are related to EE (Ashley 2000:273). EE favours practical ways of knowing, based on research and effective knowledge. Therefore, the curriculum supporting EE should be shaped by the approaches identified by Hart (2002:1247) as “student engagement, personal experiences, student reflection and action-oriented groups in natural settings”. He also notes that EE represents a belief that allows “participation in socio-democratic action....promotes learning which goes beyond the acquisition of scientific information... and includes active deliberation and debate about issues related to one’s own environment” in order to “construct ethical awareness” among children.

Teachers need to choose the method for tackling specific learning (Dreyer & Loubser 2005:134). However, strategies followed in the teaching of EE should allow learners to participate actively, as well as allow critical thinking and creative thinking. They list a number of methods which can be used in EE, noting that some may be better than others. These methods are, according to Dreyer & Loubser (2005:134), the following:

- Questioning, including tests and examinations and teaching by peers;
- Discussions including group discussions, debates, stories, panel discussions, engaging guest speakers, teaching by peers, oral reports;
- Investigation and problem solving;
- Demonstrations;
- Cooperative group work;
- Experimental methods, including exploratory learning, excursions, laboratory activities and projects.

All these methods appear suitable for the teaching of EE (Dreyer & Loubser 2005:134). However, some are more appropriate than others especially if they fulfil criteria such as being learner-centred, activity-based, relevant to learners, able to utilize the environment around the learners, taught across one learning area where teachers help one another, and are able to satisfy all the learning intelligences/styles such as auditory, visual and kinesthetic. Oloruntegbe et al. (2010:709) assert that generally, implementation of curriculums fail because teachers continue to use old methods in new situations.

2.5.3 Problems associated with the combination of science and EE curriculums

Environmental education is more closely connected to moral principles than to cognition (Hart 2002:1249). However, according to the characteristics of science noted in section 2.7.1, the relation of science to morals and cognition is opposite to that of EE. The philosophical viewpoints of EE and those of science are difficult to combine as the combination is faced with the challenges created the need to encourage industrial growth (Mueller & Bentley 2009:54,56). They are of the opinion that the western school science culture serves industrialisation and that this consideration has also affected schooling in “marginalised countries through globalisation and colonialism” (Mueller & Bentley 2009:56). Favouring science has led to the well-established field of science education which negatively affected environmental literacy by neglecting its methods. (Mueller & Bentley 2009:56) say that setting a curriculum which combines the two may

therefore be problematic. When combining the two it is necessary to avoid neglecting the beliefs of any of the parties (Mueller & Michael 2009:54). It also needs each of the parties to come out of their comfort zones to embrace one another because currently, cognitive learning is a bias ambassador for EE.

It is therefore feared that combining EE with science might reduce its function as a socio-critical-based and issue-driven process (Hart 2002:1246). In addition, Robottom (1983) criticizes school curriculums for not using approaches that suit EE. Anti-EE aspects of school curriculums are regarded as “disciplinary structures, authoritarian teacher-subject relationships and classroom-bound locus of instruction” and others typically suitable for science. Robottom (1983) argues further that science is an unfavourable space for addressing environmental problems because it is bound by “scientific world views” which are inappropriate to EE. Robottom (1998:29) is concerned that the situation regarding EE and science might worsen as a result of other considerations in the school. Similarly, Hart (2002:1249) considers schools which group their teaching into subjects as “modern schools”. He accuses them of not being suitable to teach social issues because they believe in reproducing information rather than being critical and addressing changes that are linked to life challenges.

In England there is the political will to move toward sustainability. One of the stumbling blocks to achieving this is the way the curriculum was developed. The curriculum supports science rather than EE. The teaching is influenced by a positivistic approach (Ashley 2000:275). University admissions are also influenced by the requirement of a pass in science. Ashley argues that for a genuine curriculum for the twenty-first century to be developed, it is important to realize that the pure science curriculum is not the best. The best curriculum is the one which acknowledges the limits and benefits which science provides (Ashley 2000:275-276).

Problems regarding the merging of environmental education and science were also experienced during the development of the Pan-Canadian science curriculum, reports Hart (2002:1239), since their existing policy and practice do not match. The Pan-Canadian curriculum emphasises scientific knowledge which is anti-EE and the teachers are also products of the universities which advocate the same ideology. Few

“transferable skills such as critical thinking, problem solving, and decision-making or metacognitive skills” are gained during the teachers’ pre-service training. Therefore, the combination is problematic because of the socio-critical nature of EE which demands more than scientific and technological methods (Hart 2002:1241). This suggests that the science curriculum fails to put on the lenses which would enable it to see beyond the benefits that science offers to human beings.

The problems mentioned in this section may suggest that there is no way forward and that it does not make sense to combine EE and science for the following two reasons - first, science is the cause of many environmental problems, and second, there are philosophical differences between science and EE. In his article, *Science: A Limiting Vehicle for Environmental Education*, Robottom (1983) argues that science is the wrong place to incorporate EE. He further explains that the connection between the two might bring joy to those unfriendly to the environment in that the door for them to exploit the environment will remain open. The aims of EE can’t be realised if it is taught the way science is taught. He therefore identifies four ways in which values and cognition are related;

1. Plato - reference to the fusion of knowledge with values without ascertaining the primacy of one over the other;
2. Christianity - the fusion of the two by ascertaining the primacy of values;
3. Kant - the separation of the two without censure of either;
4. Empiricism - the separation of values from knowledge while ascertaining the primacy of factual knowledge over values (Robottom 1983:28).

The outcome of the values of EE in the curriculum depends on which of the four options is used. If EE is introduced into science under the umbrella of Ecology, in the science career learning area and under the philosophy that supports science, then knowledge of EE is dominant over its values. However, Ecology was introduced to rescue the environment from some of the consequences of science as in the opinion of ecologists, the practice of science can have negative consequences. (Robottom 1983:28) Robottom (1983:28) notes that before 1970s, the teaching of EE was confined to

empiricism. This entailed learning about the environment which fosters the learners' understanding of the connection between organisms and their environment and the research related skills needed to study how they connect (Robottom 1983:30).

Teaching EE in this way has some advantages, including:

- The range of candidate activities for existing science programmes is increased;
- EE resources are used;
- Timetable programmes are avoided;
- The routine of teaching patterns is not threatened;
- The programme gains from whatever status the term EE carries;
- Teaching EE through science legitimates and conserves the stable state of existing structures and practices of schooling. (Robottom1983:30).

These advantages however do not promote the achievement of the aims of EE as set at the Tbilisi conference, but are important for the smooth running of the organisation. For Robottom and others, this may mean that science is a bad vehicle for environmental education and it may lead to the conclusion that there should not be a combination. As Robottom (1983:30) has noted, paying attention to those advantages makes education on the environment difficult, as EE needs to be approached from an angle which differs completely from that from which education about the environment is currently approached.

2.5.4 Science and Biology can be used as vehicles for EE

Even though a large number of authors concentrate on the tension between science and EE, others recognise the role, importance and contributions of science education to the teaching of EE. Biologists for example Slingsby and Barker (2003, state the fact that EE was born from science. Most of the literature and issues discussed in the teaching of EE are borrowed from science education literature and the findings and recommendations of scientific experiments. Therefore, science contributes to the successful teaching and learning of EE. According to Slingsby and Barker (2003) science has been contributing to EE for a long time but they accept that the teaching of EE within science ends in only teaching the awareness of EE. Addressing the issues of

why science knowledge does not always lead to more enlightening attitudes and values regarding EE is pending (Slingsby and Barker, 2003). These two authors blame the unsuccessful teaching of EE in science on teachers' unpreparedness.

In fact, Biology and EE depend on each other in order to guarantee each a space in the curriculum. According to Gough (1999:8) the number of students studying science has decreased because science has failed to address social issues like environmental problems. Including EE in science can therefore attract students to science. On the other hand, unlike EE, science has a fixed place in the curriculum because it is a favoured subject long-established in the curriculum, and leads to employment opportunities. Thus, linking EE to science is advantageous as it ensures a space for EE in the curriculum and therefore it will be studied by many students. It can therefore be said that Biology and science act as vehicles for EE.

On the other hand, the gap between EE and science which caused the tension between them is not static. As Ashley (2000:277) rightly mentions, EE and science need each other; but it is important to bridge the gap between them. A wide gap can be identified between learners' awareness of and attitude to environmental problems. For example, learners in Britain seem to be aware of environmental problems but they do not take them seriously (Ashley 2000:277). Learners are aware of environmental problems, but there is a lack of behavioural change and a feeling of environmental responsibility. There is therefore a need to bridge the gap between the cognitive information and the behaviour of the learners (Ashley 2000:277).

Le Grange (2001) also argues that science is the right place for addressing environmental education. He says that, "rather than rejecting science we should draw on changing conceptions of it to explore how a reflexive science concerns the dealing with mistakes, errors and criticism of their practical consequences within science itself". Hart (2002:1250) supports this view, noting also the need to draw up an inclusive curriculum for EE and science in England. Hart (2002:1241) further states that the new curriculum needs to add value to the curriculum which goes beyond the imparting of scientific knowledge to learners, to accommodate EE. This curriculum should include both the aims of EE and of science. Apart from imparting scientific knowledge, it should

also be flexible, experiential and meaningful to children personally and to their societies (Hart 2002:1247).

The British curriculum which was launched in 1997 followed the study done by the University of Western England. The study aimed to bridge the gap between learners' awareness of and their behaviour regarding environmental problems. The gap is closed by building a partnership between learners and scientists through the network programme funded by the government (Ashley 2000:277-278). In such a partnership, learners communicate with scientists, learn to understand science and its limits and realize that scientists are guided by ethics. The programme may also be used by students to participate actively and critically in environmental issues. This is what is called the reflexive modernity. Ashley concludes that this could become a good bridge, even worldwide.

However, the researcher disagrees that learners will change their future conduct when they learn about the ethics inherent in scientific operations. This is because if such ethics had been strictly followed and accompanied by accountability, then environmental problems associated with industrialisation etc., would have been reduced. Ways of transmitting knowledge in EE should be carefully selected to avoid confusion. It should also be noted that if learners are taught to be critical of science operations, they might also be critical of politics. It is claimed that this transmitting of knowledge is also done by networking. However, achieving this worldwide is not possible because of marginalised communities which have no access to communication, especially in third world countries.

In Ghana some studies have also been conducted in an attempt to bridge the gap between science and EE by integrating science knowledge with indigenous knowledge (Mueller & Bentley 2009:56). The assumption is that environmental protection is not new to native people, as they have succeeded by using their knowledge to protect the environment (Mueller & Bentley 2009:56). This view goes with the need to re-establish local production instead of importing products because this fosters the use of local traditional technology which is perceived to be environment-friendly. Teachers are therefore introducing into their curriculums the "culturally relevant and environmentally

responsive curriculum in secondary science courses” as practised in Ghana (Mueller & Bentley 2009: 56). The teachers use teacher resource books and workbooks which help with environmental research projects undertaken during science classes.

Mueller and Bentley (2009) give examples of some of the research done in Ghana, but only the one related to Biology will be outlined here. When the fermentation section of the curriculum has been dealt with, learners learn the cognitive part of the phenomenon using methods which help them to grasp the information. Studying fermentation gives learners a chance to do research on the enzymes responsible for “malting”, and the effect that waste products have on the environment is explored in part of the EE curriculum. This came about as a result of the discovery of Pito in the waste products, a substance which is produced during the fermentation of the rice imported for brewing. The same substance can also be produced from local plant products such as maize. Learners explored the effect of importing rice and suggested that rice import be stopped since the country produces grains which perform the same function in the process of fermentation.

The Ghanaian curriculum aims to relate what the learners learn in science to their surrounding environment (Mueller and Bentley 2009:57). The students/schools do most of their research in cooperation with the local community in order to use their knowledge and learn what they value, believe in and expect from the research. Mueller and Bentley (2009) also report that this is also happening in other countries, both in the developing and developed world. The people’s cultural know-how and expertise is recognised and the use of textbooks is banned. The conclusion can be reached that the Ghanaian science curriculum science tries to offer people the opportunity to think “out of the box” in which the typical science curriculum has enclosed the education community for a long time that is independently.

It is clear that the tension experienced between EE and science can make it difficult for EE to be incorporated in the science curriculum. The philosophical tension may lead to empiricism being employed in the teaching of science and of EE. However I also argue for science to remain the vehicle for EE because Ecology can be, and is, incorporated in Biology. So science provides a space for EE in the curriculum. EE could otherwise be

ignored because it is not highly thought of by the education ministry. I also think that the purely positivist approach to teaching science is not static and, like Hart and Ashley (2000), I also think there is a need to bridge the gap between science and EE.

However bridging a gap requires knowledgeable teachers who can see the relationship between the topics they teach and the environment, so as to enable them to incorporate EE in different topics. Thus, bridging the gap needs to be one of the focuses of pre-service- and in-service training. Lastly, it may be wise to teach EE in subjects like Biology which are closely linked to technology so that learners may develop environmental ethics and use these ethics in their application of scientific methods after school.

2.6 Guidelines for curriculum implementation with reference to Environmental Education

Curriculum implementation is a step in curriculum development. Implementation comes after the planned curriculum is disseminated to patrons (Carl 2002:172). Carl defines curriculum implementation as the application phase of both the “syllabi and the school’s broad curriculum, every subject curriculum and every lesson”. Carl (2002) regards implementation and dissemination as different phases even if they are regarded as the same by some people because consumers need to be informed about the curriculum before it is implemented. He acknowledges however that the successful implementation of the curriculum depends on how consumers are informed and prepared in order to be ready to embrace the curriculum (Carl 2002:172).

Fullan (1991:65) describes implementation as a process whereby a planned view is carried out. According to him, implementation of programmes are developed with different purposes, at different levels of educational hierarchy and to be unpacked in a fixed manner or open for adjustment. For whatever reason a curriculum is developed and in whatever way it is implemented, curriculum implementation is the critical part of the curriculum because it is the means of achieving the curriculum goals (Fullan 1991:65). He says that implementation is crucial but that practical factors determine its success or failure.

In addition, factors affecting implementation at grassroots level usually are overlooked and more attention is paid to document formulation. Fullan (1991:65) argues that overlooking these factors shows disregard for the fact that the planned curriculum can only be successful if teachers implement it. Teachers in turn can also be successful if they work in collaboration with the school community and parents. Thus, all stakeholders need to be knowledgeable about the change and the collective factors affecting success require consideration (Fullan 1991:66). The guidelines for successful implementation are discussed next:

1. Establish a climate of trust

A risk-taking environment needs to be established, encouraged and rewarded in order to achieve successful implementation (Pratt 1994: 327). Trust helps to change a situation where teachers are scared of implementing changes as they fear they might fail and be blamed (Pratt 1994:327). Curriculums which are downloaded on teachers however show a lack of trust in the teachers and the school communities because teachers are not treated as professionals (Pratt 1994:326). Professionals according to Bitzer (2006:102) are identified in the following ways:

- They are accredited by the professional body.
- They have received specialized training.
- They have specialized knowledge and skills.
- They are controlled by the profession itself but not by the techno- or bureaucrats.
- They are accountable to the professional body and clients and are responsible for continuous self-improvement and refreshing.

Bitzer (2006:102) notes in addition that if teachers consider themselves as professionals, they should satisfy the abovementioned criteria. Thus, trust needs to be developed for teachers to feel that they are regarded as professional.

2. Implement changes that meet recognized needs and that have quality

Pratt (1994: 328) says that implementation that advocates international and national needs does not have much effect on building support for change. Changes that are successful at implementation are those supported by the schools and community because they promote local needs. Some changes can be funded, but if they do not address local needs they may only last for the time during which the funds are available. Pratt (1994) mention in addition that if the success of the implementation of changes depends on the needs of teachers, it is worth for curriculum developers' while to do research on what is important to teachers (ibid:328). It is pointed out that the needs of most teachers are expressed by the following: "when a class comes alive, when an epiphany of new understanding occurs, when a student moves to a new level of achievement and when graduates return years later to thank a teacher".

Fullan (1991: 69) is also of the opinion that some changes are planned, but teachers do not feel that they are needed. Hence, careful research should be conducted on whether a change is a priority or of utmost importance. Fullan (1991) mentions that the change should not only meet the need but its role should also be visible because there are three complications which can lead to a needed change not being implemented. Firstly schools are confronted with a lot of changes that need to be implemented, and therefore weigh these changes up to decide which are the most urgent. Secondly, people are not always aware of the need for change until they start implementing that change. Those who do not implement the change, remain unaware of the need. Thirdly, the needed change may interact with factors which affect curriculum implementation and that can define whether it is difficult or simple to implement (Fullan 1994:69).

According to (Fullan 2001:72), many changes take place in the life time of the teachers, it is during that time that teachers learn to understand the difference between the changes which are important and those that are not. They learn that decisions are made according to how the quality of the change is perceived. For example when curriculums are planned and adopted for political reasons, implementation will proceed without monitoring or the provision of adequate resources. In such situations according to Fullan, there is always a short time between planning and implementation because

matters concerning quality are ignored. These changes are mostly ignored by teachers (Fullan 2001:72).

3. Consult widely and involve teachers in developments

Consultation with stakeholders is needed throughout all the phases of curriculum development. Pratt (1994:330) emphasizes that the most important stakeholders are teachers because they are the key players in curriculum implementation and they need to be consulted in every step of curriculum development. Other stakeholders who also work directly with teachers in developing school goals, mission statements and curriculum policies need to be involved. Stakeholders could include parents, students, or members of the community (Pratt 1994:330). The best consultation is said to be through personal contact, this prevents information and curriculum documents from getting lost.

Research has shown that teachers are still often merely recipients of curriculums which have been developed by experts (Carl 2002:249). The teacher's function is usually to apply and implement the ready made curriculum. It is therefore an issue of debate whether this should remain the case or whether there should be a shift to development which involves teachers at all levels of curriculum development (Carl 2002:249). Carl (2002) is of the opinion that teachers should play a major role in all the phases because they are the implementers of the curriculum. They know the reality of the classroom; they know how difficult children find the content and the time required for the content to be covered. He proposes that teachers need to be empowered because involvement is linked closely professional growth which brings about positive results (Carl 2002:251). (Carl 2002:251) further states that

“...if the principle of teacher participation is acknowledged, it does not necessarily mean that it also comes into its own in practice, it should be purposefully pursued in practice and it should go together with effective support, inter alia by the creation of opportunities, and encouraged theoretically, but when it comes to the execution thereof, support is often lacking”.

Lack of support to enable teachers to get involved in curriculum development, leads to failure, and teachers are then blamed for their lack of knowledge or involvement (Carl 2002:252).

4. Establish clear goals and limited scope/clarity

Pratt (1994:331) states that, the goals of curriculum developments are not always clear. Curriculum developments which are not accompanied by clear goals might not be implemented or implemented hazily because teachers are not clear about the goals. Clear goals should communicate what needs to be done by curriculum consumers. “The bigger the projected change and the less focused it is, the less likely it is to be implemented...complex changes need to be broken down into their component parts for serious implementation” (Pratt,1994:331). Even if some changes are needed, the wording may not be clear on what teachers should do differently (Fullan 1994:70). He says that many of the new policies are purposefully vague so as to “avoid conflicts and promote acceptance and adoption”. There is a need for the objectives of change to be clear in order for them to be successful.

5. Development of culture and collegiality

Curriculum implementation prospers in schools with a culture of togetherness. According to Pratt (1994:331), the educational leaders should create an atmosphere of teamwork and support among teachers, heads of departments and principals. In such a relationship, teachers who are trained in a certain field of innovation should lend a helping hand to others through mentoring and classroom observation. Pratt (1994) observes that, improved performance is most likely to take place in schools which have developed community support. These schools perform well because a change is the result of system initiatives that succeed or not depending on the strategies and support offered by the larger organization, rather than on individual efforts (Fullan, 1991:73).

The principals and teachers are the main agents of change (Fullan 1994:76). The principals’ role is to influence teachers to effect changes, thus the possibility of changes being successful lies in the influential role played by principals. They do this by monitoring the change implementation or by supporting teachers psychologically and supplying them with resources. The principals also ensure that the school conditions are

conducive to change by developing the goals, collaborative work structures, climates and procedures for monitoring results (Fullan 1994:76). In the final analysis success or failure depends on individual actions, but interaction with other teachers is also a critical variable because during changes new things are learned and interaction is one of the basic needs of social learning (Fullan 1991:77). The quality of the implementation relates strongly with teachers' collegiality, open communication, trust, support and help, learning on the job, getting results, and job satisfaction and morale (Fullan 1991:78). Lack of support among members of the school staff including the management, contributes to the complexity of implementing EE in schools and constitutes a stumbling block to the implementation of EE (Papadimitriou 1996: 88; Reddy 2000:29).

School culture and community expectations determine the purpose of the school. These influence the role of teachers and the climate in which learning takes place (Lee 2000:97, Mosoge 2008:174). Mosoge (2008) explains school culture to be the way of doing things in the school and these ways differ from school to school. In schools where collegiality is a culture, teachers help and support one another. (Bipath 2008:67) mentions that a school improves only when the way people have been doing things in the school changes. School culture is the beginning of improvement and successful changes, thus changing the culture creates a climate for sustainable improvement. The principal's main role is therefore to create a learning environment suitable for carrying out changes in the whole school community (Bipath 2008:67)

6. Provide in-service training

Fullan (1991:84) observes that educational changes involve learning new ways of thinking and doing, new skills, knowledge and attitude. That makes staff development an important factor in curriculum implementation. However, both teachers' education and inadequacies of teachers' in-service training have been blamed for the failure of innovations (Pratt 1994:334). Therefore, the focus of in-service teacher education has shifted from an approach which is aimed at fixing teachers' shortage of knowledge toward the belief that "teachers are human beings who need and want to grow personally and professionally". This is found to happen in the schools where teachers

are trained to provide social support, share experiences and collaborate in staff development (Pratt 1994:334).

Trainers and consultants are said to be ineffective and district consultants are usually not clear about their responsibilities (Fullan 1994:85). According to Fullan, trainers fail to design staff development programmes in order to provide ongoing interaction and increase the learning necessary to develop new conceptions, skills and behaviour. Such developments should be offered at an early stage of implementation because concerns and doubts start when the implementation process begins (Fullan 1994:85). Staff development succeeds when concrete, teacher-specific training activities, ongoing continuous assistance and support during the process of implementation and regular meetings with peers and others are combined (ibid: 86).

During the PACSICOM(Pan-African Conference on Sustainable Integrated Coastal Management) (1998) it was also noticed that environmental efforts are hampered by weakness in the training of teachers who find it difficult to adopt the required multidisciplinary perspective of EE because they are specialised in a particular subject. In countries like Nigeria, Malaysia, and South Africa teachers were expected by the educational departments to implement EE without professional support being offered (Mansaray, Ajiboye and Audu (1998), Papadimitriou (1998), Reddy 2000, Said *et al* (2003), while in Hungary, Mexico and Poland few or short workshops in EE were conducted due to the high cost of professional development (Hendriks, Layten, Scheerens, Slegers and Steen 2010:75). It is advised that workshops be sustained overtime for teachers to cover everything that requires development (Robottom 2000), and Said *et al* (2003) conclude that it is only when teachers are knowledgeable in EE that they change their environmental behaviour and are able to transmit proper attitudes to learners. They therefore make a number of suggestions due to the poor EE knowledge demonstrated by teachers, namely that EE should be incorporated in pre-service and in-service-training programmes, teachers should be motivated to engage in environmental clubs based in schools, teachers should engage in cross-border school activities and seek partnerships with environment-related organizations, and teachers should participate in discussions, “seminars” and excursions related to the environment.

Mansaray, Ajiboye and Audu (1998) find that, even though the level of knowledge of science and social science teachers in Nigeria is higher than that of art teachers, they demonstrate little knowledge of EE. As many as 70.3% of the teachers in the study have never heard of EE and they have never attended any workshop on EE which they are expected to teach in a multidisciplinary way. Even those who understand EE and claim to implement it, do so at a low level, as education about the environment which researchers claim does not lead to the transmission of behaviour and values (Mansaray, Ajiboye & Audu 1998, Said *et al* (2003:307) Malaysian teachers understand EE as the transmission of ecological information.

7. Provision of Resources

Teachers have little time for new innovations including the development of teaching material and they continue using the old material because “Teachers are busy people and classrooms intensely busy places” (Pratt 1994:335). They only get time to become involved in other educational activities (like: attending in-service training, the development of teaching materials or some other professional activities) when principals take over their classes (Pratt 1994:335). Sometimes, they may try to be innovative but if the process bears no fruit, the new way of teaching is neglected. Also in most cases teachers carry out innovations using materials, content and methods which have worked for them for years (Pratt 1994:335). The development of teaching and learning resources takes up a lot of the teacher’s time, thus innovations which require teachers to develop new materials have a high tendency to fail, while if the teacher is provided with high quality materials that stimulate student interest and learning, the curriculum is much more likely to be successful (Pratt 1994:335). He recommends that curriculum committees should select materials which can be obtained with a minimum of paper work.

Although (Pratt 1994:336) says that there is little evidence that more money makes for better education, many researchers have proved that unavailability of funds for resources is one of the main factors affecting the implementation of EE. During PACSICOM (Pan-African Conference on Sustainable Integrated Coastal Management) it was noted that environmental education efforts in Africa have been hampered by a lack of resources and funds. In South Africa, provision to schools was different during

the apartheid era when some schools were better provided for than others (Reddy 2000:30). He also lists “lack of chairs, leaky roofs and broken windows” as some of the problems in the less privileged schools. This is also accompanied by some other challenges such as large classes which make trips difficult and lack of teaching and learning materials.

The problem with resources is not unique to an Africa. Palmer (1998) identifies lack of resources to support EE, lack of time to teach EE, lack of space for EE in the timetable and lack of prioritisation of EE as major constraints to delivering EE in UK. Surveys have also shown that in 2010, 96% of schools in remote areas of Taiwan did not have adequate resources to support the implementation of EE and 93% of them had inadequate teaching and learning resources, 50 % experience human resources shortage and 45% had limited funds to support aspects of the curriculum other than the most basic (FedEx 30 May 2011).

Due to the lack of adequate provision of funds in Namibia, some of the responsibilities are left in the hands of parents while the government deals with others. For example, in Namibia the government is dedicated to tackling the barriers created by lack of classrooms and textbooks. Parents pay school fees which are used for school development. In some schools, the development fund can be as low as N\$2 (equivalent to R2) in rural schools and as much as N\$3600 in urban schools (Sasman 2011:1). However some of the children are exempted from paying fees due to poverty or their being orphans, which in turn reduces the school development fund (Sasman 2011:1). Limited recourses are one of the impediments which make the implementation of EE a problem in Namibia.

8. Teachers' attitude

The “attitude” of teachers towards change determines the degree to which the change will be implemented successfully (Papadimitriou 1995:85; Lee 2000:96). The more positive the attitude, the lower the resistance to change, and the opposite is also true. Although some aspects of change might not be affected by the teacher’s attitude, their attitudes are of crucial importance to other aspects. That is why Lee (2000:96) remarks

that, “Receptivity is innovation specific”. Lee’s observation (2000:96) confirms that teachers’ attitude to EE is one of the main factors affecting its implementation.

Lee’s (2000:96) study in Hong Kong concerning teachers’ attitudes particularly towards EE indicates that teachers were positive about the teaching of EE but had a different view of its implementation. Some teachers implement EE if their workload is not excessively increased, others give priority to the promotional subjects while another group does not implement EE because the teachers believe that the effort they would put into the implementation exceeds the importance of EE. An optimistic view of EE was also shown by teachers in Greece in interviews conducted by Papadimitriou (1996:86). The majority of the teachers believe that EE is as important as other learning areas, while in the same study, but it was found that a few teachers hold a different view. A negative attitude toward EE was also demonstrated by teachers in Nigeria where 58% of the art teachers, 34% of science teachers and 43% of social science teachers did not believe it is important for all learners to be exposed to EE (Mansaray *et al* 1998:337). Hence, the teachers did not implement EE.

Lee (2000:101) describes teachers who have positive attitudes towards EE as those who:

- Find EE important
- Are supported by schools and other agencies
- Do not have other worries which may disturb their teaching of EE

Even if studies outside EE show that experience, gender, rank and age affect the attitude towards the successful implementation of EE in general, the researcher did not come across studies in which these factors emerged as barriers to the implementation of EE. Findings from the study by Lee (2000:102) have also shown that these factors did not play any role in shaping teachers’ attitude towards EE “guidelines or behavioural intentions” in Hong Kong.

In summary, the success of the curriculum depends both on curriculum policy development and on the implementation. Thus the factors affecting the implementation need consideration because they are crucial to the success of the curriculum. .

2.7 Environmental Education in Formal Education in Namibia

Namibia has also supported and responded to the global attempt to incorporate EE in the school curriculum. In the first place, Namibia is a signatory to the international conferences taken place after its independence. In this section, efforts made to incorporate EE in formal education in Namibia are discussed.

2.7.1 The importance of environmental education in Namibia

Environmental education is important to all countries which experience environmental problems, which are vulnerable to problems and which share environmental spaces which are polluted. In fact, the whole world needs EE because the countries all share the same space. Namibia is a particularly semi-arid country which has experienced environmental degradation and other environmental problems. Countries in similar conditions therefore need to take care of their environment (<http://www.nied.edu.na/publications/journals/journal10/Journal%2010%20Article%207.pdf>). This can be promoted by providing citizens with environmental awareness programmes. The need for change has led to the implementation of EE in Namibia in order to develop an informed nation as a major step towards achieving sustainable living and a healthy environment.

2.7.2 Environmental education in secondary education before independence in 1990

Namibia was administered by South Africa until 1990 when it gained independence and the schools followed the South African syllabuses. The South African curriculum for senior secondary schools was not changed until 1994. Environmental education was part of the curriculum because General Science was offered as a subject in junior secondary schools, while in senior secondary education, Geography and Biology had environmental components (Kanyimba 2009:17). In Biology and Geography, environmental issues were found under the topic Ecology and limited to plants and animals (Ramutsidela 2001:35). The education sources and materials which were used reflected the situation in South Africa and Europe (DRFN 2008:4). The teachers were also ill prepared to teach EE (Ramutsidela 2001:35). However, the presence of such EE learning in the curriculum might not be recognised by some as EE learning because, as

mentioned, EE was not part of the formal curriculum in South Africa before 1989 when the apartheid era ended in Namibia (Le Grange 2001:34; Reddy 2000:24).

2.7.3 Environmental education in secondary education after independence in 1990

The education system in Namibia was changed from the South African curriculum to the Cambridge system in 1995, and later to the National Curriculum in 2006. Although the lower grades started phasing out the South African curriculum earlier, the secondary schools continued to use it until 1994 as they waited for the junior secondary students who started with the Cambridge system in grade 8 to reach grade 11. The preparation for the introduction of EE was made and a number of policies were developed in that regard. The curriculum documents are also an indication of the inclusion of EE in the curriculum. These developments will be discussed below.

2.7.3.1 The constitution of Namibia

The constitution of Namibia contains one of the first policies which address the protection of the environment and encourage the introduction of EE. The constitution in respect of the environment states in article 96(I) that:

The state shall actively promote and maintain the welfare of the people by adopting, inter alia, policies aimed at the following: 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 toxic waste on Namibian territory.

The Constitution holds anyone found violating the environmental law accountable for his or her actions. It is further stated in article 91(C) that:

The functions of the ombudsman shall be defined and prescribed by an Act of Parliament and shall include the following:

The duty to investigate complaints concerning the over-utilisation of living natural resources, the irrational exploitation of non-renewable resources, the degradation and destruction of ecosystems and failure to protect the beauty and character of Namibia.

2.7.3.2 The Green Plan

The Green Plan is a document prepared in 1992 by the Ministry of Environment and Tourism (MET), that is, the former Ministry of Wildlife, Conservation and Tourism. The document indicates that Namibia is committed to the protection of the environment and supports the incorporation of EE in the formal curriculum. The manuscript was signed by 25 institutions in Namibia including the Ministry of Education and UNAM (Kanyimba 2002:19). The document has a section titled, *Preparation for the Future: Education and Sustainable Development*, in which it is stated that “Namibia’s goal is to increase awareness and knowledge and develop skills and attitudes among young Namibians conducive to a harmonious relationship with the environment”. The document further acknowledges that, “The concept of EE in education in Namibia is quite new, but the government is committed to ensuring that EE becomes part of every pupil’s learning experience”.

Dr Sam Nujoma, the former president of Namibia presented the Green Plan in 1992 at the Rio de Janeiro summit.

2.7.3.3 “Toward Education for All” policy (1993)

Only a few Namibians benefited from formal education before independence and it was the responsibility of the government to redress that inequality. For that reason, the policy document “Toward Education for All” was developed by the Ministry of Education and Culture to ensure that education becomes the right of all Namibians, as stipulated in article 20 of the constitution. “Toward Education for All” laid the foundation on which the country’s educational system stands today, and whereby the goals and aims of education are identified in order to implement the envisaged objectives. Some of the aims and goals directly or indirectly guide EE in basic education. The goals emphasise the provision of education which stimulates a responsible attitude and produces people who respect the environment as a whole. These goals of basic education for the environment include the following:

- To foster the highest moral, ethical and spiritual values such as integrity, responsibility, equality, and relevance for life;

- To support and stimulate learners through childhood and youth and prepare them for the responsibilities and challenges of adult life and citizenship;
- To develop literacy, numeracy, understanding of the natural and social environment, civic life, artistic appreciation and expression, social skills, and to promote physical and mental health.

The aims of basic education as indicated in the policy documents are:

- to create environmental awareness;
- to develop a holistic understanding of the dynamic interdependence of all living things and their environment;
- to develop a sense of responsibility toward restoring and maintaining ecological balances through the sustainable management of natural resources and;
- to promote involvement in practical activities to preserve and sustain the natural environment.

Teaching method

The “Toward education for all” policy also stipulates the appropriate teaching approach for Namibian schools in order to reach the goals and aims mentioned above. It is interesting that the learner-centred approach which is supported by the policy, is also recommended for EE by other authors such as Dreyer & Loubser (2005:134) and Kasanda (2009). The learner-centred approach in the Namibian context, according to the policy, means that:

- 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;
- Learners should be involved as partners in, rather than receivers of, educational growth.

The methods that go hand-in-hand with the learner-centred approach are those that allow “the active involvement of learners and the participation of learners in the learning process” (MBEC, Toward Education for All 1993:60).

Teacher education

The policy recognises that the successful implementation of the policies of education depends on the teachers. The quality of education they offer is related to the quality of the education they receive. Thus, the Ministry of Education is committed to offering teachers quality education. In Namibia, teachers’ education is divided according to levels taught. In the past, teachers in the lower primary (grades 1-4), upper primary (grades 5-7) and junior secondary (grades 8-10) levels were trained at the four colleges of education namely the Ongwediva, Caprivi, Rundu, and Windhoek Colleges of Education. Teachers who were trained at the colleges received the Diploma in Education. On the other hand, senior secondary school teachers including science teachers were trained at UNAM and they received a Bachelor’s Degree in Education. This procedure has changed because at present, the colleges have become a part of UNAM and the teachers are trained at the degree level, although they continue to teach grades 0-10 and those trained at UNAM continue to teach grades 11-12

The Ministry of Education mandated itself to provide in-service training to teachers. This is done through the “teacher resource centres” which are decentralised and reachable by teachers. The centres are equipped and can be used for “seminars, workshops and advisory services”. This information is important to the research because it shows that advisory teachers are tasked by the government to advise the teachers and they have an immediate responsibility to provide professional development.

Government through the Education for All also promised to train teachers to teach EE by stating that it will strive to:

- Develop teachers who will respect and foster the values of our constitution, contribute to nation building, and respond positively to the changing needs of the Namibian society;
- Enable teachers to promote environmental awareness and sustainable management of natural resources in the school and community.

2.7.3.4 Namibia's Environmental Education policy

The government through the Ministry of Wildlife, Conservation and Tourism (MET) spearheaded the formulation of an EE policy which serves as a guideline to all the organisations dealing with EE in the country including institutions responsible for formal education. The formulation of the policy was a long process which started in 1991 and involved several regional and national workshops. In 1994, the Inter-Ministerial Working Group on EE was formulated. In 1995, the Namibian Environmental Education Network (NEEN) was established and tasked by MET to promote and co-ordinate the formation of the policy. During the policy formation period (1994-1998), there was continuous consultation with the stakeholders in order to formulate an agreed-upon policy which would represent the interests of the whole country. In 1999, the policy was adopted by the presidential committee on education for education and training and the NIED adopted it as such. Since then, both MET and MBESC (Ministry of Basic Education, Science and Culture) have agreed that the MBESC should finalise the process and spearhead the final review of the policy by the stakeholders before its submission to the government.

In the process, NEEN has successfully formulated a policy statement as follows:

We the people of Namibia, will actively encourage, support and implement environmental education as a means of achieving and fulfilling Article 95 of the Constitution. Environmental Education should aim to empower Namibians from all sectors to critically evaluate environmental information and options, to make informed decisions, and to take actions that will contribute to the goal of environmental and economic sustainability (NEEN 2004).

The manner in which the goals stated in the statement above should be achieved is suggested (see appendix A²).

² See the same appendix for the principles and aims of EE in Namibia which are simply adopted from those formulated at international the conferences mentioned before.

2.8 Attempts to Incorporate Environmental Education into Formal Education

The foundation set by the documents mentioned above needed to be implemented at all levels of education including formal education. The following attempts were made to incorporate EE in formal education through projects and curriculum development.

2.8.1 Life science project

The project started while the South West Africa People Organisation (SWAPO) was in exile during the independence struggle and it continued after independence. Its aim was to develop an environment related subject for grades 8-10 (Junior Secondary School) in Namibia. It lasted from 1991 to 2000 with the assistance of the Danish International Development Agency (DANIDA). The project achieved the production of Life Science material, revision of the Life Science syllabus, development of teaching equipment and training of pre-service teachers (Kanyimba 2002:24).

2.8.2 Enviroteach project's exploration of the implementation of environmental education in Namibia

Enviroteach is an environmental education project developed in 1992 by the DRFN. The DRFN is an NGO funded by the Swedish International Development and Co-operation Agency (SIDA) which was tasked by the MBEC to investigate the curriculum of EE in formal education. Enviroteach works hand-in-hand with the National Institute for Educational Development (NIED) which is the branch of the ME responsible for designing of curriculum programmes. Before the project, EE was not part of education. Only some "career subjects" such as Biology, and Geography had components of EE (Enviroteach 1998). The Enviroteach project was divided into phases with different objectives aimed at incorporating EE into formal education in Namibia. The success of the project was evaluated at the end of each phase to ascertain whether the objectives had been reached. Below is the outline of the three phases of Enviroteach.

Pilot Phase

The pilot phase which took place from 1992 to 1995 was meant to determine the approach that is appropriate for EE, that is, whether to introduce EE as a distinct/separate subject or infuse/integrate EE across the curriculum. The various approaches were studied carefully in order to make an informed decision about the one

appropriate for Namibia. As a result of the pilot project, it was resolved that EE should not be considered as a separate subject because its implementation requires independent infrastructure and a great deal of financial aid, training of staff in the subject, new textbooks, separate examination papers, and a new managerial structure to implement it as a new subject. All these make a separate subject option unaffordable by the Ministry of Education and Culture (Enviroteach 1998:15).

Infusion was therefore the option approved by the MEC as it was considered that all subjects have an important role to play in EE because the environment is seen as being beyond only the biological and the physical. Thus, the inclusion of EE in carrier disciplines was considered as negative to the achievement of the aims of EE which strives to consider the environment in a holistic manner (Enviroteach Pilot Phase 1998: 16). The integration approach also posed some constraints to the education sector because its introduction was not accompanied by teachers' support and teachers have the capacity to hamper or delay the implementation (Enviroteach Pilot Phase 1998:16). According to Enviroteach, constraints may include:

- Resistance to change on the part of teachers, school management, learners and parents;
- Lack of confidence and experience on the part of teachers;
- Lack of support from members of the school management board, who in many instances do not understand new methodologies being promulgated through educational reforms and;
- Lack of relevant, appropriate and user-friendly resource materials.

In order to reduce the risks mentioned above, the outreach programme was developed to provide EE resources and assist teachers to use them through the cross-curricular theme within the broad curriculum.

Key stakeholders such as the project team, steering committee, MBEC and SIDA were interviewed for evaluation of the phase. This led to three suggestions:

- Continuation of resource production;
- Introduction of EE into teachers' education (curriculum development, in-service, pre-service);

- Introduction of EE into non-formal education

The pilot phase was then followed immediately by Phase 1 of the project which concerns the implementation of EE in pre-service training of teachers in all colleges of education.

Phase 1 (investigating opportunities to implement EE in the colleges of education)

The community members in the various colleges were interviewed to find out their attitudes to the implementation of the programme in the teachers' course. The interviews involved college rectors, teachers' educators, student teachers and reform facilitators. The findings indicated that the community members in those colleges were enthusiastic and positive about the idea. Although the college rectors were concerned about certain conditions such as lack of resources, the level of support to be rendered to educators, the lack of qualified teachers' educators for EE, time planning within Basic Education Training Diploma (BETD), these considerations did not inhibit the process of implementation.

Phase 2 (implementation of the Enviroteach programme in colleges of education)

The programme was implemented in all the colleges of education in Namibia in 1996. This process started with curriculum revision in order to accommodate the cross-curricular issues. Seminars and three workshops were conducted. The first workshop was to introduce the students and college lecturers to EE. The second was the thematic workshop that incorporated drama as a method in the learner-centred approach, and lastly, learner-centred support workshops were conducted to enlighten the college community about the approach used to implement EE. Resources such as newsletters were also disseminated. The phase evaluation results showed that student teachers and personnel found the workshops and resources valuable. The resources are available in the Namibian context and this helps teachers to be aware of the environmental situation in the country and the teaching of EE in a holistic manner (<http://www.nied.edu.na/publications/journals/journal10/Journal%2010%20Article%207.pdf>).

At present, colleges of education in Namibia only train teachers who are qualified to teach Grade 1-10. Teachers for Grade 11-12 are trained at UNAM and the Enviroteach programme excluded UNAM. Thus, the education of teachers trained at UNAM does not include training in EE.

Consolidation Phase

At the end of this phase, clear and implementable guidelines drawn for the incorporation of EE into the programmes of the colleges of education had been put in place (Kanyimba 2002:23).

2.9 Roles of Advisory Teachers in Namibia

The teachers' support system in Namibia is designed in such a way that each of the thirteen regions in Namibia has one advisory teacher for each subject. Advisory teachers are the main source of in-service training for teachers in Namibia and they provide teachers with professional development in their respective regions (Leu, Hays, Leczel & O'Grandy 2005:15). Subject advisors attend the national training on innovations and policies concerning implementations and they transfer what they have learned at the national workshops to the teachers in their particular regions. Leu *et al* (2005) note that often cascading the information has not worked in Namibia because of the limited time, and that is why little implementation has taken place. They further mention that advisory teachers are trained to assist teachers, observe them, discuss the lesson observed with them, demonstrate by teaching lessons, and discuss demonstrated lessons and methods used. The training conducted by advisory teachers could be more meaningful if teachers are trained to meet all the expectations of the biology curriculum to enable them to be effective in teaching all the components of the curriculum including the teaching of EE across the curriculum using effectively the affective domain-related methods. The Khomas Regional Office developed the duty sheet for Educational Officers that includes some of the duties which are considered important to this study (ME 013:1-2):

1. To interpret the Public Service Act, Education Act, Public Service Staff Rules and other related Acts and Regulations;
2. To assist and support teachers by teaching the methodology of subjects;

3. To monitor the effectiveness of the broad curriculum;
4. To assist teachers to teach, and to assess the basic competencies according to the set standards;
5. To support, motivate and guide teachers through school visits;
6. To assist in planning, co-ordinating and facilitating workshops;
7. To ensure that subject-related directives are disseminated to schools, and implemented;
8. To observe classroom teaching for the purpose of improving teaching standards;
9. To evaluate performance of subordinates

The information above is an indication that the subject advisors are assigned the responsibility to work closely with and identify problems faced by teachers in teaching their subjects and to plan professional developments for them. In addition, they are also expected to translate the materials and ensure that the translated materials are implemented by monitoring the implementation. This shows that teachers do not work in isolation, but they have subject advisors to help them improve their teaching and ensure that the curriculum is implemented.

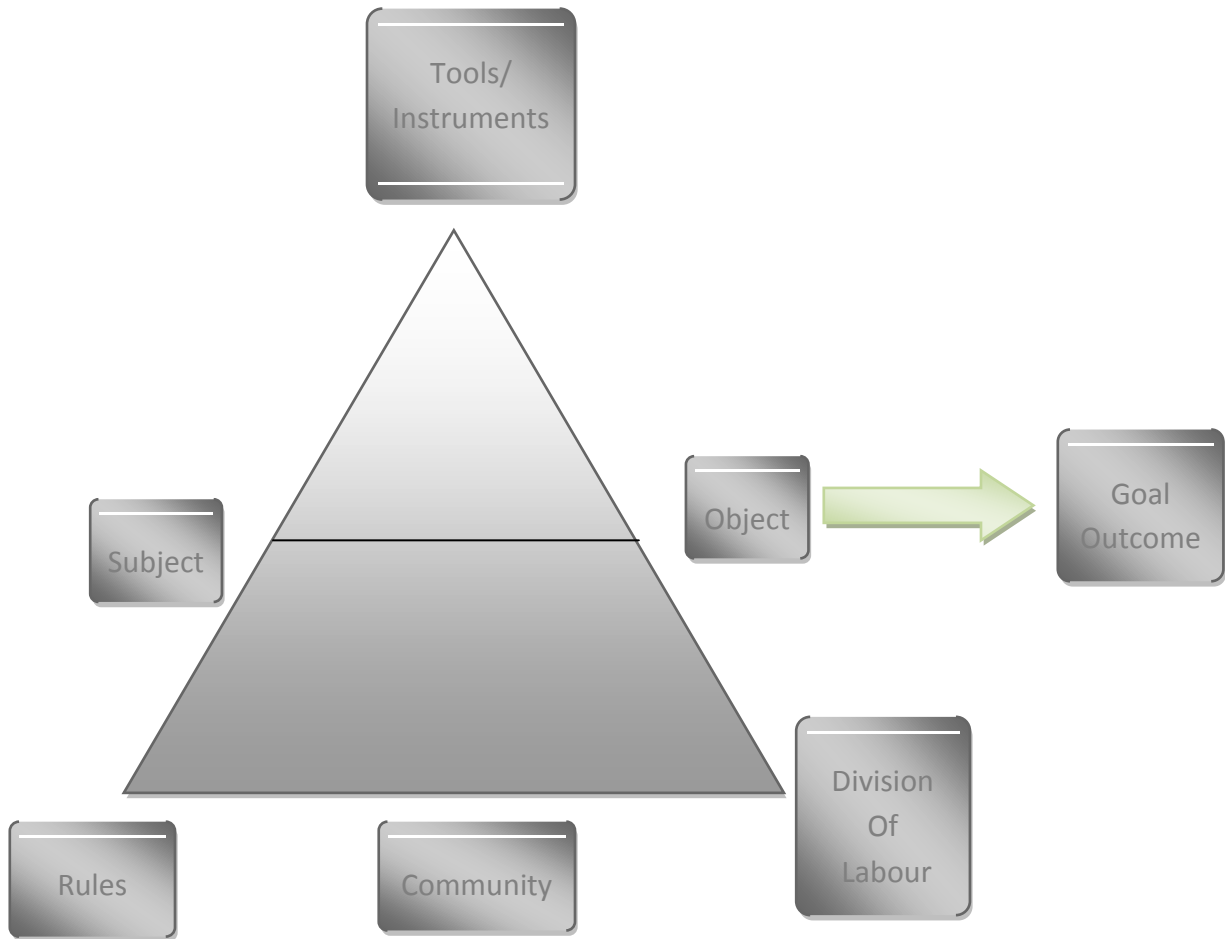
2.10 Activity Theory - Possibilities for the Implementation of Environmental Education

The cultural historic activity theory has evolved over three generations of research. According to Engeström (2001:134), the first generation was initiated around 1920 and 1930 by Lev Vygotsky who created the idea of mediation. Mediation has been shown using Vygotsky's famous triangular model in which stimulus and response is mediated by artefacts. The unit of analysis of the first generation is an individual. That became a weakness of the first generation since the individual can only be understood in a collective activity (Engeström 2001:134). That is due to the fact that, human actions are implanted in a social context and therefore actions cannot be isolated from the context in which they take place. For that reason, the theory is referred to as the Activity Theory.

Changing the focus from individual activity to collective activity was the main characteristic of the second generation which was developed by Leont'ev and Lulia, but they did not develop a graphic representation to expand the Vygotskian triad. Engeström continued where Leont'ev and Lulia stopped by expanding the triad into an

activity system. The second generation mainly turned the debate toward the relationship between the individual and his community (Engeström 2001:134). The graphic representation of an activity system is shown below:

Figure 2: Activity System



Source Engeström 2000:963

Johassen and Rorer- Murphy (1999:63) describes the six components of the activity system which interact in order to achieve the goals/outcome set for an activity as follows.

1. Subjects are the participants who are involved in the community where the activity takes place.

2. Objects are the motives/intentions which direct the activity system; thus, activities are differentiated by their objects.
3. Tools are models and methods employed that mediate activities “tools can be anything used in a transformation process”.
4. Rules are norms, conventions, expectations and social relations which mediate the relation between subjects and community. They define how participants behave.
5. Division of labour defines how the work is divided in the community, e.g. who is expected to do what.
6. Community defines the community in which the activity is embedded. Each community has its own rules which direct the expectation.

Though Leontev expanded the focus to collective action within an activity system, the theory closed debate, dialogue and network between activity systems for action improvements (Engeström 2001:135). Researchers who took the activity theory to the next level concentrated on “dialogically, activity network, actor network theory, boundary crossing, and third space”, which all refer to two or more activity systems working together to increase the achievement. The third generation therefore expanded to include two or more interacting activity systems (Engeström 2001:136). Tsui and Law (2007:1299) support the view of collective actions between activity systems when they state:

It is no longer sufficient for an individual to acquire expertise within the boundary of one’s own field of expertise... one has to engage with other communities of practice; one has to move between multiple parallel contexts. These contexts demand and afford different and sometimes conflicting, mediating tools and patterns of social interactions. One is challenged to negotiate and integrate elements from different contexts to provide solutions to problems.

In this research I will refer to boundary crossing as a collective action between activity systems.

In the third generation of activity theory, five principles can be used to summarise the boundary crossing between the activity systems. I will describe the principles using Engeström's (2001:136-137) review.

The 1st principle is that the activity system is seen in a network relation to other activity systems and the combination effort is seen as a unit of analysis; "goal directed individual and group actions, as well as automatic operations, are relatively independent but subordinate units of analysis, eventually understandable only when interpreted against the background of entire activity systems".

The 2nd principle is the multi voicedness of activity systems. An activity system is a house of different histories because each participant (subject) has his/her own history and the activity system also carries different histories in its artefacts, rules and principle. The histories in the activity system may be increased when it combines effort with other activity systems when trying to cross boundaries. Multi-voicedness is a "source of trouble and a source of innovation, demanding actions of translation and negotiation". Activity theory advocates posit that activities have intentions and these intentions are planned by the participants. However, their plans are not rigid but can be changed to achieve better goals, because when an activity involves a lot of people, it is prone to much criticism which needs to be negotiated to come up with a common idea. This means that a large number of contradictions is expected in an activity which involves more than one participant, and that leads to thoughtful and richly scrutinized intentions and expectations.

The 3rd principle is historicity. The problems and potentials of activity systems can only be understood against their history because they get transformed over a long time. Thus activity systems need to be analysed against their history.

The 4th principle is the role of contradictions as a source of change and development. Engeström says that contradiction is not the same as problems or conflicts but it is a tension-developing between activity systems. Contradictions take place when an activity system adopts a new element from outside as a result of networking. The new element collides with the old, the collision causes tension and disturbances but it also brings new ideas leading to innovative change

The 5th Principle proclaims the possibility of expansive transformation in activity systems. This describes the condition in an activity system when some individual participants use the contradictory ideas and move away from their norms, which brings about expansive change in the activity system. “An expansive transformation is accomplished when the object and motive of the activity are reconceptualised to embrace a radically wider horizon of possibilities than in the previous mode of the activity. A full cycle of expansive transformation may be understood as a collective journey through the zone of proximal development”.

Johassen and Rohrer-Murphy (1999 70-78) outlined some steps to assist in analysing an activity system for the purpose of designing constructivist learning environments. Sub questions are also developed that need to be answered in an analysis. I will use some of the steps to analyse the activities of teachers in environmental education.

Clarifying the purpose of an activity system is the first step in an analysis. This step requires understanding the goals and motives of an activity system. This can be done by understanding the relevant context within which activities occur. It is also advised that the subject should be understood, as well as his or her motivations and interpretation of perceived contradictions in the system. This can be done by generating a list of all participant-driven motives and goals, keeping in mind what is expected from the performers and who set the expectation. This step also requires interviews to be conducted with those who are associated with the activity, in order to understand the contradictions and the overall factors that affect the activity.

In the next step, all the components of the activity system should be defined such as the subject, object, community, rules, and division of labour. Johassen and Rohrer-Murphy (1999 70-78) say the subject of an activity is the learner in the constructivist learning environment. The learner is thus an important component that drives the system. The subject is perceived to establish the goals of the system based on the contradictions they experience in the activity system. Thus the analyst should describe how he perceives the learners' roles in relation to the goals of the system. On the other hand it is the transformation of the object which moves the subject toward the goal. How the object will fulfil the goals needs to be defined. It is also important to examine the

community in which the subjects work and the nature of the social interaction among participants and how labour is divided among them.

Analysing the tools and mediators is the next step in an analysis. The interactions of the components of the activity system are mediated by signs and tools which provide the communication between the objects. Mediators can be instruments, signs, procedures, machines, methods, languages, formalisms and laws. Tools mediate an activity that connects a person with the objects and also with other people. Rules also mediate the relationship between the subject and the community or communities in which they participate. The models, procedures or methods which are accepted in a certain context can also mediate activities. The following questions will assist in analysing the tools and mediators:

- What tools might be used in this activity?
- How readily available to participants are those tools?
- Which tools (physical and cognitive) are used to perform activities in activities and across activities?
- What are the rules, laws or assumptions which guide the activities in which people engage?
- How might these rules (formal- informal, internal-external) evolve?
- How widely understood are these rules?

Context analysis is another step proposed by Johassen and Rohrer-Murphy (1999). Traditional methods of activity analysis focus only on the technical core of performance and forget the situation in which activities occur, while activities define and are defined by the context in which they take place. Analysing context is essential for defining the larger activity systems within which an activity occurs because different contexts dictate how things should be done in practice. The analysis should include indentifying the limitation posed on the activities by the external agencies. The context should also include how the tasks are organised among the members, whether tasks are dictated or taken on voluntarily and how these tasks are divided and shared among the participants.

When the analysis is complete it is therefore important to look back at what was analysed, make conclusions based on how components affect each in terms of the relationship that exists between the components of the system, and how formally the relationships are established.

Consequently, activity theory is deemed appropriate in this research, focusing mainly on the third generation of the theory. The interviews focused on two subjects, the teachers and the advisory teachers who are expected to work together according to their job description in the implementation of the curriculum. I will therefore use theory to explore the expertise of teachers in what they are expected to implement; to study the collegiality within the activity system and how the labour is divided within the school system in order to ensure the successful implementation of environmental education; how the boundaries are crossed for teachers to learn more about their duties and the factors which affect the implementation; and how teachers are affected by the implementation of environmental education. I also used theory to suggest how environmental education can be enhanced through crossing boundaries.

2.11 Conclusion of the chapter

This chapter is the foundation on which the results of the study will be analysed and discussed. During my studies I came to the conclusion that there are different ways in which EE can be implemented in the curriculum and that education for the environment is an important approach. In addition other authors allude to the reality that science is important to the environment, but its implementation can also have bad consequences. . For that reason and because of the fact that the philosophies of EE and science differ, science subjects are considered by some people as bad vehicles, while others call for the need to close the gap between science and EE and argue that science can be a good vehicle for EE.

I also attempt to search for guidelines for effective curriculum implementation, so as to analyse if the guidelines are taken into consideration during EE implementation in Namibia. This can lead to uncovering many factors which might have affected the implementation of EE in Namibian schools. Activity theory is also described and its

importance to this study is outlined as one of the theories used for analysis. A study of this theory can lead to a better implementation of EE.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

Research is a process whereby people try to get answers to the questions they pose in their engagement with their world; that way, knowledge is produced. This chapter provides a plan or design for collecting data that can generate answers to the research questions. The coherency with which the plan is organized is described and this includes the paradigm in use, the purpose of the research, the context and the techniques. Branch (2006:33) affirms that the design should be done in a way that promotes the validity of the results, therefore the steps taken to produce valid results and to ensure reliability and ethical precautions is also outlined in this chapter. .

3.2 Research design

The purpose of the research design is to plan the stages of the research. Bogdan and Biklen (2006:54) note that when preparing for a journey, those who travel without planning the detail of the way will encounter more problems than those who planned.

Research can be done in many ways. In this study, a case study design will be used. A case study is described by Bogdan and Biklen (2006:54) as a process whereby the researchers strive to study cases in detail. A single case study may include one person or many. The present study is a single case of Biology teachers who are expected to teach EE as part of their normal curriculum implementation. This case involves a number of people who are all involved in the same process of implementing EE as part of the Biology curriculum.

3.3 Paradigm

My interest is to understand the way teachers teach EE as part of the Biology curriculum, therefore an interpretive paradigm was selected as the orientation for the research. This paradigm was developed from Edmund Husser's phenomenology and the view of Wilhelm Dilthey and other German scholars on *Hermeneutics*. Hermeneutics is the study of meaning (Mertens 1997:11). Making meaning generally involves understanding. When an issue is not understood, then interpretation is required. The

interpretive paradigm therefore becomes self-explanatory in that it is the interpretation of meanings which are not understood, to those who do not understand. Though historians used the paradigm to interpret old writing, the term is used today when some issues are not understood and need interpretation. Mertens (1997:11) writes that interpreters use the term hermeneutics in any situation where meaning is lacking.

In addition, interpretivism is regarded as a philosophy which acknowledges the difference between the object and the human, and arrives at the conclusion that the two cannot be treated the same way (Babbie & Mouton 2001:28). Moreover, humans are exposed to changes in their daily life, and their experiences of the world should be respected. Therefore, interpretivists argue that people should be at liberty to express the meanings which they impute to their experience (Conole 1993:19; Babbie & Mouton 2001). Conole (1993:19) explains it thus:

Extrapolating to social science, human behaviour is seen as the outcome of external influences. From an interpretive perspective human actions have reasons. Actions are preceded by intentions and may be accompanied by reflection. Actions take place within a structure of social rules within which they have meaning for both actor and observer. Meanings are generated and shared through language and other forms of symbolism and are negotiated.

In this study, the interpretive paradigm is used to interpret the responses of teachers and advisory teachers which were collected through interviews and classroom observation. According to Conole (1993:7) this is possible because it is assumed that human actions are guided by reason which is shared through language and other forms of symbolism. The aim of social research is thus to understand the world according to people's understanding of their world and the way they interpret their experiences (Babbie & Mouton 2001:33). This research includes data interpretation, which is aimed at clarifying meaning. Clear meaning is important especially when the results of the research are compared to findings of other existing studies. However, meanings are initially made by the subjects, who described behaviours through data developed by way of interviews.

Based on the studies conducted by Conole (1993), Mertens (1997:11), and Babbie and Mouton (2001), the assumptions for the interpretive paradigm can be summarised as follows:

- Observable behaviour should not be the only focus of data collection but it should embrace the meaning-making and reason-giving of people's behaviours and actions.
- The reality and the person who observes the reality cannot be separated because our perceptions about the world are bound to the experiences we have had during our lives. This means that life and the world have both subjective and objective characteristics.
- Understanding is a method of studying humanity through an empathic identification with the other and a grasping of their subjective experience.
- Meaning is generated and shared through language and other forms of symbolism.
- Observation is made through the social, linguistic and cognitive skills of the researcher. Knowledge is obtained through the generation of inquiry to achieve new information. The integration of findings depends upon the quality of the social skills of the researcher in the production of knowledge.
- Interpretivists acknowledge that the knowledge they build reflects their particular goals, culture, experience and history. This means knowledge is intentionally constituted and is built through social constructivism of the world.

The above discussion makes interpretivism a suitable paradigm for this research in which there is an attempt to understand how teachers implement EE. This is because it makes it possible for the researcher to go beyond studying the facts into discovering the effects and the reasons for teachers' actions.

3.4 Research methods

Choosing the right method for the study does not depend on the quantity of available methods or the methods which are mostly used by researchers. The method should relate to the study because different methods have different purposes. If the wrong method is selected, the proper results might not be obtained. Furthermore, data collection methods are categorised into two groups, qualitative and quantitative

methods. To suit the purpose, researches that are interpretive in nature and other in-depth studies of situations employ a qualitative method. Babbie and Mouton (2001:33) also see the combination as ideal for the reason that both interpretive and qualitative methods dig deep into meanings and reasons in order to understand a situation.

A qualitative study is defined by Babbie and Mouton (2001:270) as a social research into human action through the gathering of in-depth information from participants in order to understand their behaviour, instead of explaining them. Le Grange (2000:192-193) mentions two distinctions of the qualitative method namely the derivative and the literal contrasts. The derivative part already mentioned above is the philosophical view of the research, in this case, an interpretive paradigm while the latter refers to the instruments used to collect the data. The choice of instruments for data collection depends on the research design selected. Babbie and Mouton (2001:278-287) further describe three designs associated with the qualitative method, all of which have four things in common:

1. Engagement in deep discussion with the subject of the study;
2. Using sampling methods to select a small representative group;
3. Freedom to collect data from different sources; and
4. Freedom to make some changes in the study when necessary.

The qualitative research design selected for this study is the case study. It is regarded as a deep examination of the subjects of the study (Babbie & Mouton 2001:28) with the aim of understanding the situations of the subjects and the factors that influence their 'behaviour. Another reason for choosing the design is that, it gives room for the use of multiple data collection techniques and the involvement of different groups of people who are believed to have influence on the behaviour observed (Babbie & Mouton 2001). The design is an advantage here because it enables the study to include both teachers and subject advisors. Teachers can talk about their experiences in teaching EE while advisors describe how they promote the teaching of EE in schools. Additionally, because by nature, the case study permits the collection of data using more than one method, interviews, observation and document analysis will be used in this study.

Qualitative design is however not static but dynamic, therefore if anything of interest to the study can be obtained through a quantitative form of inquiry, a shift can be made (Conole 1993).

3.4.1 Interviews

Both the interpretive paradigm and the qualitative study (specifically, the case study) are selected for this research because they make it possible to study cases in depth. The interpretive method demonstrates that “meanings are made and shared through language and other forms of symbolism... through social constructivism” (Conole 1993:7). Without any doubt, the instrument that matches these values is the interview because it is embedded in the use of language and it opens the way for in-depth discussion bringing about in-depth understanding of situations. Seidmen (1998:3; 2006:9) states that, “at the root of in-depth interviewing is an interest in understanding the experience of other people and the meaning they make of that experience” but not in getting answers to questions, in order to test the hypothesis or to evaluate situations. Seidmen (2006:7) also asserts that an interview is a process of meaning-making. The stories told by storytellers start somewhere and stop somewhere as the tellers tell them while reflecting on their experience.

In order to conduct an interview, a schedule of questions needs to be prepared. There are therefore similarities between interviews and questionnaires although interviews are orally conducted while questionnaires are administered and the answers are written down. (Grange 2000:192). Despite the similarities, interview is preferred because socialisation takes place mostly through speaking, and this is one the assumptions of the interpretive paradigm. Other advantages of using interviews will be discussed later in this section.

In this study, semi-structured interviews were used with open-ended questions. Although questions were prepared before the interview period, the participants were not restricted regarding the answers. . Such interviews are relevant in cases which require the in-depth study of situations especially when trying to understand human experiences since people have different experiences which cannot be predicted or restricted to certain responses. Additionally, the presence of the researcher is an

advantage to the research as it ensures that the expected responses are received, and understanding is enhanced when the researcher probes for answers. (Babbie & Mouton 2001:251). Seidman (2006:83) however faults the use of the word “probe”, claiming that it somehow gives much power to the researcher to treat participants as objects, therefore he opts for the use of the term “explore” In my view, the choice of words is not an issue, but what to do and how to do it remain important, because no researcher tells the research participants that they are being “probed” or “explored” but rather they convey their ideas in practice. Other important advantages of interviews mentioned by Babbie and Mouton (2001) are the following:

- The researched find it difficult to refuse to participate in the presence of the researcher;
- The researched try their best to answer the questions;
- Facial expressions of the respondents and their body language add meaning to their responses. .

Though the interview technique is suitable for this study, some obstacles can render it either impossible or difficult. Seidman (2006:12) identifies some of the obstacles as:

- An interview can be time-consuming
- It is costly
- The research has to be contextualised
- Data collected needs to be transcribed
- Access to the schools can be difficult.

In reality, any method of collecting data involves some obstacles; and some of the obstacles are shared by a number of methods. However, knowing what possible obstacles might need to be faced is important because this aids in the preparation for the process.

3.4.2 Observation

Mertens (1997:318-319) identifies five types of observation as:

1. Non-participation - observing by watching the video or listening to the tape record of a certain event during which the researcher was absent.
2. Passive participation - the researcher is present at the scene but does not interact with participants.
3. Moderate participation - the researcher participates only in some activities but not in all. This is done in order to maintain a balance between being an insider and an outsider.
4. Active participation - the researcher does what others are doing but not completely.
5. Complete participation - the researcher does everything which is done in the situation.

Although initially the researcher chose to be a passive participant in this study, she eventually became a moderate participant. The researcher participated in marking and binding question papers for examination. This behaviour was partially dictated by the African tradition that one cannot be passive while others are working. It was also clear that participating in the activities would not interfere with the results, especially as the marking was guided by the marking scheme.

The statements made by teachers during the interviews could be verified during the observation stage. Thus, observation in this study was used as a data collection method that ensured reliability by validating the results of the study. In addition, the researcher could see or hear things which were not mentioned during the interviews but are useful in the search for an answer to the research question. Babbie and Mouton (2001:294) note that the presence of the researcher on the scene is the greatest advantage to the research because he or she can see the reality on ground. Kelly (2006:307-308) further explains that:

While talking to people is a good direct way of getting to know about their feelings and experiences, it usually comes 'after the fact' in the sense of relying on the interviewee's recollection of an experience. Observation on the other hand, takes place while things are actually happening, and thus gets you even closer to the action. Because the interpretive approach emphasises studying phenomena in a naturalistic way, observation most often takes the form of participant observation, where you, as researcher, become fully involved in the setting being studied.

Babbie and Mouton (2001:294) and Kelly (2006:311) also caution that the researcher must take notes of what happened in relation to the research observation. The note-taking should take place during the observation or immediately after, in order that you do not forget. The authors also outline the following advantages of observation which they have adapted from Kelleher (1993:126):

- Observation forces the observer to become familiar with the subjects, which allows previously unnoticed or ignored aspects to be seen.
- People's actions are probably more telling than their verbal accounts, and observing these is valuable.
- Observation is unobtrusive and when obtrusive, the effect wears off in a reasonable time.

Unstructured observation was employed in this study as the researcher wrote down the descriptions of observed information at the scene of the teaching while paying attention to any important information pertaining to the observation. However, even though the observation was unstructured, an observation schedule was set up to keep the focus on the research question. Kelly (2006:314) also states that it is important to remain focused although any information found necessary for the research should be recorded.

The observation schedule focused on the following:

- Methods used in teaching - This helped to identify whether the methods used enabled the inclusion of or blocked the implementation of EE.
- Types of questions used in teaching - Like the teaching methods explained above, types of questions used can be categorized as high order questions and

low order questions. Low order questions require answers which retrieve the information given, while high order questions allow the learners to go beyond the provided information to discuss issues and find solutions.

- Availability of resources – It has been shown in several studies that curriculum implementation is hindered by lack of resources. It is important therefore to find out whether schools are rich in resources
- Determining whether teachers generally include EE in their teaching.

3.4.3 Document analysis

Document analysis took place throughout the research, as data was collected from books, articles, government documents and lesson preparations. Peil (1995:126) states that documents are used to collect the existing information and facts about the specific research topics. Government documents were analysed to find out how EE was developed and included in the Namibian curriculum for secondary schools especially in Science/Biology. Most of these government documents are available on internet while others were obtained from government offices. Officials in most cases required a research permit before making the documents available. Lastly, lesson plans were studied during the fieldwork to find out whether teachers included EE in their teaching. According to Mertens (1997:324):

The qualitative researcher must turn to these documents and records to get the necessary background of the situation and insights into the dynamics of everyday functioning. The researcher cannot be in all places at all times; therefore, documents and records give the researcher access to information that would otherwise be unavailable.

3.5 Sampling

It would be impossible to interview everyone that is qualified for this study because there are too many Biology teachers, and interviewing like other forms of qualitative techniques for collecting data, involves a messy process of preparing data for analysis. For this reason, only a small number of subjects were selected to represent the whole group. This group had the same characteristics as the rest of the population and could be used to draw conclusions about the whole population of the Biology teachers who

were trained at the University of Namibia (UNAM) and whose teacher education did not include EE. Branch *et al* (2006:44) point out that sampling is all about selecting a population which helps in generalising the finding for the units of study (see also Fogerman 2002:97). Samples are selected in two ways. When a sampler needs to control the probability of the individuals in the sample, the selection is called probability sampling, while the converse is non-probability sampling. Control sampling is typical of quantitative rather than qualitative research. Therefore, the sampling techniques used in this study are the non-probability sampling techniques.

In this study, teachers from two regions (Omusati and Khomas) were selected to represent the whole group of Biology teachers trained at UNAM who did not study EE during their training. Four schools from each of the two regions were part of the case study and one teacher was selected from each school, to make a total of eight teachers. The technique is purposive sampling which is described by Fogelman (2002:101) as a sampling method whereby the researchers use their knowledge to select the agents which represent the entire population. The regions studied were identified purposively, such that the experiences of teachers in the urban areas could be compared to those of teachers in rural areas. The two regions are far from each other and that had much bearing on the transport cost and time spent on the study. In addition, the secondary schools are also far apart from one another, especially those in the Omusati region. As a result, purposive sampling was employed together with convenience sampling in which the selected schools were those closer to the centre where the researcher resided. Convenience sampling entails that the sample be reached easily and takes the limiting factors into consideration (Fogerman 2002:101, 103).

The advantage of using the case study technique in this study has already been noted above. However, this technique also makes it possible to study other groups of people who possibly influence the behaviours of the participants (Babbie & Mouton 2001:281). Subject advisors have the responsibility to cater for the teachers' professional development. When EE became part of the curriculum of Science and Biology in Namibia, subject advisors were expected to include EE as part of the professional development they offer teachers. Therefore, the researcher also attempted to

understand how the subject advisors promote EE. The subject advisors in the two regions were interviewed but a different interview schedule was used.

3.6 Data Analysis Process

Like any other research technique, data analysis should be appropriate to the research design/paradigm. The data analysis technique used for this research should enable the presentation of data to be done in such a way that the meaning which people impute to their experience emerges clearly from the data. The interpretive and qualitative methods selected for this study favour the presentation of data in detail rather than mathematically (Braun & Clarke 2006:79). There are a number of data analysis techniques that are qualitative in nature, but the thematic technique was selected for this study.

Thematic analysis involves any data analysis technique which spots, selects, scrutinises and presents the themes from the entire data (Braun & Clarke 2006:79). However, thematic analysis is not regarded as a method on its own but is an umbrella term for all the analysis methods used to search for themes in raw data. Braun and Clarke identify two reasons for searching for themes in the data:

1. To present the themes; and
2. To develop the theories.

Analysis in this research excludes methods which search for themes for the purpose of developing theories. In this case, the thematic analysis method used is the constant comparative. The constant comparative is a thematic analysis method because it is not theory-based. The name “constant comparative” refers to the main activity during the analysis process, in which data is repeatedly compared in order to come up with the themes. During the process of comparing and re-comparing data, participants’ feelings, thoughts and actions are uncovered (Maykut and Morehouse 1994). Maykut and Morehouse (1994) mention that roles are the focus of this research; thus, constant comparison enriches the research with findings that enhance the understanding of their condition.

In the process the steps suggested by Braun and Clarke (2006) and supported by Mykut and Morehouse (1994) and Terre Branche, Durrheim and Painter (2006) were followed. The steps are summarised as follows:

Step 1

The process began with the transcription of the tape-recorded data. The data was typed out word-for-word as the participants had uttered them. During the transcription, the researcher familiarised herself with the data by listening to the tape recordings. . The familiarisation process continued even after the transcription as the researcher pored over the transcribed data. Braun and Clarke (2006:87) affirm that transcription should not be done passively because the aim is to look for “meanings, patterns and so on” which appear in the data. They also state that the initial ideas for coding start at this point, therefore this can be considered as an important stage of data analysis. Furthermore, the process is described as time consuming and a researcher may be tempted to skip it completely. This first step in the analysis turned out to be time consuming, but later the effort proved worthwhile because at that early stage, the themes for the data presentation began to get clearer.

Step 2

At this stage, the researcher had become familiar with the data i.e. the transcription, which was at first handwritten and then typed in order to improve the understanding. After the transcription process, shuffling through the data also led to further enlightenment. Thus, one can agree with Braun and Clarke (2006:88) that the researcher at this point, is conversant with the data and should be able to select the relevant aspects quickly.

Searching for themes in this research is data-driven; it is not theory-laden. Although the search was approached through the questions used during the interviews, this was only done to keep the researcher focussed and all the themes, expected or unexpected, were drawn from the data set. This is unlike the process of approaching the data with questions which steer the results in a certain direction for the purpose of developing a certain theory and picking answers suitable for drawing conclusions that affirm a certain hypothesis. The process supports the view of Braun and Clarke (2006:890) that

thematic analysis depends on drawing all the themes that emerge from the data rather than choosing only what is needed to answer the theoretical question. While selecting and tracking the themes, the researcher is advised to “work systematically through the entire data set, giving equal attention to each item and to identify interesting aspects in the data items that may form the basis of repeated patterns across the data set” (Braun and Clarke 2006:87). The journey of working through the data set began with the transcription, but at this stage, the researcher aimed to come up with themes rather than merely getting acquainted with the data as in Step 1 above.

The main activity that took place at this stage involved drawing a two-row table and placing the data set on the left side of the table before interpreting the data on the right side. Other related meanings were added later to form a theme using constant comparison. The same procedure was then used for all the data sets from all the participants. This was accompanied by the coding of data pages, based on the style proposed by Maykut and Morehouse (1994:127). The letter T was used to represent the transcript followed by a stroke (/), then the first letter of the participant’s name and the page number. In some instances, more than one letter was used when two or more names started with the same letter. Page numbering appears on upper right hand corner of each page such as T/NAM-3. Page numbering is then followed by photocopying the transcript and cutting out the “chucks” with the “units of meaning”. The units of meaning were tagged as in the page numbering to make it easy for the reader to consult the data set for more details. The meanings were then cut out separately for grouping.

Step 3

Searching for the themes is the main activity in Step 3 that is, after searching for meanings in the whole data set. Meanings which relate to the same issues need to be brought together to form a theme (Braun and Clarke 2006:90). In this study, this began with the pasting of one idea of meaning on the large chart and examining the meanings to see if they fitted the idea written on the chart. If a meaning fitted the idea, it was then pasted below the idea. If it did not fit, a new idea was identified and written separately. The comparison took place in this manner until all the cuts with the same meaning from all the data sets were matched with the appropriate ideas of meaning. Comparison of

themes development followed the order in which the questions were asked (Maykut and Morehouse 2006:135). The next three diagrams provide a vivid picture of how the information was clustered. This is meant to show the physical process which took place, without paying much attention to the written information.

Figure 3: Units of meaning with the same meaning (theme)

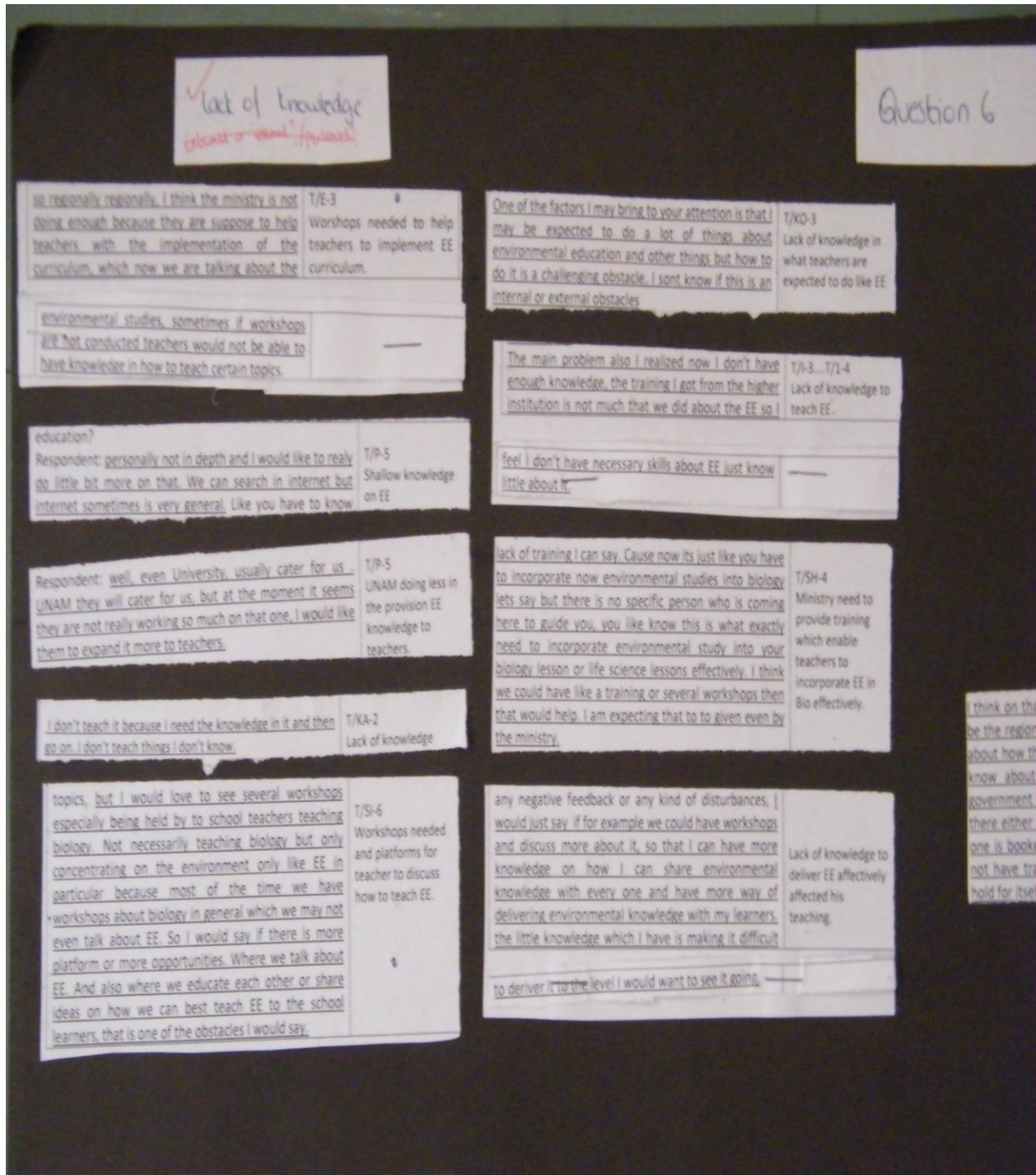


Figure 4: Themes which emerged from Question

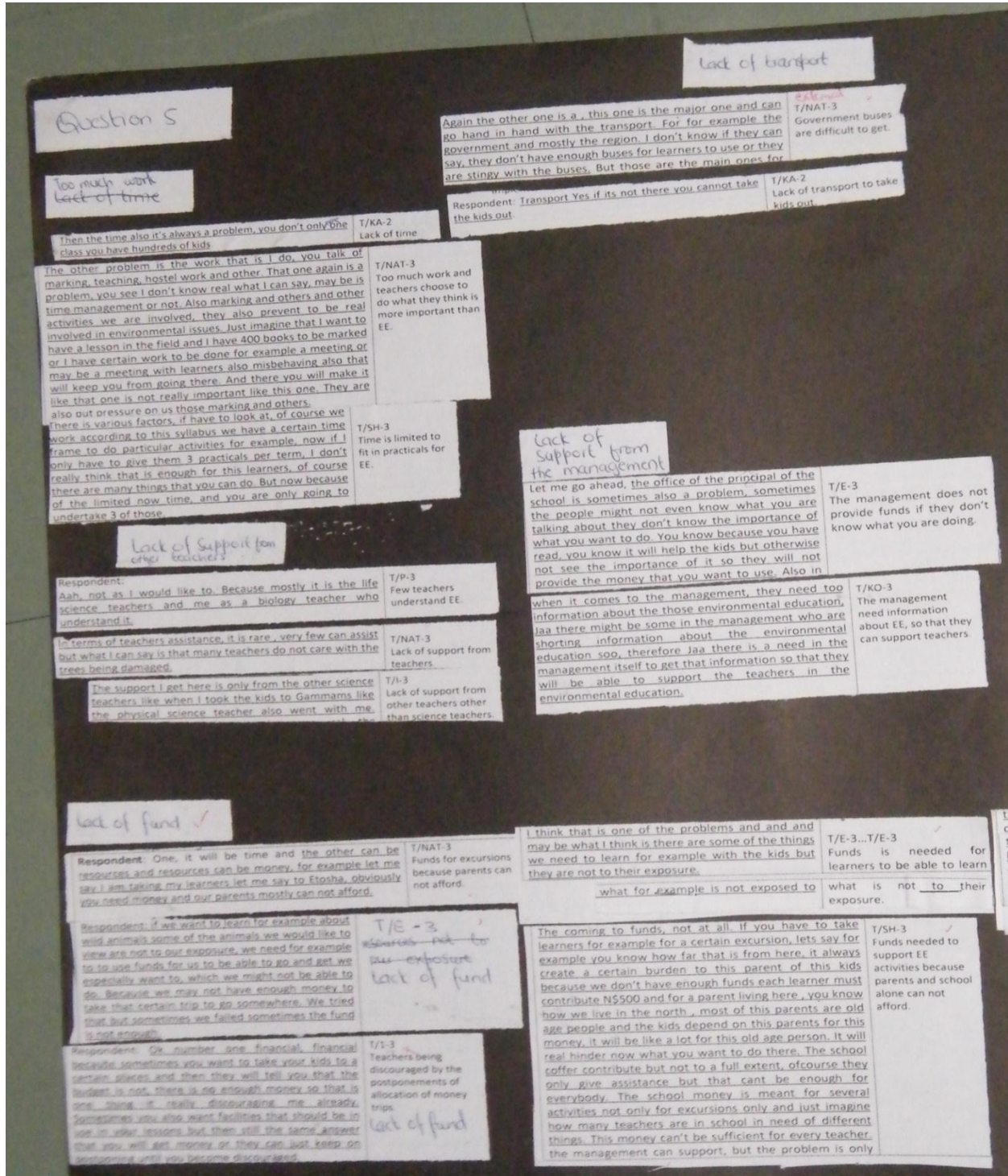


Figure 5: Four of the many data charts prepared during the data analysis



Step 4

Finally the themes which emerged were refined for presentation by arranging the coded data in themes. Braun and Clarke (2006:90) explain that, “this phase refocuses the analysis at the broader level of themes, rather than codes, and involves sorting the different codes into potential themes, and collating all the relevant coded data extracts within the identified themes”. Codes were not used at this stage; rather, the researcher employed what could be referred to as initial ideas for themes. The importance of codes was not really clear therefore an alternative was improvised to meet the functional needs of the study and the researcher’s level of understanding. At this point, themes which were initially separated but later found to have similar meaning were merged while those with different meanings but which were grouped together were separated (Maykut & Morehouse 1994:139).

The questionnaire was set up in a logical and coherent way; hence, data was presented in the same way to maintain the logical flow of the storytelling. In several instances, the presentation is not constrained by the view of the majority unless it was considered important, since some of the views expressed by few people remain important to the study. As Bogdan and Biklen (2006:80) explain:

Qualitative studies that report how many people do this and how many people do that, rather than generating concepts and understanding, are not highly regarded by qualitative researchers. More accurately, they are poor use of qualitative resources when such data can be collected more easily and cheaply using other methods.

The presentation went beyond data presentation. This can be seen later in chapter 5, where the data is discussed and interpreted.

3.7 Validity

The word validity basically refers to something that is justifiable and can be trusted. The validity of the research is determined by the measures employed to carry out the research. Instruments used for measurements are valid when they measure what they were planned to measure (Branche, Durrheim & Painter 2006:147). Different measures are validated using different types of validity:

- To test if the findings reflect what is measured, internal validity is used.

- Though a small sample was selected in this research, it was meant to represent the whole group population. To find out the degree to which the result can be generalised to reflect the population it represents, external validity is used.
- To test if the data collection instrument covers what it purports to cover, content validity is used.
- However, construct validity is the extent to which the construct under study is defined in an acceptable way (Branch *et al* 2006:163-166; see also Babbie & Mouton 2001:122-123; Bush 2002:65-68).

The consideration of validity is important to this study. To this end, the interviews were tape recorded to ensure the trustworthiness of the transcripts as opposed to the approach in which the researcher writes down the answers during the interview. Tape recording ensures that data interpretation reflects the reality on the ground and is based on the statements of the participants. Thus, the reality of how teachers implement EE in Namibia and how advisory teachers support the implementation was uncovered. This settles the issue of internal validity.

Regarding external validity on the other hand, in-depth or thick description of data was presented to enable the generalisation of the findings to the entire population. Sufficient content validity was assured by setting the interview schedule which covered the content specified by the research sub-questions. Lastly, the researcher provided a broad definition of the EE construct since a narrower definition might be considered unacceptable in the field. In addition, participants were introduced to the construct before participating in the interviews. This ensured validity because participants were made to understand the field of the research.

3.8 Reliability

If a research is repeated under the same conditions and the same results are produced, it is then considered reliable (Cohen, Manion & Morrison 2000:117; Bush 2002:60). If a different result is produced, the instruments are unreliable. Repeated tests are typically quantitative but adaptation is made to fit the context in qualitative research. More than one method of data collection can be used to find out whether related results are reached (Branch 2001:278). Such a process is called

triangulation. In this research, the interviews were triangulated with classroom observations and document analysis, that is, by comparing and presenting the results to give a picture of how teachers implement EE. In this research therefore, triangulation was employed as a reliability assurance method through interviews with subject advisors to find out whether teachers get professional help in administering EE.

3.9 Research Ethics

Oliver (2010:122-123) argues that:

....at its very heart the key principle of research ethics is that one ought to treat the people who help you with your research with care, consideration, and sensitivity... that we should at all times respect the human dignity of those who help us.

In addition, the people should be respected if one considers that without their help, information would not have been obtained. Oliver concludes that without the researched, the research process cannot proceed. This is mainly true in empirical research (such as interpretive research) as opposed to the critical paradigm in which contact with the people is avoided.

Moreover, the researched should be respected because the information which they provide might not be useful to the researched and might be considered uninteresting. The questions might also address issues which they are not comfortable with (Oliver 2010:123). Even though their consent is obtained, their respect is a bonus.

Thus, it is especially important that researches dealing with human beings follow ethical considerations, even though ethics is also important in non-qualitative research. The principles to be considered include participants' autonomy, non-maleficence and beneficence (Durrheim & Wassenaar 2002:66). According to Durrheim and Wassenaar, it is ethically problematic when participants take part in research without their consent (autonomy). Obtaining their consent also does not imply that they can be treated in any way that could harm them physically or mentally (non-maleficence). This includes avoiding asking personal questions.

Participants on the other hand need to benefit from the research findings in one way or another (beneficence), e.g. direct benefit or benefit for other researchers or the

community. It is thus important to explain the benefits of the research to participants as this could also encourage them to take part in the research. Participants' autonomy is also emphasised by Burgess (1989:5) who cites other ethical dilemmas highlighted by Barry and Bruce (cited in Burgess, 1989) as:

- Research sponsorship - participants are informed about funders of the research and their beliefs which might divert the research findings towards the sponsors' principles.
- Research relation - considers the fact that the relationship between the research and the participant might have an effect on the research findings while the data dissemination suggests that researched should be informed about how the findings will be used and published.

Mertens (1997:24) agrees with the principles outlined by Burgess (1989) and says:

1. The research must use a valid research design.
2. The researcher must be competent.
3. Consequences of the research must be identified.
4. The sample selection must be appropriate for the purpose of the study and be a proper representation of the population that will benefit from the study.
5. Participants must agree to participate in the study through voluntary informed consent.
6. The researcher must inform the participants whether they will be compensated.

Even if some of the research ethics and norms such as research sponsorship do not apply to this research, others are important and they contribute to the validity of the findings of this research.

In the first place, access to the schools was sought. The gatekeepers in this case included the Permanent Secretary of the Ministry of Education, the Regional Directors of the Omusati and Khomas regions, school principals, and the teachers with whom the researcher had to enter into an agreement regarding their

participation. The consent forms were prepared and signed by the subjects before participation to show that they agreed that their involvement was based on voluntary participation. The consent forms were supplemented with all the necessary information that would assist the researched to understand the content of the research. Oliver (2010:124) writes that it is part of showing respect for human dignity when people are provided with all the information which enables them to understand what they are participating in and make informed decision regarding the participation. One of the main points in the consent form assured participants of confidentiality and that their identities would not be disclosed during dissemination (Olivier 2010:124). The confidentiality covered the names of the institutions because it is easy to identify the Biology teacher if the name of the school is disclosed. The teachers were also informed about what the research entailed and what was expected of them. In addition, the tape-recorded cassettes were kept safe where only the researcher had access to them.

3.10 Conclusion of Chapter

In this chapter, an attempt is made to ensure that the research design remains coherent. First, it was determined that the research question could only be answered by using a method that would uncover teachers' experience in teaching EE in order to understand how teachers implement EE when teaching Biology. The paradigm which allows for an in-depth study of cases, that is, the interpretive paradigm was employed based on its characteristics. The implication is that the research method as well as the data collection and data analysis methods adopted in this stud, would enable a detailed presentation of the data. Thus, the research moved along the qualitative line, using interviews as the main method of data collection and thematic analysis as the data analysis method. Most importantly, the teachers constituted the basic units of analysis although subject advisors were also included by way of triangulation.

The discussion also touched on the subject of validity noting that the validity of the research was insured so that in the end, the data reflects what it set out to reflect and the conclusion reflects the picture of the population represented in the sample. Finally, the measures taken to ensure that the researched are not harmed physically or mentally were described.

CHAPTER 4

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

In this chapter the focus is on the presentation, analysis, discussion and interpretation of the data. The data was collected from two groups of respondents namely Biology teachers and Biology advisory teachers. Different interview schedules were arranged in addition to other methods of data collection such as observation schedules. Data from the interviews of teachers and advisory teachers will be clustered together in themes for presentation and discussion. Observation data will also be added to the clustered data collected during interviews. The classes were visited after the interviews. In some schools, the researcher could attend two lessons while in other schools, only one lesson or none at all. The reason for this is discussed under the barriers encountered in the research.

Classes for observation were not selected purposefully but I observed any class prepared on the days I visited the schools for observations, because EE is understood as a cross curricular issue in Namibia and it is expected that teachers teach EE wherever is applicable. Throughout Basic Education, HIV and AIDS education, Health and Wellness education, Human Rights and Democracy, Information and Communication Technologies (ICTs) and Environmental learning are integrated across the curriculum (ME 2009:4). EE is therefore expected to be taught wherever it is applicable. I understand and am aware that it is easy to integrate EE in some topics. In other topics EE can be incorporated but it needs a knowledgeable teacher to relate these topics to the environment. Curriculum documents are analyzed for the inclusion of EE in the next section.

4.2 Environmental Education in the Current Curriculum with the Emphasis on Biology

All around the world, curriculums have recently been undergoing changes to include environmental education (Ross 2007:659). The Namibian curriculum is no exception. In this section, the curriculum documents will be analyzed in order to track the inclusion of EE and determine the credibility of the current Namibian curriculum for the inclusion of environmental education. The analysis will focus mostly on the

guidelines for EE in the national curriculum, the Biology syllabus, and the question paper for Biology in the 2010 ordinary level examinations.

Basic education in Namibia is divided into primary and secondary levels. The primary level starts from pre-primary to Grade 10 with three phases namely pre-primary, lower primary (Grade 1-4) and upper primary (Grade 5-7) while the secondary level is further divided into Junior Secondary (Grade 8-10) and Senior Secondary (Grade 11-12) as indicated in the figure below.

Figure 6: The structure of Basic education in Namibia

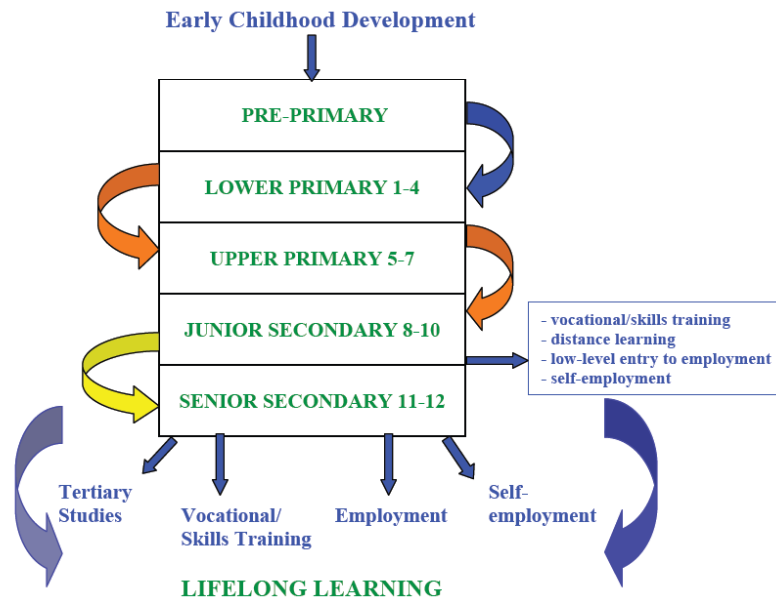


Figure 1: The Structure of Basic Education

Source: ME (2010:3)

Primary and Junior Secondary education are compulsory, but only those who meet the requirements may proceed to the senior secondary school where Biology is offered as a science subject.

The Namibian curriculum aims at an environmentally sustainable society as it states that:

There is no atmospheric, land, and water pollution from croplands and rangelands or mines, and minimal pollution from urban and industrial areas. Farms and natural ecosystems are productive and sustainable socially, economically and ecologically. There is high quality, low-impact tourism. Average family size is small and there is food security (ME 2010).

The aims of the curriculum in relation to developing an environmentally sustainable society are to provide the scientific knowledge and skills and attitudes and values needed to ensure that the environment is respected and sustained; and to develop the ability to make environmentally wise choices in terms of family development, as well as in economic activities (ME 2010:8).

One of the preconditions is to equip teachers with all the necessary teaching aids, technology and other relevant materials to support effective learning and in order that they will have the skills to develop and adapt materials themselves to suit multi-ability groups of learners. The learner-teacher ratio should also be at a manageable level (ME 2010:5).

Furthermore, the school community is urged to understand that the formal learning set out in the curriculum is only part of the life of the school, and that, co-curriculum activities should enrich the curriculum. The activities should be organized to support particular important areas of learning or to supplement areas of learning with little curriculum time. Environmental groups and clubs are suggested as co-curriculum activities (ME 2010:39).

The curriculum analysis showed that there seems to be a relationship between the aims of environmental education and aims of basic education curriculum in Namibia. Environmental education should be “appropriate to the need of the society, appropriate to the environmental sustainable society; follow the holistic approach and cross curricular approach; it focuses on the development of both knowledge, values and attitudes; follows a learner centred approach and involves them in real life situations; promotes lifelong learning and promotes critical thinking”. These are also some of the characteristics of basic education in Namibia (ME 2010:4,16,19,26,29,30 & ME 2005b:1,2). That shows that there is a relationship between environmental education and Namibian national education.

Learners aged 5-17 (Grade 0-12) experience environmental learning throughout their basic education because it is identified as one of the “main risks and challenges” to be integrated “across the curriculum”. The curriculum states:

All our learners need to understand the nature of these risks and challenges, and how they will impact our society and the quality of life of our people, now and in the future. They must understand how these risks and challenges can be addressed on a personal, local, national, and global level and how they can play a part in addressing these risks and challenges in their own school and local community (ME 2010: 4).

Learning in these grades is thus divided into learning areas in which Natural Science and Social Science are the carrier learning areas of EE in the curriculum of each of the grades. The learning areas are further divided into subjects. The subject Environmental Studies is responsible for environmental education in Grade 1-4 while for Grade 5-7, Natural Science, Health Education and Social Studies are the carrier subjects for EE. To address environmental education, Life Science was introduced as a subject in grades 8-10 at independence in 1990. In addition, Physical Science and Geography are also carrier EE subjects in Grades 8-10. These subjects are compulsory for all students attending these grades. In Grade 11-12 (senior secondary), learners select a field of studies with three “mutual supportive subjects”, that is, English and two supplementary subjects or one supplementary subject and a local language. That means a learner should have six subjects altogether, and mathematics is compulsory to all students from 2012. Biology, Physical Science, Geography, Agriculture and Development Studies have components related to the environment in their curriculums and are therefore the carrier subjects for EE at the Senior Secondary level. Different fields of subjects are combined at the ordinary/high level as follows:

Table 1: Fields of study in secondary schools and combinations of subjects

Natural Sciences and Mathematics	NSM1	Biology Physical Science; Mathematics
	NSM2	Biology; Mathematics; Geography
	NSM3	Physical Science; Mathematics; Computer Studies
	NSM4	Agriculture; Biology; Mathematics
	NSM5	Physical Science; Mathematics; Geography
Social Sciences	SS1	Development Studies; Geography; History
	SS2	Economics; Geography; Histor
Technology	T1	Design and Technology*; Mathematics; Physical Science
	T2	Home Economics; Biology; Development Studies
	T3	Fashion and Fabrics; Business Studies;
	T4	Development Studies Mathematics; Computer Studies; Design and Technology
Commerce	C1	Accounting; Business Studies; Mathematics
	C2	Accounting; Mathematics; Computer Studies
	C3	Accounting; Economics; Mathematics

Source: ME (2010:18)

It may be concluded that every learner has the opportunity to be exposed to EE throughout the schooling period because EE is compulsory according to the curriculum from pre-primary to Grade 10, EE is a component in some subjects as a local problem-solving curriculum action as well as a cross-curricular theme, and as a single subject. The Biology curriculum has a component of EE in the curriculum and allows EE to be integrated across the entire Biology curriculum.

However, at the Senior Secondary school level, there is no guarantee that integrating EE in carrier subjects means that all learners will be exposed to it. Only those who select the field with the carrier subjects or as supplementary subjects are exposed to EE. Table 2 shows that not all subject combinations include a carrier

subject with an EE component. However, the curriculum makes provision for EE to be experienced as a cross-curriculum theme. The other factor is that some teachers do not understand EE because it was not part of their training. The barriers to its implementation mentioned by authors are teacher-centeredness, workload, examination pressure, less commitment and so forth (Gayford 1996; Lee 2000; Le Grange 2001a).

Although the exact number of learners who are left out and having an opportunity to learn EE cannot be predicted due to lack of information, one may conclude that many learners have an opportunity. This is because the curriculum states that Natural Science (EE career learning area) is one of the fields of study to be encouraged in order to increase the number of people with expertise in Natural Science, which is one of the “priorities” of the Namibia’s Vision 2030 (ME 2010:17). Therefore, many learners are expected to take these subjects and Biology is one of the Natural Science subjects.

According to the Biology curriculum, the environment is considered as a whole because EE caters for the wellbeing of the whole environment. Section IV of the Biology syllabus stipulates that learners should learn about the relationships of organisms to one another and to their environment (ME Biology Syllabus Ordinary Level 2005:24). The section is subdivided into four topics namely energy flow, food chains and food webs, nutrient cycles, and population and human influences on the ecosystem including the damage to the environment and conservation (ME 2005b: 24-25).³

However, the knowledge provided is limited to the mention, description, definition, explanation or discussion of the content which is already provided in textbooks. There is no room for identification of new things and local problems, and this does not even appear in the suggestions for practical work in which the practice of EE is expected to be the environment itself. This is what Ross (2007:664) refers to as “shallow causality” whereby learners are “not expected to offer understanding that extends more than a single causal step”. This is also indicated in Question 9 of the 2010 Ordinary Level examination which is reproduced below:

³See appendix B.

Figure 7: Question related to ecosystem from the Biology question

16

9 Fig. 9.1 shows the water cycle.

For
Examiner's
Use

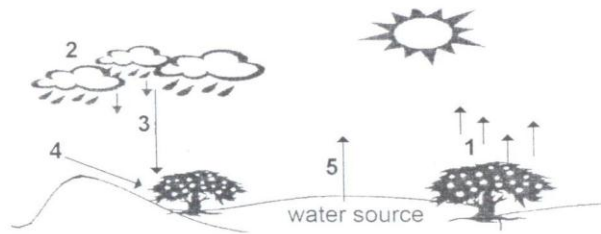


Fig. 9.1

(a) Identify the stages in the cycle numbered 1, 2, 3, 4 and 5.

- 1
- 2
- 3
- 4
- 5

[5]

(b) State what happens to water that infiltrates the soil, if it is not absorbed by the roots of plants.

.....

[1]

(c) Explain the effect of deforestation on the water cycle.

.....
.....
.....

[2]

[8]

4322/2/10
720047

[Turn over

Source: ME (2010b:16)

The question requires that learners remember the names of the stages of the water cycle and state what will happen to the water which is not absorbed from the soil. The learners are also to explain the effect of deforestation on the water cycle. However, the stages, their details and the effect are explained already in the textbook used; learners just need to memorize, retrieve and write them down to gain the two marks allocated for the explanation. This could give the impression that all environmental problems anywhere are solved in the same way because there are right answers to environmental problems. Thus, stating neither the stages nor the explanation of effects in this regard has gone beyond “shallow causality”.

In addition, what the curriculum refers to as the relationship between organisms and environment is represented by the models of relationship in terms of energy flow and nutrient cycles. However, the human influence on the ecosystem and conservation which is supposed to be directly embedded in these models, is separated from them and becomes a new topic on its own (See Appendix B, ME 2005b:24). Ross (2007) insists that “breaking the environment into generalized models of relationship. is driven by a particular epistemological model for curriculum” which is positivism in this case (see the characteristics of this in 2.7.1). These characteristics are also said to guide the ecology and science curriculum. Ross (2007) claims in addition, that the types of arrangement in EE are prepared for assessment purposes. This claim seems justified because the EE component in Biology is also examinable.

The environmental interrelationship is in addition broken by the subject division, since each subject addresses the environmental learning related to it. The relationship between individual subjects and environmental learning is lost. Although some of the topics in the different subjects are related, there is no referral to see other subject curriculums for more information, to show how all the subjects work together and how the environmental issues are dealt with in all the subjects which are interdependent. In the first place, the issue has shown that curriculum planners have worked in isolation, and it is left to the teachers and learners to figure out the borders of the different subjects. The holistic view of the environment in the entire curriculum is disturbed if it is learned in a disjointed fashion. For instance, pollution is dealt with in all natural science subjects such as Physical Science, Biology and Agriculture (see ME Biology Syllabus Ordinary Level 2005:25; ME 2005a:11; ME 2005c:33).

The arrangement of environmental learning into objectives separates the environmental learning from the society. Le Grange and Reddy (1997:14) indicate that environmental education is a social activity which does not need predetermined objectives because its objectives are formed in collaborative relationships with others and are contextual.

The provision of the content in the textbooks also contributes to the separation of the environment from society. The fact that teachers are prevented from using society and the immediate surroundings to prepare lessons for environmental education, creates the impression that there is no need to use them because what the curriculum and the examination require of learners is already provided in textbooks. This contradicts the curriculum requirement that learners should understand how environmental problems “can be addressed on a personal, local, national and global level and how they (the learners) can play a part in addressing these risks and challenges in their own schools and local communities” (ME 2010:5). The provision of the content to be learned in EE in textbooks can make the use of local and school environments as a source of information difficult, thus promoting the separation between the environment and society.

Biology is a study of life (Mary Jones 1994). Life involves anything which is alive, and life is made possible by the physical environment as a life supporting system. However, the Biology curriculum makes the study of life, a study of the human being and its anatomy such as the human transport system, the excretory system, the respiratory system, reproduction, and human nutrition, and very little is said about plants and other organisms. This can lead to the perception that life is synonymous with human. Thus, the environment is merely viewed as a system that caters for human needs. This argument is made apparent by the rationale behind the Biology curriculum which stipulates that the “learning experience in the natural area aims at increasing the learners’ knowledge and understanding of the physical and biological world of which they are a part. This includes understanding how people use the natural environments to satisfy human needs and how the environment can be changed in an ecologically sustainable way” (ME Biology Syllabus Ordinary Level 2005:2). To some extent, this statement gives the impression that the environment does not have its own right to stay healthy but that it should be protected for the sake

of human beings. The reality that humans are not the only organisms with basic needs is ignored.

Two “ideal types” were used by Ross (2007) to analyze the Scottish curriculum on EE. They are referred to as Type 1 and Type 2 or education about the environment and education for the environment. The differences between the two are outlined in the table below:

Table 2: The ideal types used to analyse the Scottish curriculum (Ross 2007)

Type	1	2
<i>Environment</i>	Reducible to ‘parts’ and the sum of these in simple mechanistic interaction	Greater than the sum of parts Richly emergent
<i>Society (incl. self/environment)</i>	Dualistically separate Environment is ‘other’ to society/self	Relationally dependent Co-evolving and co-integral
<i>Value of environment</i>	Resource to meet basic human needs (instrumental relation) Environment has inherent value	Emotional/care-laden relation Environment has inherent value

Source: Ross (2007:661)

The Namibian curriculum, according to the analysis above, provides a platform for the inclusion of environmental education of all grades and for Biology as a carrier subject. There are a lot of relationships between the aims of the curriculum and the aims of EE. The curriculum in addition provides an opportunity for EE to be treated as co-curriculum activity. The Ministry of Education promised to prepare teachers and enable them to implement all the aspects of curriculum. It also promised to provide teachers with resources and skills in order to enable them to provide their own materials.

There seems to be a tension between the policy and practice in the implementation of EE. The Biology curriculum provides a chance for EE to be studied as a whole but the practice is dominated by the study of the human body rather than the study of all

organisms. In addition the knowledge in the Biology syllabus is limited to “causal causality” and question papers follow the same trend. Environmental study is broken into models which disintegrate the environment; it is broken by subject divisions. The fact that the content is provided in the textbook divides EE learning from society. To sum up, the curriculum provides for the environment to be studied as Type 2 in some cases while in other cases as Type 1. However, the practice is dominated by Type 1 rather than Type 2 as presented by Ross 2007.

4.3 Context of the Study

In this section I present the broader contexts of the schools I worked with in this research project. I describe the physical condition of the schools; provide information about the geographic area of the school and general information about the school. The information is important because it shows the conditions, situation and context in which Biology teachers work and expected to Implement EE.

Context of school number 1

The first school visited is situated in Omusati Region in Northern Namibia in what was known as Owamboland. It is a village school situated around 35km away from main town of the region (Outapi) where most of the development is taking place. The school was established before independence for the Owambo learners in that area. Due to sparse distribution of the population in the Ovamboland villages, hostels are provided in order to reduce the distance to school. However, due to lack of space in the hostel, it is advised that those who stay within 5km from schools should commute from home. However, some learners travel more than 20 km on foot or by bicycle.

This school suffered from unequal distribution of resources due to difference in racial provision in the country in the past. Though equality is currently promoted in the independent Namibia, the effect of inequality remains visible especially in the area of school infrastructure and resources. Some schools struggle more than others to catch up in terms of resources, and school 1 is one of these. For example, the classroom where I observed a lesson, has windows, chairs and desks rated at 4 , meaning that they are in bad condition, while its floors and walls are in a very bad condition (rated at 5) requiring serious renovation. It does not have a library, but it has a computer laboratory with 10 computers used only by learners registered for Keyboard and Word processing, and the computers are not connected to the

internet. In addition the teaching/learning resources such as text books are not enough and there are no microscopes and other technological instruments which the curriculum requires for effective learning. There are 620 registered learners from grade 8-12 and 23 teaching staff members. . Though this is a good teacher-learner ratio, in reality classrooms are full. For example there were 39 learners in the classroom where the observation took place and other classes are the same.

Context of school 2

School 2 is also in Omusati region in a town proclaimed under a village council. There are 655 learners and 25 teachers. The school has a hostel to cater for students who live long distances from the school, but there is only accommodation for 90% of the learners. For that reason those who stay further than 5km and those writing external examination (grade 10 and 12) are given preferential treatment. . The school is situated in a poor community and many of the learners are exempted from paying school fees, while others are also exempted due to their status as orphans. However the fees are higher (N\$ 655) than the fees of other schools in Omusati region because the school offers a high level curriculum in sciences, languages and Geography. In this school around 7 learners had to share one textbook during observations. There is a poorly resourced library. The computer laboratory used for Keyboard and Word Processing as a subject, is also used to present computer literacy to all learners at least once a week, and is without internet connections. The observation was done in a grade 11 class of 37 learners. The windows, floors and walls were in a bad condition. There are large holes in the floor but the chairs and desks are in a relatively better condition. The classroom was a Biology laboratory with broken sinks and no water connections.

Context of school 3

School 3 is situated near school 1 in a village in Omusati region, 35km from the regional town. The total number of learners is 587 and there are 20 teachers. It has a hostel but some learners from nearby villages also walk about 10km to school every morning because the space in the hostel is not sufficient. The school does not have a computer laboratory or library and there is a shortage of textbooks. Learners pay N\$450 annually but due to the large number of orphans in the country and the poverty, some of the learners are exempted from paying school fees. The school has

a high number of learners in each classroom; there were 40 learners in the classroom when I acted as observer. The condition of windows, floors and walls of the classroom, as well as chairs and desks was rated at 5 (a very bad condition) and other classrooms are in the same condition.

Context of school 4

This is a school with 700 learners and 26 teachers. It is situated deep in the Omusati region, 70km from Outapi town where facilities like a library are to be found. The school has a library which is always closed because it is used as storeroom for the books which are no longer in use. There is a laboratory used for Physical Science and Biology but this is very poorly equipped. There are boarding facilities but some learners are non-boarders because the space in the hostel is not enough and those within 5km walk to school. Due to poverty in the community and the orphans, the school fees are only N\$ 300 per annum with some of the learners exempted from paying school fees. The class observed had 40 learners like other classes in the school. Resources like classroom windows, chairs and desks are in a bad condition but the floors and walls are in a slightly better condition.

Context of school 5

School 5 is in a capital city of Namibia in Khomas Region. The school accommodates 960 learners and there are 36 teachers. Like any other school in the city, school 5 benefits from being situated in the city. The headquarters of the institutions of high learning are based in Windhoek. These institutions have big libraries which can also be accessed by those community members who register to use them. There is also a national library where visitors can use computers and the internet for free. However the school also has its own library and computer laboratory (without internet) which learners can use. It is a non-boarding school because many of the learners come from the surrounding areas and transport is available. However the school is in a poor community for mostly black and a small number of coloured people. . Due to poverty some of the learners are exempted from paying school fees like in other parts of the country but school fees are as low as N\$500 annually, which is very low compared to other schools in Khomas . However, there is a very big difference in terms of infrastructure between this school and the schools in the villages described earlier. The windows are in a very good condition

and the condition of the floors, walls, chairs and desks are good. There were broken chairs in the classroom, but they were not used by learners.

Context of school 6

This is a Khomas school in Windhoek with 1200 learners and 44 teachers, mainly coloureds and blacks from different tribes. Like school number 5, I assume that this school also benefits from being able to access the amenities in the city. Because transport is available, this is not a boarding school. The school has its own library and the Biology laboratory in a good condition. It is used also as a Biology classroom with posters for Biology put up on the walls. Each learner has his or her own textbook. The school has an environmental club established by the participants. In general, the classroom and school condition is good with very good floors, roofs and walls. The chairs and desks are in a good condition though some broken chairs were in use. The windows were also rated at 2, which is good. School fees are N\$800, which is higher than in other schools in the study.

Context of school 7

This is one of the expensive government schools situated in Khomas region, because the school fees are N\$960 annually. There are about 700 learners who are taken care of by a group of 24 teachers. Few learners are exempted from paying school fees and the school pays for excursions. Most of the learners are coloured but there are a handful of black Namibians and Angolans. Like many other schools in the towns it is a non-boarding school. The school is within walking distance of the city centre where library facilities are found. However it also has its own library, Biology laboratory and computer laboratory without internet. The staffroom however has computers with internet connections which are accessible to learners under teachers' supervision. Windows, floors, walls, roofs, chairs and desks are in an excellent condition.

Context of school 8

School 8 is in a capital city of Namibia in Khomas Region. The school accommodates 1065 learners and there are 40 teachers. Like any other school in a city, school 8 benefits from the amenities of the city such libraries because all the headquarters of the institutions of high learning are based in Windhoek. There are

big libraries which can also be accessed by the community members who register to use them. However learners need transport to get to the city centre to use the libraries. Some of the learners cannot afford transport because the school is in a very poor community. It mostly serves learners from the informal settlements and very poor locations. It is one of the cheapest schools in Windhoek at N\$650 per annum with many kids exempted from paying school fees, while others leave without paying even if they are not exempted. The school has a poor library and a poor Biology laboratory with expired chemicals for testing food. The observation took place in a classroom with chairs, desks, floor, walls and roof in good condition although a few of the windows were broken.

The school context data above will form an important part of the discussion related to teachers' implementation of EE.

4.4 Demographic information of the participants

Table 3: Demographic / biographic information on teachers who participated in the research

Participant	Region	Coded pages	Gender	Age	Years of experience	Highest qualification
1	Omusati	T/SH-	Female	29	7	BED UNAM
2	Omusati	T/E-	Male	32	8	B.Ed UNAM
3	Omusati	T/NAT-	Male	26	4	B.Ed UNAM
4	Omusati	T/KO-	Male	44	17	MASTEP UNAM
5	Khomas	T/KA-	Female	33	9	B.Ed UNAM
6	Khomas	T/SI-	Male	27	8	B.Ed UNAM
7	Khomas	T/P-	Male	55	25	MASTEP UNAM
8	Khomas	T/I-	Female	31	8	B.Ed UNAM

The table shows the demographic information of teachers interviewed in this research. The data shows that 62.5% of the researched are male and 36.5% are female and all are between the ages of 26 and 55 years. The younger teachers aged

between 26 and 32 years are degree holders while the older participants are MASTEP (Mathematics and Science Teachers Education Programme) graduates with diplomas. They all have taught for more than 4 years but not more than 25 years. The participants are known by numbers and not by names, as indicated in the table, in order to maintain confidentiality and abide by the ethics of the research. Demographic information is very important to the study because it shows that teachers included in the study are experienced teachers and they are all products of UNAM as per the scope of the study.

Table 4: Demographic information on advisory teachers

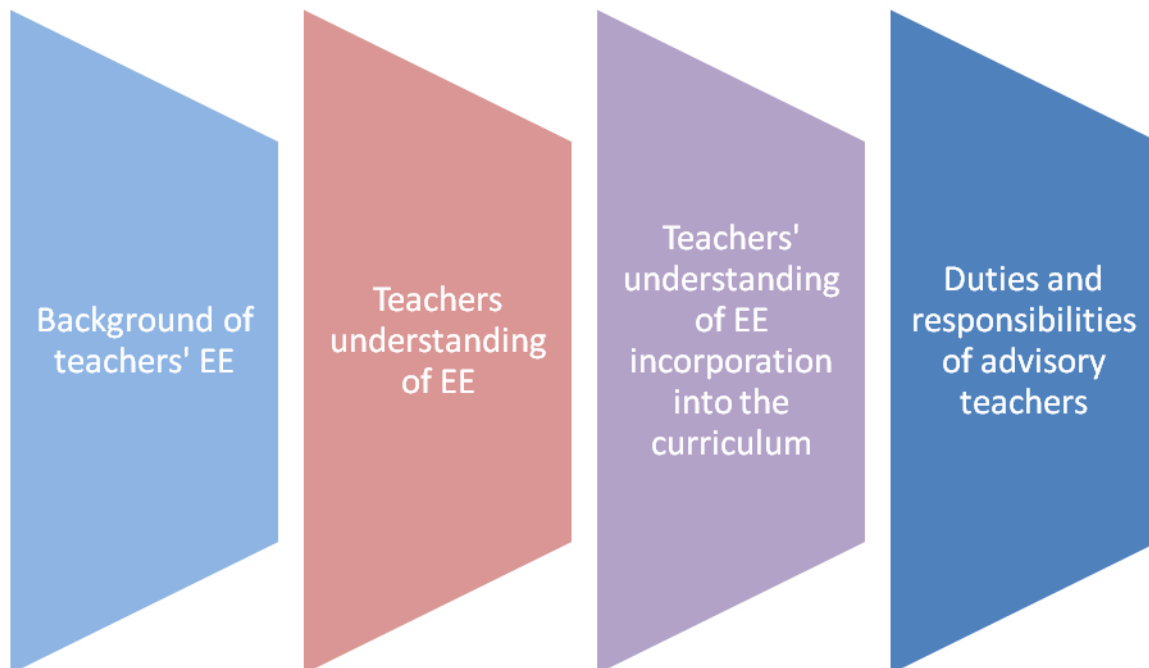
Participant	Gender	Age	Experience	Qualification
9	Male	31	2	BED UNAM
10	Male	60	25	MASTER'S DEGREE

The above table gives information about the advisory teachers, namely the numbers which represent the names/codes, as well as the age, years of experience and the academic qualifications. Both are males; one is at the pension age with 25 years of experience as a subject advisor and a Master's degree while the other is 31 with only 2 years of experience in the advisory post and a B.Ed degree.

4.5 Teachers' and subject advisors' knowledge and background of the curriculum

In this section information about the Biology teachers' and advisory teachers' background on EE, is provided. Teachers' understanding of environmental education and their understanding of how EE is incorporated in the curriculum is also probed. These are fundamental to the implementation of EE because I expect that the preparation of teachers on EE affects the way they understand it and the understanding of EE in turn affects the understanding of how EE is incorporated in the curriculum. This understanding also affects the way teachers and advisory teachers execute their duties. As mentioned by Said, Ahmadun and Masud (2003:312), successful teaching of environmental education depends on adequate environmental knowledge. Advisory teachers' knowledge of their duties also falls in the same category.

Figure 8: Knowledge and background of teachers in EE



4.5.1 Background of teachers and subject advisors in environmental education

The department of education at UNAM has not yet introduced environmental education into their programmes. However UNAM's Department of Science offers environmental related subjects like Conservation Biology and Ecology. Student teachers doing Biology as a teaching subject attend Biology classes in the Department of Science and they attend education related subjects in the Department of Education. Teachers participating in the study are products of UNAM who did either MASTEP or BEDC as shown in the table 3. Some of the Biology teachers realized that what they learned was not Environmental Education, while others thought science environmental learning was also Environmental Education. They discovered that environmental lessons were not offered in Education but in Science and were disconnected from pedagogy. Participant 3 alluded to this when he said:

“Do you know where the problem is again? They are not incorporating biology with education (sic). You are taught biology there on its own and you are taught education on its own” (T/NAT-7).

One of the subject advisers is also a product of UNAM (see table 4) and like other UNAM students, he was not trained in Environmental Education. The older subject advisor was trained at the College of Education before the introduction of EE into the colleges. Like the Biology teachers, the advisers admitted that they were not prepared to teach EE during their pre-service education.

The background of teachers in environmental education affects a number of things in their teaching career. In the first place it influences their understanding of EE, the incorporation of environmental education in the curriculum, and the methodology they use for teaching EE. Thus in many cases where knowledge of environmental education is a problem, the introduction of EE in pre-service and in-service education is suggested (Said *et al* 2003).

It seems however that some universities like UNAM offering education programmes are not prepared academically to offer EE, due to lack of qualified human resources. Kasanda (2009) also mentions that Namibia has few qualified educationists to train teachers in EE. It does not seem though that, there is much concern about this matter, as no effort is being made to increase the number of experts because there is a lack of provision of scholarships for studying EE offered either by the government, or by UNAM which offers education programmes for teachers.

Some of the teachers in this study also wished to further their studies in environmental related fields. Further studies require money, and the government does not provide scholarships. Participant 6 expressed his interest to study in the environmental field. He secured an admission at a certain university and then applied for a scholarship at the Ministry of Education and the Ministry of Environment and Tourism but he did not succeed. He expressed his sentiments the following way:

Two years back (sic), I applied for a master's degree at the University of Liverpool. I struggled for almost two years trying to get a scholarship. I could not get scholarship from the Ministry of Education or the Ministry of Mines and Energy... this is how difficult it is when you want to study environmental education. I don't know if people understand the importance of environmental education... I feel it is not prioritized to the extent where it was supposed to be... the environment where you live is very important. If you see someone

who have (sic) a key interest like you and me, we are supposed to be given the utmost support (sic) either financially or to go for a good course” (T/SI-9).

Participant 2 also states that the successful implementation of EE depends on the teachers' preparedness. Teachers require funds from the government in the form of scholarships if they wish to further their studies in EE.

What the government should do is to provide funds for people to further their studies in environmental studies, so they must provide the funds and provide everything necessary (T/E-6).

The Education Department promised that teachers would be prepared to teach the curriculum (ME 2010). In addition, they should be provided with skills to develop teaching materials themselves. Thus in this case, UNAM seems to have failed to comply with the government mandate to prepare teachers to teach EE with confidence.

4.5.2 Teachers and advisory teachers' understanding of EE

I started probing for data related to teachers' views of EE because I wanted to know how they understand EE. It is important to know how teachers understand EE because the activity theory posits that the subjects' understanding of what they do is important in the implementation of their duty (Johassen and Rohrer-Murphy 1999:70). Different views regarding the understanding of EE as alluded to in section 2.3, were used as a base for understanding how Biology teachers in Namibia understand EE. It is a priority to study teachers' understanding of the change before implementation. According to Said et al (2003) "determination of the environmental gap of the teachers with respect to knowledge and practice is essential in order to assess their preparedness in guiding and shaping the young generation." The argument is that teachers are assigned the duty to teach EE, but do they know what EE means.

I used the three ways of understanding EE as proposed by (Lucas 1972) to assess the teachers' understanding of EE, namely, education about the environment, education in the environment and education for the environment, as discussed in section 2.3. Education about the environment is reported to limit the teaching to the

mere transfer of information. Robottom and Hart (1993:23) inform that the proper understanding should be education for the environment. This includes the attainment of knowledge and skills which change the actions of humans with regard to the environment. The participants I consider to have a good understanding of EE, are those who describe EE in the light provided by Lucas (1972) and Robottom and Hart (1993).

Participant 1 understands environmental education at the ecology level as she mentions the sections of ecology which are in the Biology syllabus like: the effect of pollution and the effect of deforestation on the environment and the management of solid waste. She teaches these sections or topics by transferring information alone because she “teaches about” ecology. I categorise her understanding as teaching about EE because teaching about is merely giving information (see section 2.3.1).

“I think that we can teach about things like effect of pollution on the environment, effect of littering on the environment, effect of deforestation on the particular environment” (T/SH-1).

Participant 6 understands environmental education as talking about managing the pollution of the major components of the environment which he mentioned as being the land and air. The concept of managing pollution of land and air is taught as part of education about the environment but this is limited to the Biophysical environment.

“When you talk about environmental education, you talk about managing of solid waste but also the emission of gases and all other pollutants that might pollute either the air or land around.....Environment will comprise of major things for example the atmosphere; you have the land and the air. These are the major components. You talk of the land and the air. So when you talk about EE you need to talk about how to look after this are major components of the environment” (T/SI-2).

Conservation is also a major section in ecology and participant 7 understands environmental education as teaching people how to conserve. This understanding includes action because people are taught to conserve.

“It’s about teaching people to conserve their environment” (T/P-1) (emphasis added).

Human influence on ecosystem and conservation is also a major part in the syllabus under Ecology and the last participant understands EE as teaching about Ecology.

“I can mention conservation of our wild animals and plants and then we should also teach them human influence on the ecosystem” (T/I-1).

Participant 2 also understands EE as a teaching which creates awareness of sustainability. Creating awareness is another way of imparting information thus this response is also categorized as teaching about EE. The concept of sustainability is an important part of EE, but creating awareness about sustainability is limited to education about the environment.

“The awareness of how to make sure of sustainable development” (T/SH-1).

Like participant 1, participant 3 also understands environmental education as creating the awareness of how to use methods which ensure sustainability for the benefit of the next generation. This understanding is narrow in two ways: it is limited to talking about sustainability which can be classified as education about the environment. On the other hand, the environment is understood only as a source for the satisfaction of human needs without considering other organisms or the entire environment.

“Environmental education is a process whereby people or learners are made aware... how to care about the environment and at least to apply methods that are not harming the environment so that... the next generation can benefit from the environment (T/NAT-1).

Participant 2, among others, understood EE as teaching about the human environment which should include the investigation of how food is prepared and of how humans behave towards each other. This understanding is narrowed to education about the environment because it involves “talking about” which is mere transmission of information. It is also limited to the social part of environment.

“It’s talking about environment itself where humans are, how food is prepared... how people conduct themselves” (T/E-1).

Participant 4 teaches about the relationship between organisms only, especially how a good relationship can be created between human beings and other living

organisms. This perspective of environment ignores the fact that the environment should not be perceived as only a biophysical environment .

“Environmental education is a study of what is in the environment for us to be able to associate with them and also those organisms to be able to associate with us....We are looking at... the things... living in the environment... so we need to understand the nature of those living” (T/KO-1).

The analysis also shows that EE is understood by participant 5 as creating awareness on environmental issues. This is seen as teaching about the environment but actually it is merely imparting information about environmental issues.

“Whereby we have to teach our kids the issues related to the environment and then to make them aware of the environmental issues that is how simple I understand it” (T/KO-1).

Most teachers seem to see EE as teaching Ecology, the chapter they have in the Biology curriculum. Their teaching of Ecology is dominated by the transferring of information about biophysical aspects. Other teachers create awareness about sustainability and environmental issues, while others create awareness about how to preserve the environment for the benefit of people. Only a few seem to have a broader understanding as they teach people to conserve the environment.

Advisory teachers

The knowledge of advisory teachers is important to the implementation of EE because they are the mentors of the teachers. In the view of participant 10, EE means caring for the land and water, and creating awareness in order to prevent the pollution which might cause health problems in the human environment:

“Environmental education for me... is the education which is focusing on how we take care of our environment, how we take care of... the atmosphere... land... water. It have (sic) to do with managing and taking care of places where we are living so our places remain healthy so that they won't be creating health hazards to ourselves (sic). Meaning we have to be aware of them so that we prevent poisoning this area, so that they can't create problems to our own bodies (sic)...” (T/NAM-2).

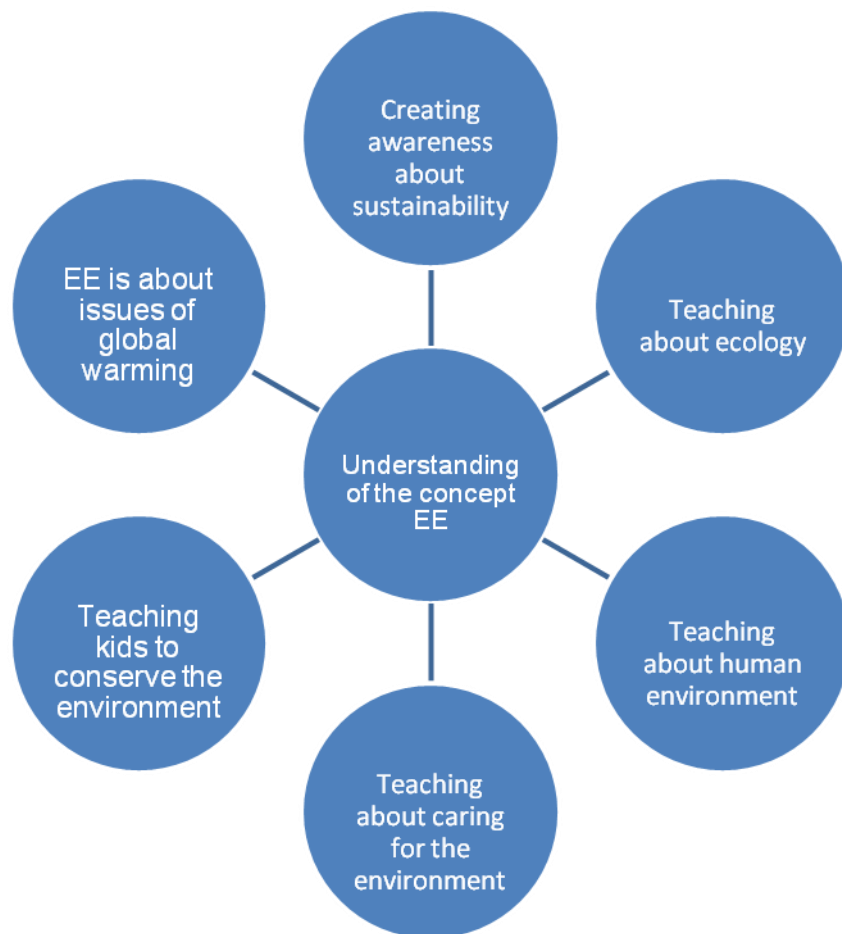
Participant 9 explained his understanding briefly. He understands teaching about global warming as EE:

“It is like the issues of global warming” (T/F-1).

Advisory teachers like teachers, also have also a limited perspective of environmental education. They understand EE as transmitting biophysical information to learners. They also understand it as creating awareness about pollution in order to prevent human diseases or they see it as an understanding of global warming.

Using the information above, teachers and advisory teachers’ understanding can be categorised as follows:

Figure 9: Aspects of teachers’ understanding



Biology teachers and their mentors (subject advisors) interviewed during this study exhibit some understanding of EE. They understand environmental education at the

Ecology level. Most teachers mentioned some aspects of Ecology as they read from their syllabuses. Ecology and Conservation Biology were also science subjects which teachers learn at UNAM as science student teachers. One of the advisory teachers is also a UNAM student and understands EE in same way. Some of the concepts related to Ecology mentioned by the teachers and their mentors are listed below:

- Effect of pollution on the environment
- Effect of deforestation on the environment
- Sustainability
- Conservation of Biodiversity
- The influence of humans on ecosystems

Other teachers in this study disconnect humans from the environment and they understand environmental education only as teaching about the human environment and ensuring human health by reducing pollution. A few of the teachers also think that EE is meant to create awareness of how to care for the environment for the benefit of the next human generation, or that it means creating awareness about EE issues or teaching children to conserve the environment, or to understand the issue of global warming.

It is not surprising to find Biology teachers with some understanding of environmental education even if they are not trained to teach EE, because of the Ecology which is in many Biology curriculums, if not in all. When Mansaray Ajiboye and Audu 1998 conducted research to find out about the knowledge and attitude of Nigerian teachers, they found teachers with poor understanding of EE even though Science teachers were a little more knowledgeable compared to teachers of social science subjects. Science teachers' knowledge was attributed to the Ecology in the science curriculum.

In this research Biology teachers and advisory teachers are also shown to have some understanding of EE. They also understand EE at the Ecology level, like the Nigerian teachers. Ecology is a chapter in the Namibian Biology curriculum and a subject that Science student teachers take at UNAM. When a person understands EE at Ecology level, he/she is rather an ecologist than a teacher, since, in teaching and lesson preparation, teachers do not only depend on content knowledge but they

draw on a number of related fields such as content knowledge, curriculum knowledge, general pedagogical knowledge, knowledge of the aims and purpose of teaching, knowledge of learners, knowledge of educational context, settings and governance, as listed by Gudmundsdottir and Shulman (1987:60). Thus at the moment, I can say Biology teachers in Namibia are ecologists rather than environmental educators because they only have environmental content knowledge while they lack other types of knowledge related to teaching Environmental Education, such as pedagogical knowledge. Gudmundsdottir and Shulman 1987 describe the package of knowledge that makes teachers unique.

“Teacher’s understanding of subject matter is transformed to make it teachable. This process of transformation taps the difference sources of knowledge, the most important being pedagogical content knowledge. It is this way of knowing and understanding the subject matter that distinguishes the teacher from the subject matter specialist” Gudmundsdottir and Shulman (1987:60).

There is a link between teachers’ understanding of EE and what they learned at UNAM because they studied ecology and they understand EE as Ecology. This is also how they teach it. Ogumbiji and Ajiboye 2009:294 called for innovation strategies to be explored when preparing teachers for EE, because teachers normally teach the way they were taught.

An understanding of EE can be manifested in teaching but can also be manifested in describing what is done. When teachers describe how they understand EE, they also describe what they do in practice. Thus those teachers who understand EE as teaching about the environment, talking about the environment, spreading information about the environment, creating awareness about the environment, studying the environment and looking at the environment, feel that they are expected to teach EE by transmitting information. Transmitting information is related to education about the environment (see how it is described in section 2.3). I classify those who understand EE as caring for the environment as educators for the environment because caring is an action toward the environment. Taking learners on excursions is important to those who understand EE as education in the environment.

The teachers in this study concentrated on imparting knowledge and little was said about changing values and attitudes. Their obligation to teaching knowledge alone is also evident through the verbs which they use to explain their understanding, like, teaching about, talking about, spreading information about, creating awareness, studying, and looking at the environment. Equally, these verbs and “teaching about” Ecology show that teachers understand EE at the level of educating learners about the environment. Based on the responses of teachers, Environmental Education is understood by teachers as a teaching procedure concerned much with transmission of knowledge.

The method used in this study was also successfully used by Metz 2010 to compare the views of teachers about EE. Teachers’ views were framed around education about, in and for the environment. Knowledge outcomes such as those found in curriculum documents are considered as teaching about the environment. Methods which involve taking action are considered education for the environment, while being in the environment is for those who get involved in activities outside the classroom. The findings show that EE is mostly understood as education about the environment.

Teaching about the environment is associated with cognitive teaching or transmission of information to learners (Robottom 1998). Cognitive teaching is also favoured in the teaching of Science (Hart, 2002). Cognitive teaching is demonstrated by the low order types of questions and transformation of factual information which dominated the teaching of Biology in the schools where I observed lessons. This is shown in the diagram below:

Figure 10: Teaching nutrients at the cognitive level

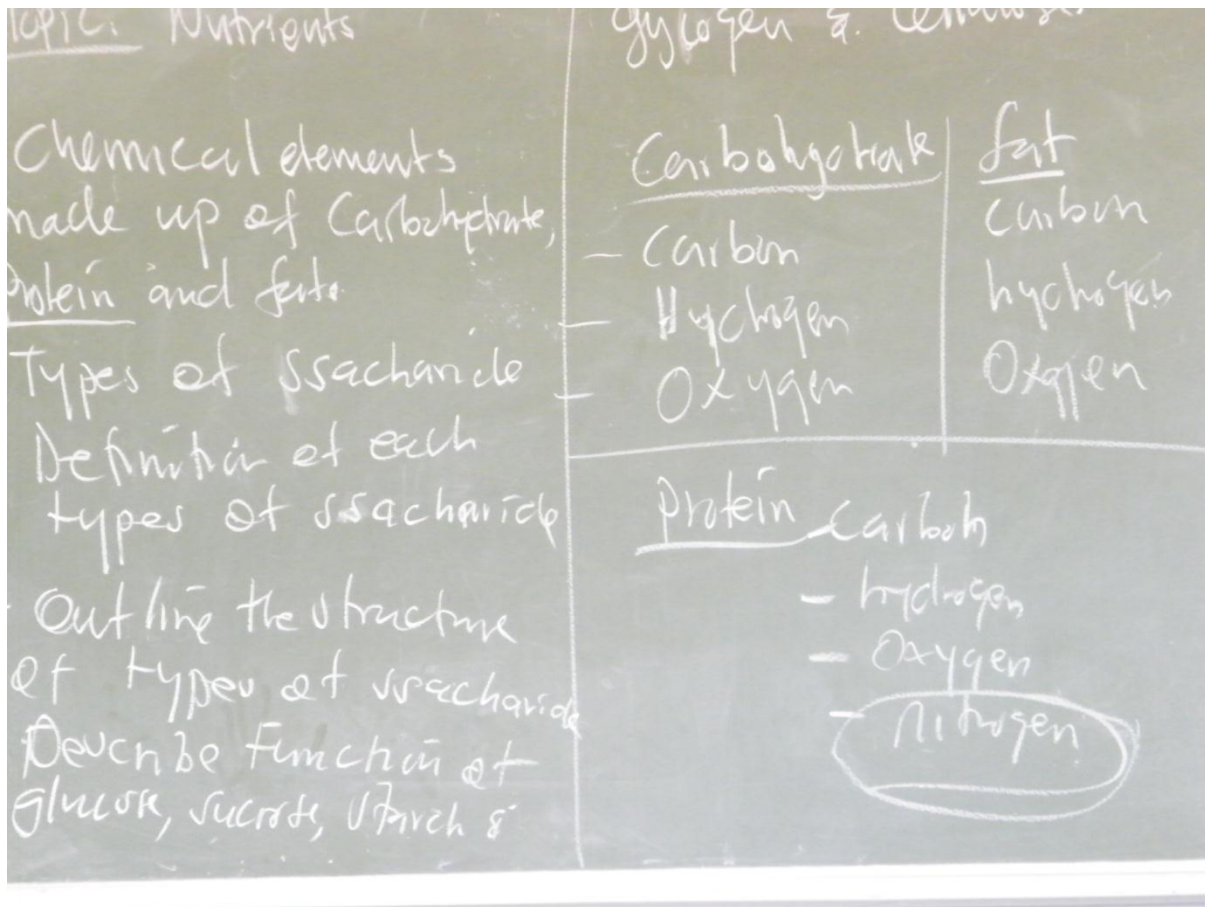


Figure 10 above shows the picture taken during the observation of one of the lessons on nutrients. Cognitive teaching is clearly demonstrated because learners are only expected to know the chemical elements of nutrients, the types of nutrients, and to describe and outline the chemical structures of nutrients. Teachers use the objectives which are outlined in the curriculum for Biology, while, confining teaching to outcomes is not favoured in EE because it separates EE and society, as discussed in this chapter (section 4.2).

There are however, a few teachers who presented a better understanding of EE, like those who understand EE as taking care of the environment. But their teaching is also limited to creating awareness. Like other teachers, they also demonstrate a lack of understanding of two important things. In the first place not enough importance is placed on the formation of values and attitudes as aims of environmental learning. Secondly, participants do not pay enough attention to the interacting dimensions of the environment, as alluded to in 2.2.1. The concept of the environment as a constitute of biophysical, social, political and economical aspects is not sufficiently

understood by teachers. Teachers concentrate more on the biological and physical aspects of the environment. They seem to exclude unnatural things from being part of the environment because no one mentioned the economic and political aspects of the environment.

Mansaray, Ajiboye and Audu 1998 conclude that the knowledge of teachers is crucial to the quality of the education they offer. This lack of knowledge among Nigerian teachers needs to be addressed if their effort to implement EE programmes is to be successful. The result of the research in Nigeria, like the result of this research, leads to the conclusion that “usually teachers called to handle environmental education topics lack the requisite training to do so, and consequently, are reluctant to embark on a journey through seas which, for them, are uncharted” Mansaray, Ajiboye and Audu (1998). According to Mansaray et al 1998, whenever teachers with poor environmental knowledge are called to implement EE, it can be predicted that the results will be poor. .

4.5.3 Teachers’ understanding of the incorporation of environmental education in the curriculum

Johassen and Rohrer-Murphy (1999:70) advise that in analysing the activity system, it is important to find out if subjects understand the aims, objectives and rules guiding the activity.

The guidelines for the implementation of EE are presented in the curriculum documents. In this section the coded data on how teachers understand the way EE is incorporated in the Biology curriculum and the entire curriculum is discussed. Biology teachers use the syllabus as a guide for their daily teaching. They also have the National Policy for Basic Education in Namibia. The data reveals that teachers do not understand how EE is incorporated in the curriculum or they understand Ecology as the only way EE is incorporated. Participant 2 in one short sentence mentioned that he does not know how EE is incorporated in Biology.

“I don’t real know how EE is incorporated in the curriculum” (T/E-2).

Although, she looks at the study of living organisms, nutrient cycles and the relationship between organisms and non-living organisms as a way in which EE can be incorporated in the curriculum, more needs to be included. She probably does not

understand what “across the curriculum” means in terms of teaching EE, although the curriculum stipulates clearly that EE should be taught in this way.

“I think it is wrongly included in the Biology curriculum because it is more like telling kids I mean learners for example that the environmental studies is only about living organisms. They are either only concentrating on plants or on animals or this things of nitrogen and carbon cycles without even thinking about the other things which are now which are personal hygiene, they think who ever now have come up with the curriculum that think environmental studies they think environmental education is only how non living and living organisms interact that is how I see it” (T/E-2).

Participant 3 did not read the curriculum document to find out how EE is incorporated but he thinks that EE should be part of the curriculum.

“I did not really go through it but I think it is also part of the curriculum where (sic) we have to make learners aware” (T/NAT-1).

He thinks that more of EE should be included to enable learners to learn about environmental problems and their effect on the environment because little is mentioned about EE in the curriculum.

“In case of biology curriculum, I think it is just there 2% because there you can just of this cycles (sic) and... that learners won't real be aware, they will just say, ok this... are just problems but once you make it... 10%... learners... become aware of... the problems and consequences it might have (T/NAT-1).

According to Participant 4, EE is not well explained in the curriculum, thus he does not understand the way it is incorporated.

“... EE is not well highlighted in this... I may not get a well-defined clue. Sorry” (T/KO-2-T/KO-3).

According to participant 5, the curriculum does not say anything apart from the EE topics about living organisms which teachers must teach, but she thinks that is not enough because living organisms do not live in isolation.

“It does not say anything but... it is just part of the topics I have to teach... because we are teaching about living organisms, but they don't live in isolation” (T/KA-1).

Participant 6 has mixed feelings because he states that he has no clue but he also thinks that EE is not incorporated. Though he considers some sections in the syllabus like pollution to be related to the environment, he feels that a lot is not included.

“I will say in general that in a way, not specifically incorporated... I have no clue.....If you look at let's say certain topics like pollution and so on, these are obviously matters pertaining to the environment in a way it is incorporated even though I feel not that much because certain other areas are not included” (T/SI-2 Participant 6).

Participant 7 can't remember what the curriculum said about EE because he does not use the curriculum policy documents, he only uses the scheme of work. He only remembers vaguely that somewhere in the curriculum there is mention of “protection of the environment”.

“My dear, I must now think, I can't remember....I usually work on my scheme of work but I did not go check that, but there is a portion that I remember very vaguely that there is a mention of protection of the environment that learners become aware that we should look after the environment” (Participant 7 T/P-2).

Participant 8 also was honest enough to admit that she did read the curriculum, thus she does not understand how EE is incorporated, but she later pinpointed topics of ecology as she read through the syllabus.

“I have not come across with anything else related to that (sic). But to be honest I have not gone through it” (T/I-2). “Like the damage to the environment... effect of deforestation... use of fertilizers ... pollution... conservation... biodiversity as well” (T/I-2).

Most of the biology teachers do not understand how EE is incorporated in the curriculum. The lack of understanding is related to ignoring the curriculum

documents or not reading them. Teachers who did not read the curriculum, could not understand what the curriculum said about EE. As a result some of them concluded that EE is not incorporated in the curriculum. Others understand the incorporation of EE as the ecological part of their curriculum. This also reflects the way in which they defined EE.

Advisory teachers

I also found it relevant to find out if teachers' mentors understand the curriculum in terms of EE incorporation. One of the two subject advisory teachers indicated that he did not understand how EE is incorporated in the Biology curriculum and that he needed to read more on the issue before answering the question. He said frankly:

"For that one... really, you caught me unaware now... I have to consult the biology syllabus and specifically mention the topics that are integrated in the biology syllabus for you. That is really a difficult one. I won't be able to answer that one straight away now. I have to consult the syllabus" (T/F-2).

Participant 10, a school advisory teacher, said that no part of the curriculum can be specifically identified as EE, even though he understood that the presence of Ecology in the syllabus caters for EE. He said:

"... So far, we don't really have a specific part which we are saying is environmental education in biology (sic)... What we have are topics like ecology... that can be regarded a part of environmental education. That is how it is integrated in biology higher level and ordinary level" (T/NAM-2).

He admitted however that he had not evaluated the curriculum to find out how EE is incorporated in the curriculum but only knew that Ecology could be found in the curriculum:

"... for the meantime, I think we did not really go that extent of real evaluating... what the current syllabus have say (sic)... the teachers need to synthesize to learners about environmental education. So far, we are only focusing on the syllabus, say under this ecology, teach the following, under this conservation, teach the following. We did not go to that extent really of

evaluating what the syllabus said much about environmental education”
(T/NAM-2).

Advisory teachers also do not appear to understand how Ecology is incorporated in the curriculum, other than that it is incorporated. . However one of the two advisory teachers does not understand how EE is incorporated at all because he has not read the curriculum.

Interpretation of the way teachers and advisory teachers understand the incorporation

Neither teachers nor biology advisory teachers have a good understanding of the way environmental education is incorporated in the curriculum. Most of the participants revealed that they do not understand or have not read the curriculum and others cannot remember or think that the curriculum did not mention anything about EE. All these responses point to a lack of understanding of how EE is incorporated in the curriculum. The only group of teachers that has some understanding of how EE is incorporated are those teachers who understand that Ecology (Environmental education) can be a component of another subject and that this is a way in which EE can be incorporated. The introduction of Ecology in the curriculum is meant to be a way of incorporating EE, even if it is criticized for not achieving the aims of EE (see section 2.5).

All the teachers and advisory teachers had curriculum documents with them during the interviews. In these documents EE is incorporated in the curriculum in all the ways discussed in section 2.5. It is incorporated as:

- Environmental education as a local problem-solving curriculum action. The curriculum mentions that environmental problems “can be addressed on a personal, local, national and global level and that learners can play a part in addressing these risks and challenges in their own schools and local community” (ME 2010:5).
- Environmental education as a component within the subject, like the Ecology section of the Biology curriculum.
- Infusing environmental education across the curriculum, for example when challenges are addressed “across the curriculum”.

All our learners need to understand the nature of these risks and challenges, and how they will impact our society and the quality of life of our people now and in the future. They must understand how these risks and challenges can be addressed on a personal, local, national and global level and how they can play a part in addressing these risks and challenges in their own school and local community (ME 2010: 4).

Pratt (1994:333) proposes that curriculum documents be distributed through personal contact to avoid them from getting lost. However in the case of Namibia, teachers were in possession of curriculum documents during the interview. Therefore poor document dissemination cannot be blamed for teachers' lack of understanding of the way EE is incorporated in the curriculum by Biology teachers who participated in this study. On the other hand some teachers may receive the documents and ignore them. At the 49th Annual Conference of the Science Teachers' Association of Nigeria, one of the officials complained that teachers receive curriculum documents and ignore them, they are only interested in the examined part of the curriculum (syllabus) (Oloruntegbe *et al* 2010:708). This may be one of the ways in which teachers respond to curriculum implementation. The lack of understanding can be attributed to ignoring the documents.

However, not all teachers lack understanding of EE because they ignore the documents. Some may have gone through the syllabus but failed to understand the language, especially those who had not received training in EE. Some concepts could be confusing such as "across the curriculum", "multidisciplinary", "integration", and so on. Le Grange and Reddy (1997:15) also noted that teachers in South Africa also experience confusion as regards to concepts because the language used for EE is unfamiliar. It may not be difficult as such but it needs familiarization.

Understanding the curriculum is important because this is related to understanding the aims of the curriculum. When teachers do not understand the incorporation of EE in the curriculum as a result of not reading the curriculum, not understanding the language or ignoring the curriculum, they also do not understand the aims of EE and they are not clear about the goals of the curriculum. Thus as a result, they may implement it wrongly. Ecology needs to be taken to another level where it advocates attitudes and care for the environment for it to become EE. Lack of understanding of

the aims of EE has led to Ecology being taught as if it is a science. This was the concern of both Fullan (1994) and Pratt (1994) who warned that when teachers do not have a clear idea of the implementation, they might implement the curriculum wrongly.

Teachers understanding of the way EE is incorporated is Science- related. What teachers learned in science defines how they understand the incorporation. They don't understand EE beyond what they learned at UNAM in science-related environmental topics. This shows that there is a strong relationship between the teachers' knowledge of EE and the way they understand incorporation of EE in the curriculum.

Even though documents are apparently clear on the implementation of EE, one of the advisory teachers complained about the lack of documents that explicitly make EE compulsory in schools. He claimed that teachers reject things which are not in writing:

“For you to do any implementation, you need the national document, now, one can say we need a national document which is specifying that we must start the implementation of (sic), coming from the ministry of education. It's hard for teachers to take up any instruction which are given if it's not in black and white, so number one can be a document. We need a document, a guiding document to be produced” (T/NAM-3).

(Johassen and Rohrer-Murphy 1999:70) suggest that subjects should be trained to understand the aims of the curriculum properly so as to avoid forced implementation.

Teachers understand Ecology as the way in which EE is incorporated. This demonstrated the relationship between teachers' knowledge and their understanding of the curriculum. Their knowledge shapes how they understand the curriculum. At present Ecology is taught as if it were education about the environment, which shows what happens when teachers are forced to teach something although they do not understand the goals.

4.5.4 Advisory teachers' knowledge of their duties and responsibility

Advisory teachers are the immediate mentors of teachers. Thus it is worthwhile knowing whether they know their duties and responsibilities. Data analysis showed that advisory teachers their duties as assisting teachers with content knowledge, lesson preparation, lesson presentation and methodology, and setting biology examinations. Participant 9 listed his responsibilities as follows:

“The main duties are to assist teachers in the content knowledge of the subject, in lesson preparation, lesson presentation and how to apply the knowledge that they have of a particular subject in their particular field” (T/F-1).

(Participant 10) also agreed with the statement of his colleague as he said:

“We have to advise teachers like in my case, I advise teachers on life science and biology on the teaching methodologies... and that we have also to advise them on setting of examinations, moderation of examination but the most area is methodology (sic), what is the best method of delivering a lesson that the main issue... the subject content, because there are these new teachers. As I can say, most of the new teachers who are joining the industry, they are not really trained on the best methodology and they could not come across those difficult topics (sic). Now we need to take them through this difficult topics... and methodology so that we can simplify the content and best method of delivering this content to the learners” (T/NAM-1).

The duties and responsibilities are performed by conducting both regional and national workshops and monitoring the implementation in schools of what is learned in the workshops. What follows was reported by an advisory teacher in a region where teachers had never attended a workshop and did not know who their subject advisor was:

“In the beginning, when the new syllabus is introduced we have workshops to introduce the subjects and then... after that we do monitoring, go to schools and visit classes and see how teachers are doing, how they are presenting lessons (sic). But to implement the syllabus, we have national workshops and regional workshops” (see T/F-1).

Advisory teachers have many responsibilities to perform which include assisting teachers with content knowledge, lesson planning, lesson preparation, methodology, and setting exams in biology. They perform their duties by conducting workshops in the regions, each of which has its own subject advisor for each subject. Regional workshops are said to be continuous and cater for problems which teachers encounter in their schools, while the new curriculum is introduced during national workshops. What is learned in the workshops is monitored by subject advisors in schools.

The duties mentioned by advisors are their general duties. They did not mention the extent to which they are expected to assist teachers with the curriculum. They should have admitted that they have a duty to assist teachers with the entire Biology curriculum whether with the examined part of the curriculum, the social learning part of the curriculum or the extramural activities. The duties mentioned by the advisory teachers are the same as the job description mentioned in ME (013:1), proving that they know their responsibilities and that they are expected to fulfil their duties alluded to in section (2.11).

Furthermore, one of the duties of the advisory teachers is to help teachers with the implementation of the best teaching methods. In Biology, like other subjects, has distinct aims; one is the outcome of science knowledge while the other pertains to the values of EE and other social studies incorporated in the curriculum. Since these are achieved through different teaching methods, teachers need assistance to achieve all the aims. Advisory teachers are expected to know these different aims of the curriculum and the purpose of teaching each, in order to pass the correct information on to teachers because at present, the complaint is that EE is taught like Science (Robottom 1993; Ashley 2000; Hart 2002). The result of this research also pointed to the same fact. However, advisory teachers' knowledge of EE and the inclusion of EE in the curriculum have proven to be poor. This makes them less effective in the performance of their duties and as a result, teachers are ineffective in teaching EE.

“Subject advisors, I don't know now if they are too few that they are not able to go to the schools (sic). They need to visit these teachers and... get to the roots of what exactly is happening in the schools” (T/KA-4).

The advisory teacher complained earlier that subject advisors are not available and not known by teachers. Sometimes teachers only see a group of unknown people, coming to their schools and complaining about the way teachers perform their duties and not assisting to improve the situation. Teachers assume that subject advisors are a part of the group. This suggests that though advisors are aware of their duty to monitor curriculum implementation, they neglect it and leave teachers to struggle all alone with the implementation.

The advisory teachers are aware of the responsibilities assigned to them by the Ministry of Education. They know they are expected to advise with content knowledge, lesson preparation, methodology and the setting of examination papers. The duties are performed through workshops and school visits. Even if advisors are aware of their duties, their limited EE knowledge and lack of knowledge of how EE is incorporated in the curriculum may hamper the implementation of EE.

In one of the regions, the researcher witnessed the advisory teachers' performance of their duties as they conducted workshops in Biology. This shows that advisors perform the duties which they are aware of. The reason why they don't perform their duties regarding EE can be because they are not trained to do so and they cannot identify the aims of EE in the curriculum because they have no understanding of EE. The activity theory suggests that subjects should understand their duties and responsibilities if they are expected to perform these duties (Johassen and Rohrer-Murphy 1999:70). This does not happen in EE.

4.6 Attitude towards Environmental Education

Teachers

Teachers' attitudes form the foundation for implementation and teachers describe how important the implementation is to them. Teachers who find EE important are considered as having a positive attitude toward EE and support the implementation better than those who don't find it important (Lee 2000:101). All the teachers interviewed consider the teaching of EE important. Therefore, the Biology teachers in this research can be said to have positive attitudes toward EE. Teachers also give the reasons why environmental education is important.

In the case of participant 1 teaching of EE is important in order to protect the environment which is the source of human nutrients. Participant 1 stated that:

Most of us know that humans are omnivores, meaning that we depend on plants for food and also animals. So now there is no way that we are going to talk about maintaining our living through the intake of food without talking about manufacturing of the food that we eat from plants... it is good for the learners because they will know that it is not a good idea to cut down all the trees. Why? Because if I do that, I am cutting away my survival because I need the O² for breathing and the food from that particular plant (T/SH-1).

Participant 4, like participant 1, sees the environment (animals and plants) as an important source of food. The destruction of the environment affects human beings.

Animals, we depend on them... Plants, we depend on them, because we are getting food from them, so destroying the nature, we are destroying our life (T/KO-1).

Participant 5 considers it important for learners to be informed about problems which might arise in the future if the environment is destroyed.

To take care of our environment it's important...I mean it has to do with the future. If you did not take care of the environment, then we will have problems. It is important ... if they are aware of what is happening... even if they go in their work related environment or whatever... they won't know how to take care of the environment, so it will become worse and worse. We need at least to inform them of these things (T/KA-1).

She also praised the current curriculum for making it possible for learners to be taught how to preserve nature for the future generation.

It is very important because in the classroom of today we are taught to keep our nature safe so that the young generation...should still have a room to understand what existed and what is going to be existing for the others (T/KA-1)

Participant 6 thinks that it is very important for learners to grow up understanding that humans depend on the environment, thus they should take care of it.

As a biology teacher, I think it is very important because if we sensitize our learners from a young age, they will grow up understanding that our environment is very important. If we look after it, it will look after us (T/SI-2).

He thinks that people are nothing without the environment. That makes it important for Biology teachers to implement EE in their teaching. He mentioned the catastrophic events and diseases like skin cancer which are a result of destroying the environment. It is therefore important to implement EE.

I believe as a biology teacher that it is very important to always talk about EE because if you don't take care of the environment, our environment will cease taking care of us... What becomes of us? Of late, you hear about different catastrophic events taking place, you talk of tsunamis... earthquakes... skin cancer and this environment related diseases (T/SI-1).

Participant 7 also stresses the relationship between living and non-living things in the environment, because destroying of one them affects the whole structure. Therefore there is a need for learners to learn that the environment should be cared for in order to benefit humankind and for the sake of sustainability.

Conservation of the environment, how the abiotic and biotic environment interact and how they cannot be without each other. So if you destroy one link the whole system will collapse and affect the others. So directly and indirectly we are dependent therefore people should know that the environment is important and they should be learned (sic) that they should be educated so to speak that the environment is there for our benefit but should not be destroyed; it can be used and should be looked after (T/P-1).

There is strong evidence of the importance or the need of EE in teaching. Thus the attitude of teachers toward teaching EE is positive. This attitude is motivated by the benefits that people reap from the environment, especially as it is the source of food and it plays a role in nutrient cycles. EE can also provide an opportunity for learners to be aware of environmental problems which might arise if the environment is not cared for and to learn how to preserve nature for the next generation.

Subject advisors

Both advisory teachers also considered EE important in the teaching of Biology. Their responses and reasons for the importance are not very different from those of the teachers. One of them (Participant 10) noted that it is through EE that people realize what mistakes are being made so that this can be put right. This reflects a positive attitude:

“Environmental education is very important... as I have said before, we need to understand the environment where we are living... because if you understand... that is when from there you can really try to make changes (sic). You need to realize that there is something which is not good which you are doing (sic)... it is from realizing it... you can change” (T/NAM-2).

He also raised two other important points, one relating to the importance of EE in alerting learners about the health hazards which they are likely to face, and the other to the fact that the teaching of EE can influence the community as a whole:

“It is very very important; we need... to find out what problems are we likely to face in future, yes. Learners need to know health hazards (sic) because these learners can also take this idea to parents” (T/NAM-2).

“Learners can also influence the whole community... they need to know... they can also take information to the community... to parents is a right way (sic) of influencing everybody” (T/NAM-2).

Participant 9 also showed a positive attitude when she noted that EE can help to avert natural disasters:

“I think we should really look at... environmental education and what we should do to improve on whatever we want to (sic) because we don't want to sit with natural disasters like Japan...” (T/F-2).

The attitude of advisory teachers is also positive like that of the teachers. EE promotes the understanding of how people misuse the environment and promotes change. It also alerts learners to future health hazards and natural disasters humans might face in the future. Advisors think that teaching EE to learners will spread the

understanding of caring for the environment because kids spread the message by sharing information with their parents.

Interpretation of teachers' and advisory teachers' attitudes toward EE

All the teachers and advisory teachers find EE important. They find it important because the environment is the source of food and when people damage the environment they are therefore damaging their source of food. They also consider it important to preserve the environment for the future human generation. The destruction of the environment causes catastrophic events and diseases, thus it is important to warn learners about these events. Lastly, it is important to identify possible ways to solve the environmental problems that face the world.

Teachers are the people who implement the curriculum and the changes which serve their purpose are more likely to be implemented than those which are not. Pratt noted that changes which promote teachers' needs are implemented (Pratt1994:328). He also mentioned that teachers are surrounded by many changes and they are likely to implement changes which they find important. Biology teachers and Biology subject advisors consider EE important and their attitude towards change determines the degree to which the change will be implemented successfully (Papadimitriou 1995:85). Biology teachers in Namibia consider EE important, and that is a positive attitude toward EE. The implementation of EE therefore does not pose any threat because accords with what the teachers find important.

A positive attitude can be the beginning of hope for implementation but it is not the end. Teachers in schools are presently faced with many changes requiring implementation Fullan (1994:69) stresses that teachers have to decide which changes are the most urgent. However it seems that many teachers favour the implementation of EE:

"It is very very important; we need... to find out what problems are we likely to face in future, yes. Learners need to know health hazards (sic) because these learners can also take this idea to parents" (T/NAM-2).

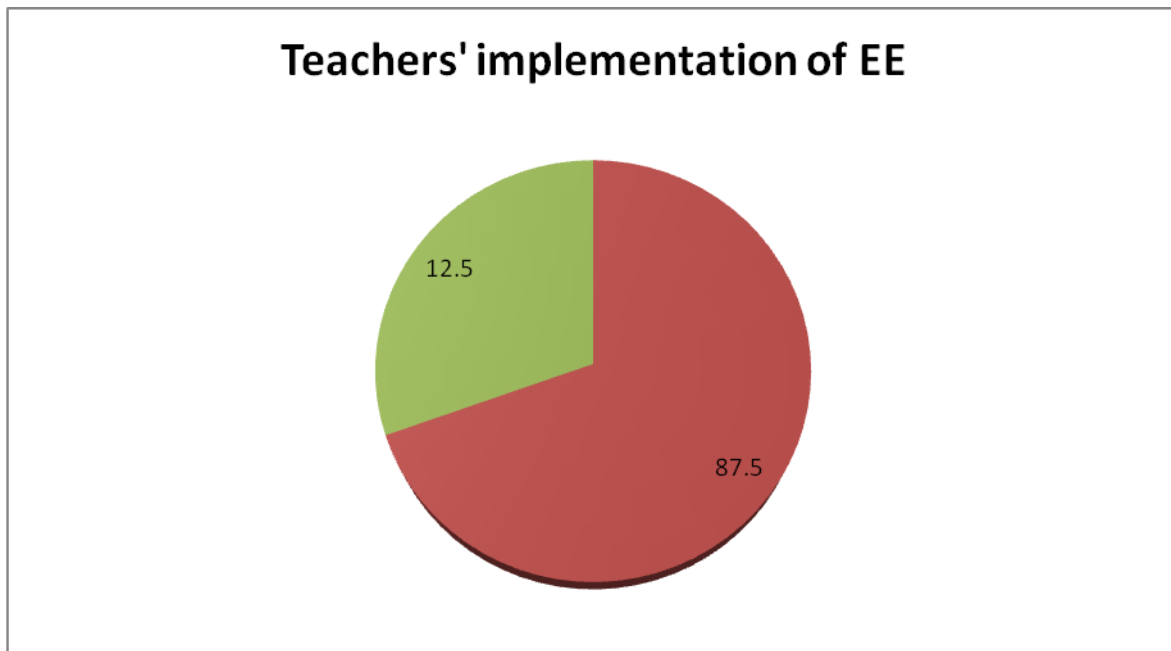
This however does not automatically guarantee also the implementation of EE as there are many other factors involved. The obstacles are discussed in section (4.8) and they prove that, the implementation of EE in Namibia is complex. Fullan (1994:69) also stresses that attention must be paid to the obstacles which might hinder implementation. It is reported in the previous section that the participants have little knowledge, a factor which makes the implementation complex. According to Lee (2000:101) the success of implementation does not only depend on the how important teachers consider the change to be, but on other concerns about the implementation and on the support they receive for the implementation.

The effect of attitude on implementation was highlighted by Nigerian teachers who showed negative attitudes toward EE since they believed that it was not important to teach it to all learners; therefore, they did not implement the teaching of EE (Oloruntegbe *et al* 2010:709). Lee (2000:101) observes that those who find EE important have a positive attitude towards EE and those who have positive attitudes support the implementation of EE because teachers in his study who found EE important, implement EE. Therefore, it is expected that Biology teachers in Namibia will not reject the implementation of EE, especially if their attitude is accompanied by attention being paid to obstacles which affect environmental education.

4.7 Pedagogical approaches used by teachers when teaching EE

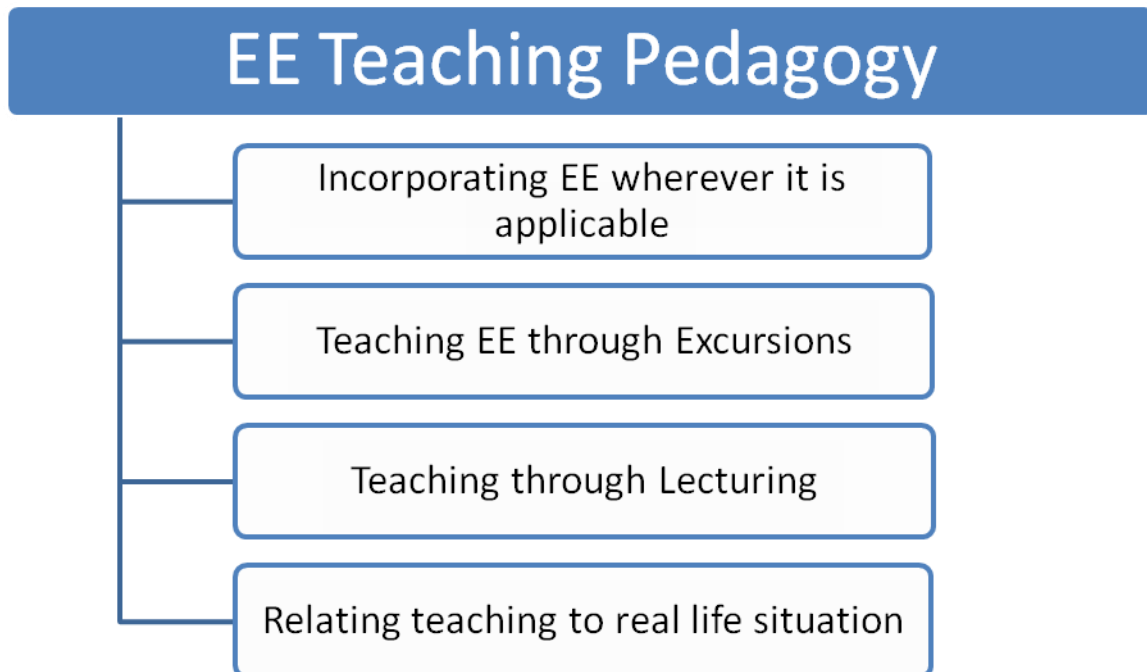
Teaching approaches are some of the artefacts which mediate between the components of the curriculum (Johassen and Rohrer-Murphy 1999:70). They mention that artefacts are important in implementation. Thus it is important to find out if the correct artefacts are used. The responses given by teachers on whether they implement EE, led to the researcher becoming interested in how many teachers implement and how many teachers do not implement EE in their teaching. The pie chart below was developed:

Figure 11: The Pie Chart showing teachers who implement EE



The pie chart shows that a larger number of teachers mentioned that they implement EE in their teaching of biology. Of the eight teachers interviewed, 7 incorporated EE in their teaching, accounting for 87.5% of the entire sample, whereas only 12.5% of the teachers were not sure that they implemented EE and no one indicated that they did not implement EE at all. Interview analysis shows that teachers teach EE in many ways and these are presented in the diagram below.

Figure 12: EE Methods used by teachers



4.7.1 Teaching EE wherever it is applicable

This takes place when EE is integrated in all the topics of the curriculum which are related to the environment. Several topics in the Biology curriculum relate to the environment. Teachers also realize that most or all the topics relate to the environment. Some of the teachers also pinpoint these topics. They think that topics related to the environment can be extended to teaching about EE. Participant 1 can see that all the topics are related to the environment.

“... Almost all the topics that we talk about have a special relation to the environment (T/SH-1).

Participant 2 pinpointed the circulatory system as related to the environment and she thinks that teaching about this can lead to discussing heart problems and a balanced diet.

“Most of the concepts that are in the syllabus somewhere somehow, environmental education is included” like “when... teaching certain topics” like “circulatory system... environmental study is there... kids... learn... how to take care of themselves when it is coming to heart problems... food they need to eat” (T/E-2)(participant 2).

Participant 2 was observed teaching the topic related to nutrients and the objective was to familiarise learners with the different nutrients, their functions and ways to test for their presence in foods. However, he did not relate this to the environment although he agreed that EE can be taught wherever it is applicable and he also mentioned nutrition in his response as related to the environment.

The lesson on nutrients can be one of the easiest lessons in which to incorporate environmental education since the environment produces food for all the organisms. When the environment fails to produce enough food, the organisms starve. (Jones 1994:47) says that starvation takes place when there are more people than available food. Food production uses the substances from the environment through photosynthesis to produce energy which is the source of food for all organisms. In addition, chopping down the trees which are primary producers, or the over killing of certain species of organism impact on food chains by reducing food/energy for other organisms next in the food chain (Jones 1994: 47). There is a need for sustainable use of natural resources to continue providing food for the organisms.

Participant 4 also considers some topics in the curriculum like reproduction and the prevention of STDs to be related to the environment. He claims that, he used the opportunity provided by this topic to teach the learners how they should take care of themselves and he is proud of what he is doing. He said:

“... There are some topics in biology which have a relation to the environment so not to mention here that the body is also, to prevent diseases... I think it is also environmental education when you are talking about reproduction and when we went as far as touching... diseases... I... put emphasis... going even out of the book... how they should... take care of themselves... not to be infected with viral diseases... and I use to sound... We are hammering on that...” (T/KO-2).

I observed his class when he was revising respiration and he did not relate the topic to the environment. This topic is directly related to the environment and EE can be integrated in the lesson. During respiration carbon dioxide is produced and released into the atmosphere and oxygen from the atmosphere is used up. One can say that respiration plays an important role is replacing the carbon dioxide used by plants during photosynthesis and reducing the oxygen from the atmosphere which is

released by plants during photosynthesis, thus striking a balance in the atmospheric gases. I explained this using the simple chemical formula used in respiration which is:

glucose + oxygen \longrightarrow carbon dioxide + water + energy

Participant 6 who runs an environmental club, related during the interview, how he could incorporate EE in respiration lessons by using practical examples related to the environment:

“You can talk about types of respiration related diseases... you bring in practical examples in the environment, like... if you live in an area where the whole family is smoking... nicotine, tar... have advisory impact on your respiratory system. Whenever applicable... we bring in practical environmental examples” (T/SI-3).

Incorporating EE wherever it is applicable is teaching EE across the Biology curriculum and this is supported by the Namibian curriculum. All the Biology topics are related to the environment directly or indirectly. That makes it possible to teach EE across the curriculum. Xingcun (2004) mentioned for example that, without an understanding of photosynthesis and transpiration, it is impossible to comprehend how beneficial plants and forests are to humans. I understand that some of the topics are easy to relate to the environment while others need a trained teacher to relate them to the environment.

However, does teaching across the curriculum really take place in schools? Lessons on many different topics were observed, some of which are directly related to the environment but EE was not incorporated in any of these lessons. These topics included:

- Nutrients
- Respiration
- Osmosis and diffusion
- The human reproductive system
- Cell division
- Plant nutrition
- Characteristic of living organisms

I will now discuss how some of these topics could be taught. I am aware that they cannot be taught in a uniform way. In the discussion I will try to show that it is possible to teach EE in all Biology topics. I tried to find out if all the observed lessons can accommodate EE and I learned that it is possible.

The lesson with participant 1 was on the human reproductive system but the lesson plan was not provided because, according to the teacher, it was still in preparation. In terms of methodology, books and a writing board were used as learning materials. The writing board was used to write the answers given by learners as they read from the textbooks. Searching for answers from the book followed both an information transfer approach, since the learners gave information without analysing it, and a student-centred approach because learners searched for the information themselves. During this process, the teacher asked several questions, some of which are listed below:

- What is human the reproductive system?
- Which type of reproduction takes place in humans?
- What is formed when the fusion takes place?
- Mention the parts of the female reproduction system
- What is the function of the ovary, oviduct?
- What are the functions of the male reproductive organs?

These questions are typically low order questions because learners were asked about facts and nothing was mentioned in relation to EE in the lesson.

In my view this is one of the easiest topics during which to incorporate EE. A teacher can approach it from an angle of emphasising the use of family planning in order to reduce or stabilise the world population, since a large population has an impact on nature. Mary Jones (1994:226) mentions some problems which are caused by a large population:

- An increase in air and water pollution
- A large population means cutting down more forests to provide land for growing crops and building houses (increase in deforestation).

- When the deforestation takes place it causes loss of habitats for other species
- In addition it causes soil erosion as the soil is exposed to wind and rain after vegetation is removed.
- More pollution also means more diseases because when people live more closely together they are more likely to pass diseases on to one another.

The above topics can be incorporated through discussions because in Grade 12 learners should be aware of problems caused by the increased population in their own communities.

The lesson given by participant 3 was about cell division and learners were expected to be able to describe mitosis simply in terms of the exact duplication of chromosomes resulting in identical daughter nuclei. The materials used for the lesson were books and the writing board. The approach used was information transfer and it entailed that the teacher asked questions and learners searched for the answers while the teacher wrote the answers on the board and provided a summary at the end. Even though the learners were permanently in groups, the groups did not do anything together. The type of questions they were asked were low order questions such as:

- Describe what double fertilization is
- What do you understand by cell division?

The lesson did not incorporate EE at all.

It may be difficult to incorporate EE in a topic like cell division and knowledgeable teachers may be required. It is also necessary to understand that all the topics in Biology are interrelated and one process cannot happen without another. It is through that understanding that one can look at the process in relation to others and see that the topic is also related to the environment. Cell division is important to the environment. It is through cell division that reproduction takes place and organisms grow and repair their worn tissues. In addition it is through cell division that life continues on earth, that's when the old organisms die and the new ones grow to replace the old ones; this is a continuous process. This is again done by using nutrients from the environment, and a shortage of nutrients reduces growth and

repair is blocked. Other teachers with their expertise in the subject can use different approaches.

In the lesson given by participant 6 posters and writing boards were used to teach the organ system and the movement of substances. There was no mention of the organ system in the lesson plan for the day but it was probably an unfinished previous lesson. The objective of the lesson was for learners to understand the effect of osmosis on animal and plant cells, including the role of the cell wall, and the importance of turgor pressure. The posters used described how plant cells and animal cells react in different solution concentrations, and the summary was written on the board. The teaching entailed asking learners questions and learners responding while the teacher offered explanations. However, the approach was basically information transfer with the following low order questions:

- Name one organ system
- What is the function of the digestive system?
- What are the organs in the digestive system?
- What is the function of the stomach?
- Give the distinction between diffusion and osmosis

Nothing was said in this lesson about EE.

Osmosis is a part of diffusion whereby particles move from their region of high concentration to low concentration regions. Some of the substances such as EDCs can diffuse through the skin and they can harm the body. EDC is a collective name given to chemicals which interfere with the function of the endocrine system (hormonal system) (De Jager 2003). They are absorbed through the skin by diffusion and cause a lot of complications in many organisms. In humans they have neurological effects, cause testicular cancer, reduce sperm count, and cause breast cancer. Thus it is important to reduce air pollution to prevent pollutants from entering the living tissues.

No lesson observation took place at School 7 (participant 7) because when the researcher arrived there, teaching was over and the learners were waiting for the

school to close for the holiday, unlike in the other schools where teaching was still going on. However, the researcher collected lesson plans for analysis and visited the Biology classroom to assess its condition. The lesson plan which was analysed was for a Grade 11 lesson with 36 students, according to the teacher. The topic was on the characteristics of living organisms and the objective was that learners be able to list and describe the characteristics of living organisms, as well as define the terms nutrition, excretion, respiration, sensitivity, reproduction, growth and movement. The teaching aids used were the writing board and worksheets. The lesson was organized in such a way that the teacher asked questions while learners provided the answers to the questions. Some of the questions included:

- What features do living organisms have?
 - Which characteristic of living organisms can be described as the removal of metabolic waste?
- A. Egestion
- B. Excretion
- C. Nutrition
- D. Respiration

The questions in this lesson were clearly low order questions which necessitated memory recall or simple information which and required simple answers. It was evident also that EE was not central to the lesson and nothing in the lesson plan was related to EE.

Biodiversity is the biological part of the environment. Different organisms have the some basic similarities and are therefore regarded as living organisms, while there are also differences among them and each is unique. The impact of human activities on the environment such as deforestation, farming and pollution, has caused changes to the habitats of many organisms. Loss of habitats has destroyed some species completely making them extinct while others are vulnerable to extinction (Jones 1994: 244). This calls for conservation of the biodiversity. The curriculum calls for learners to take part in excursions in order to learn to appreciate the biodiversity or to be involved in community-based actions. .

Teachers can see that there is a relationship between the topics they teach and the environment. However those observed did not use the opportunity to make learners aware of the relationship. This means that teachers may see the relationship but they may not know how to plan lessons which incorporate EE across the curriculum.

4.7.2 Excursions as a method used when teaching EE

Outdoor education or excursions usually refer to organized learning that takes place outside the classroom. Out-of-class learning can be organized far from school or in the local environment. A teacher in Khomas Region planned a short distance trip to a sewage treatment plant but she was not involved in the learning. An employee at Gammams explained the sewage treatment. However the trip was not entirely meant for learning, it was meant for leisure. Participant 8 explained what happened:

“I took them to... sewage treatment... what we call Gammams sewage treatment, I remember I took them once... at Gammams I took them there also to have fresh air. Yes, there was a discussion but I am not the one who explained, I don't know those things, I don't know how they are working (sic). There was a guy who was going around with them here and there” (T/I-2).

Some of the trips teachers mentioned are not meant for EE but for the teaching of main subjects like Geography content. Participant 3 described a trip on which they went in 2009.

“The one we had 2009 was mostly on geography. We went to the sea and the desert and we were mainly discussing these things of geography, we did not really include these things of biology (sic) and other things” (T/NAT-2).

Teachers consider excursions as an integral part of teaching EE. However only two of the teachers interviewed succeeded in organising trips due to the costly nature of trips and the unavailability of government transport due to the high demand. . Buses are needed to transport learners to different places. In Omusati region the schools don't have private buses; they depend on the government buses which are deployed

regionally. Although teachers are aware of this facility, they feel it is of little help because of poor access to the buses. . This is what participant 3 had to say:

“This one is the major one and can go hand in hand with the transport. For example the government and mostly the region, I don’t know if I can say they don’t have enough buses for learners to use or they are stingy with the buses” (T/NAT-3).

He is also unhappy about unnecessary delays and lack of transparency in the booking process.

“... The region... don’t (sic) have enough buses or I don’t know about how they allocate buses to schools. For sure... with the government bus... once I book this month (March), I will go there either December or January, what they will say is... ‘that one is booked’” (T/NAT-4).

Participant 2 from the same region is also aware of the government buses which she wanted to use because the school does not have enough money but they were informed that the buses are not available:

“Since now the school does not have money, you ask transport from the regional office, they will answer you that they don’t have transport) but transports are there” (T/E-3).

The other option is to depend on parents for funding, however some parents cannot afford to contribute to field trips. This is not only the problem in Omusati Region but also a problem in Khomas Region. Participant 3 wanted to take learners to Etosha but did not succeed because parents could not afford the contribution:

“Let me say I am taking my learners... to Etosha; obviously, you need money and our parents can’t afford (T/NAT-3, Participant 3).

Participant 1, also from Omusati Region, shares the same sentiment:

“Coming to funds, not at all (sic). If you have to take learners... for... excursion... you know how far that is... it creates a burden to these parents... because we don’t have enough fund(sic). Each learner contribute N\$500 and for a parent here, you know how we live in the north. Most of these parents are old age persons (sic). It will really hinder now what you want to do... the

school coffer can contribute but not to the full extent... the school money is meant for several activities not only for excursions..." (T/SH-3).

Participant 2 also wanted to take her learners to a reservation area to observe animals but they did not succeed in obtaining funds:

"... some of the animals we would like to view are not to our exposure(sic), we need funds to be able to go, which we might not be able to do because we may not have enough money to take that certain trip (sic)... we tried that but sometimes we failed, sometimes the funding is not enough" (T/E-3).

In contrast to Omusati Region, all the secondary schools in the Khomas region included in this study have school buses which can be used for trips by learners. Some of the schools have mini-buses while others have middle-sized buses, but none of them has a big bus. Participant 6 from the Khomas region also complained of lack of funds to transport a large number of learners during excursions, he contacted some ministerial department but they could not provide funds and those who offered did not offer enough to support the whole trip as planned, which led them to shorten the trip to only 2 days.

"Lack of resources so that... we could be taking a... large group of learners to certain places ... those are still like some of the internal stumbling blocks... with transport, you need money... to transport a group of specific learners from here to Ruacana. Our school is not the best (?) school; we struggle even with normal school fees... even last year when we went Etosha, we struggled. First, we wanted to ask N\$300 from all the kids but they were not able to pay. I also asked from the ministry of environment, I could not get. I could only get ... little amount from Namibia Nature Foundation, they gave us N\$3000 and we were around about 20 learners. Eventually I have to drop the amount I asked from kids from N\$300 to N\$150 per learner, that means that I also have to shorten my days of visiting where I had to go (sic). We only visited two days, then we came back" (T/SI-5).

The lack of funds therefore impacts negatively on the teaching of EE. The problem partly arises because teachers perceive excursions or outdoor learning as going on

long trips. Distant trips, according to (McMaughton 2007:632), are costly. This problem can however be circumvented by planning short trips.

Incorporating visits in environmental education is a common process. How this changes the attitude of learners and their behaviour depends on how the trip is planned. Research however shows that learning in the environment is capable of changing the attitudes of learners to the environment. Ballantyne and Packer (2002) find that learning in the environment is attractive to students and has an important impact on their attitudes to the environment, their desire to look after the environment, their behaviour in natural areas and their household environment practice. It was therefore concluded that excursions where instruction is combined with observation, are a powerful teaching method for EE, especially if the excursion is combined with giving learners a chance to understand the effect of human action on the environment.

The positive achievement of an excursion depends on its plan and purpose. A trip that is planned for leisure will end up providing entertainment to students even if there is an attempt to hide behind EE. Others may plan excursions for EE in terms of Ecology which end up providing only knowledge. Like (Bursukov 2010:1) explains that their soil-ecological and ecological excursions trips are meant for exchanging experience and knowledge by demonstrating the interrelationship of ecosystem components.

In conclusion therefore, field trips are considered by Biology teachers to be a method of teaching EE. Few teachers, however, succeeded in organising field trips. The problems experienced included lack of funds, few government buses, and poverty. Distant field trips are costly as MCmaughton 2007:632 warned. Learning in the environment is considered a good method of teaching EE because it is learner centred and it creates a desire for caring for the environment among learners. Short distance EE learning ensures learning at an affordable price.

4.7.3 Relating teaching to real life situations

Real life situations refer to what is happening in reality and in the communities of which learners are members. When teachers teach environment-related topics they

relate to the real life situation. Participant 3 gave an example of what he did when he discussed deforestation:

I can recall one time I went there (pointing) down at the forest there. Then I was talking of, now just imagine we have this forest, let's assume we cut down all the trees. How the wind will blow? ... Then, they say, it will blow fast and then cause soil erosion. Another case also related to biology. You said human and plants are helping each other, in what way are plants are helping the human beings?... Obviously once we remove... trees... you are going to hear in the future no enough (sic) oxygen... (T/NAT-2).

Participant 1 also from Omusati Region, stated that what is learned by the children in class is also important to their immediate community, such as deforestation. Learners should therefore have some experience of what is happening in their own environment. Thus teaching should be related to the experience of learners.

I try to relate whatever we are going to discuss with what the learners have experienced... Of course, there are certain things which they do in their environment... let's say we are talking about deforestation, it is a fact that us (sic) in Omusati region deforestation is taking place here, we have all this loss of trees... due to that ... learners have an idea of what is happening within an environment, then we try to relate whatever topic to what learners already know (T/SH-2).

Teachers also assert that they teach EE by relating to real life situations through giving practical examples, and using the environment as a source of discussion. This method adheres to the criteria for teaching environmental education given by Dreyer and Loubser (2005) because they are learner-centred and use the immediate environment as both the centre of learning and the source of learning. Dreyer and Loubser (2005:136) write that methods used to teach EE should comply with criteria that will ensure learner-centeredness, and that all learners should take part. The methods should be applicable to learners' needs and interests and account for their prior knowledge, use the learners' immediate environment, and should be used across the curriculum.

4.7.4 Using the lecture method

The Lecture method is a teacher-centred approach where information is transferred to learners without their being involved in learning. EE is also taught through a teacher-centred approach. Teachers think that using a learner centred approach is a waste of time because learners don't grasp the content. Thus teachers mostly use the teacher-centred approach which they find useful for transferring information and reduce the involvement of learners, because some learners do not contribute to group discussions. Participant 4 who understands the learner-centred approach as using group work, expounded on his use of the teachers-centred approach as follows:

"This learner centred means learners should be in groups... they say learners should do 80% while teachers facilitate. In this case, it is impossible for me to restrict myself but to teach the way I feel they will understand. So I will not utilize that I should only teach 20% but I might do 80% and for them to do 20%. It is not meaningful for me to restrict myself to 20% while the learners are not benefiting from this method" (T/KO-3).

Therefore it seems that the method mostly used by teachers is a lecture method, as participant 8 said: :

"I took them once... otherwise the rest I just taught theoretically" (T/I-2).

Another teacher confessed that he uses the lecture method sometimes combined with the use of posters and pamphlets to explain the effect of smoking on the respiratory system:

"Sometimes, you also use lecture method where you give some posters or pamphlets on which there are people smoking (sic) and teach how it might affect the lungs" (T/SI-3).

Information transfer through lecture methods was used in almost all the lessons observed. It was coupled with the questioning method to find out whether the content had been grasped. The questions were low order questions and learners were requested to mention facts alone without analyzing any process. In the next table I present the questions which were asked in the 8 classes observed

Table 5: The types of question used by teachers

<p>Lesson with Participant 1</p> <ul style="list-style-type: none"> - What is human the reproductive system? - Which type of reproduction takes place in humans? - What is formed when the fusion take place? - Mention the parts of the female reproduction system - What is the function of the ovary, oviduct? - What are the functions of the male reproductive organs? 	<p>Lesson with participant 2</p> <ul style="list-style-type: none"> - Define monosaccharide, disaccharide and polysaccharide. - What are the elements which make up carbohydrates? - What are the foods which make up carbohydrates? - What do you think is the function of glucose?
<p>Lesson with participant 3</p> <ul style="list-style-type: none"> - Describe what double fertilization is - What do you understand by cell division? 	<p>Lesson with participant 4</p> <ul style="list-style-type: none"> - What is CO₂? - Where does CO₂ come from? - Name the process producing CO₂ in which organelles in the cells does respiration taking place?
<p>Lesson with participant 5</p> <ul style="list-style-type: none"> - What is the colour of the leaf? - Why is the leaf greener on the upper surface than on the lower surface? - What is the function of the leaf? - What are different parts of the leaf (seen with naked eyes)? 	<p>Lesson with participant 6</p> <ul style="list-style-type: none"> - Name one organ system - What is the function of the digestive system? - What are the organs in the digestive system? - What is the function of the stomach? - Give the distinction between diffusion and osmosis
<p>Lesson with participant 7</p> <ul style="list-style-type: none"> - What features do living organisms have? - Which characteristic of living organisms can be described as the removal of metabolic waste? <p>E. Egestion F. Excretion G. Nutrition H. Respiration</p>	<p>Lesson with participant 8</p> <ul style="list-style-type: none"> - List characteristics of living organisms - Compare the structural differences between a monocotyledonous and a dicotyledonous plant

The results of this research point to the use of teacher-centred education in Namibia and specifically in Biology. Teachers feel that learners do not grasp anything in learner-centred classes, thus teachers stick to the teacher-centred approach. Through the teacher-centred approach they teach a lot of theory, rather than involving the learners. This was confirmed through observation. Teachers taught Biological theories and used low order questions to find out if learners had grasped the information.

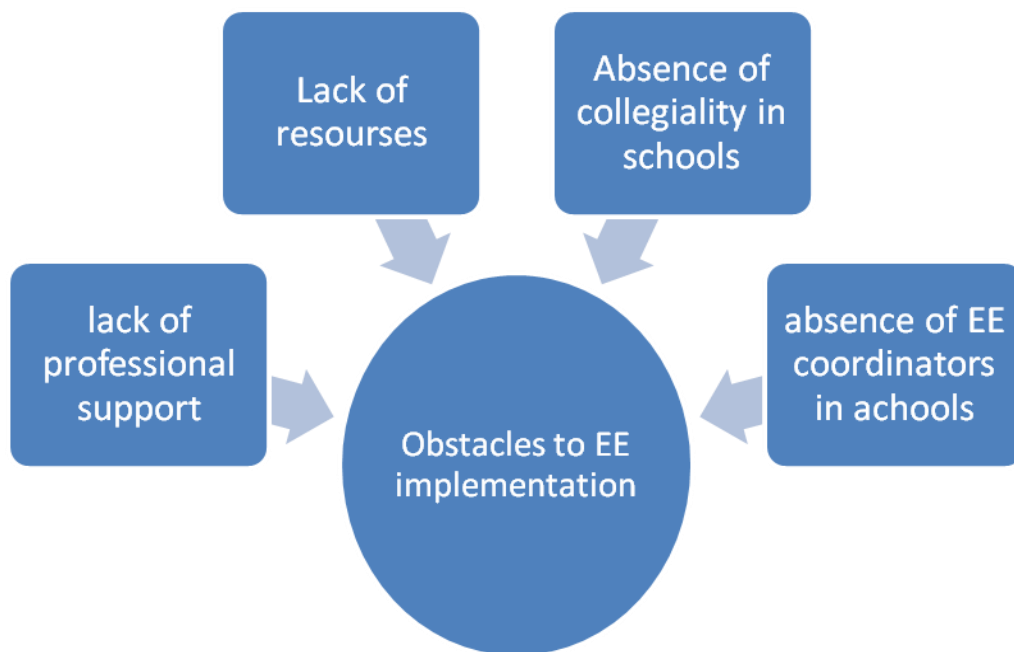
After independence the Ministry of Education proposed that a learner-centred approach be employed (ME 2010) in Namibia. The teacher-centred approach was discouraged and learners are now considered as total beings that come to school with some knowledge and do not need to be filled up with new information. However Kasanda (2009) reports that the teacher-centred approach has not changed much in schools in Namibia. In his research Lee (2000) also says that the teacher-centred approach is the only method which goes hand in hand with the Chinese school culture which emphasizes hard work, discipline and respect for teachers.

This also points to the reality about the tension between Biology as a science subject and Environmental Education. Hart (2002: 1247) describes science as a discipline which is restricted to theoretical knowledge; it is experience-based, and its knowledge base is focused on cognitive information (Ashley 2000:273) Environmental Education on the other hand, favours practical ways of knowing, based on research and effective knowledge. Therefore, the curriculum supporting EE should be shaped by approaches identified by Hart (2002:1247) as “student engagement, personal experiences, student reflection and action-oriented groups in natural settings”. Using the lecture method which is a teacher-centred approach is good for teaching science but not environmental education. Therefore the gap that is proposed to be closed between science and EE by Ashley 2000, Le Grange 2001 and Hart 2002) may remain open and EE remain not welcome in the teaching of Biology education.

4.8 Obstacles to the implementation of environmental education

(Johassen and Rohrer-Murphy 1999:70) advised that the activities of the activity systems may be hampered if careful study of obstacles which hinder the implementations is not done. Fullan 1991 also mentioned that curriculum documents may be sound but implementations may fail because of obstacles at the grassroots level. Obstacles refer to factors which affect the implementation. In this section these factors were coded and the themes which emerged from the analysis are presented, interpreted and discussed. Figure 13 presents a summary of these themes.

Figure 13: Obstacles to the implementation of EE



4.8.1 Inadequate provision of resources

Teachers

The inadequate resources referred to in this section are lack of funds , teaching material and lack of transport, and unsuitable classroom condition and size. The responses of teachers will be considered but the researchers will use results from observation. Provision of resources in general is problematic in the teaching of EE and Biology. Almost all the teachers responded by saying that they did not receive

any aid to help them teach EE, except participant number 3 who has what he calls an “old poster” in his class.

“In my class, there is one, but these are old posters. I don’t know even if we are having the same age with them (sic); very very old” (T/NAT-5).

Some of the teachers don’t have teaching materials for EE, they only received resources such as chemicals for experiments in other Biology topics. Participant 8 explained by pointing to the expired bottles of food test chemicals in the laboratory storeroom:

“As you are sitting in my lab now, you can see those are just chemicals that I am using for other topics but there is nothing for EE, to be honest with you” (T/I-4).

Teaching-learning materials are not provided even for those who teach higher level and are expected to administer practical examinations. They only receive enough resources for examinations but not for practical classes. Some schools like school 2 do not have basic resources like microscopes. Participant 2 expressed her predicament as follows:

“From the ministry, not really... when you teach higher level... you... request for chemicals, they don’t provide; they only do that during examination. We have nothing; just imagine, we don’t even have a microscope at school (sic)... few resources that we have will not be able to help us” (T/E-4).

Participants 5 supported participant 2 by saying that they don’t receive material for practical classes for higher level. They are told to list what they need for higher level practicals, but these materials are never received by teachers. Most of the chemical solutions have already expired:

“You know we write a paper for practical and you need to do some of those things... It is not easy; the resources are not there... You are told to make a list of what you need, then you do it... Years will pass, nothing... Most of the solutions we have, some of the things expired already (sic)... Kids apply for higher level but the lab is not functional” (T/KA-3).

Participant 7 has also not received teaching materials for EE and Biology, and as result he developed his own materials for teaching Biology, but not EE.

“I don’t get any teaching material. Those you have seen in my class I developed them myself” (T/P-5).

Participant 1 uses materials from the local environment when teaching. This can be a good source for environmental education.

“We receive nothing. What we do is...we try to use local materials... I did not receive anything of that nature” (T/SH-5)

Teachers who consider teaching in the environment a central part of teaching Ecology have not succeeded in organising field trips due to the small number of buses, small buses and lack of funds to transport learners. For example in Omusati region the schools don’t have private buses; they depend on the government buses which are deployed regionally. However, although teachers are aware of this facility, they feel it is of little help because of poor access. This is what participant 3 had to say:

“This one is the major one and can go hand in hand with the transport. For example the government and mostly the region, I don’t know if I can say they don’t have enough buses for learners to use or they are stingy with the buses” (T/NAT-3).

He is also unhappy about unnecessary delays and lack of transparency in the booking process.

“... The region... don’t (sic) have enough buses or I don’t know about how they allocate buses to schools. For sure... with the government bus... once I book this month (March), I will go there either December or January, what they will say is... ‘that one is booked’” (T/NAT-4).

The other option is to depend on parents for funding which is also not practicable because some parents cannot afford to pay the money which is requested as a contribution.

In contrast to Omusati Region, all the secondary schools in the Khomas region examined in this study have school buses which can be used for trips by learners.

Some of the schools have mini-buses while others have middle-sized buses but none of them has a big bus. Participant 6 from the Khomas region also complained of lack of funds to transport a large number of learners on excursions. He contacted some ministerial department but they could not provide transport and those who offered did not offer enough to make the whole trip as planned possible, which led them to limit the trip to only 2 days.

“Lack of resources so that... we could be taking a... large group of learners to certain places ... those are still like some of the internal stumbling blocks... with transport, you need money... to transport a group of specific learners from here to Ruacana. Our school is not the hint (?) school; we struggle even with normal school fees... even last year when we went Etosha, we struggled. First, we wanted to ask N\$300 from all the kids but they were not able to pay. I also asked from the ministry of environment, I could not get. I could only get ... little amount from Namibia Nature Foundation, they gave us N\$3000 and we were around about 20 learners. Eventually I have to drop the amount I asked from kids from N\$300 to N\$150 per learner that means that I also have to shorten my days of visiting where I had to go (sic). We only visited two days, then we came back” (T/SI-5).

The implementation of EE requires funding. Teachers mentioned earlier that lack of teaching resources and funds affect the implementation of EE. Accordingly, they suggested that a special fund be set up to take care of activities related to EE and to equip teachers adequately to teach EE. They thought that the Ministry of Environment and Tourism and the Ministry of Education should be responsible for providing funds for EE. Schools also need to set up fund-raising activities to reduce resourcing problems. The following was suggested:

“They need to sit and see how to develop funds (sic) ... in terms of money because without money, you can't go ahead. Excursions require financial things (sic) and so on. So all I need is support from the... ministry of tourism and ministry of... education... then when money comes to school it should be allocated to EE and then I can see how I take it up (sic), taking learners to excursions and so on” (T/I-5_ T/I-6).

“As a school, we really need to work hard to make sure that at least there are some resources that you don’t only need to get from the ministry but there are resources that we need to work together to create some capitals (sic) to buy them as a school. So you have to work somehow as a team” (T/KA-4).

“Funds to set us free to plan as we want” (T/P-6).

In conclusion, The implementation of EE is difficult because there is no provision of resources to facilitate the implementation. Teachers complained about lack of teaching and learning resources for teaching both EE and Biology and lack of transport during excursions where they learn EE in the environment. The lack of transport is attributed to the inadequate number of government buses, small sized school buses and lack of funds from the government and contributions from parents due to poverty. Teachers suggested that funds be provided by the government for better EE implementation.

Advisory teachers

Advisors also considered the lack of resources to be a barrier to the successful implementation of EE and to the curriculum in general. They mentioned, among other problems, lack of textbooks in schools, which the new Minister of Education is trying hard to address. Materials are also needed by advisors to demonstrate issues related to EE and their effect on the environment to teachers. This is what advisors had to say about the need of resources

“We also need a bit of materials then you demonstrate something where people can see as an example (sic) you are having this gas... having this effect ... if you buy materials then you do demonstration where people can see because it will have an effect... it is also going to help the implementation of this subject” (T/NAM-3).

“You see, we have schools where we have not even textbooks (sic). There are a lot of barriers in our education system still in implementing (sic). It is now very important to you so that it can be implemented but there are some other barriers like financial barriers, we have textbook problems and a new minister is really trying very hard to eradicate the textbook problems” (T/F-3).

Advisory teachers are also concerned about lack of funds needed for them to conduct more and longer workshops to cover the curriculum. According to participant 10, the lack of funds makes them become selective when it comes to what to include, leave out or to cut short, in order to reduce costs.

“When it is coming to fund (sic), one can say we really don’t have enough... for the meantime because we do not cater for all workshops which we plan to do. Yeah, we are selecting those... major ones which we think will help teachers because if we don’t select you cut the time so that you can cover as many topics as you can within the short period of time, so we don’t have enough fund” (T/NAM-5).

Participant 9 noted that implementation especially of EE as a separate subject which he considers the best way to introduce EE, requires a lot of money, which might not be available:

“The other problem... I think this is also the main barrier, lack of funding. Funding of implementing even a new subject because that is also need a lot of funding... we will definitely experience financial problems in doing that” (T/F-3).

Observation analysis also pointed to schools especially in Omusati Region being in a very bad condition. Most of them have broken chairs, floors, walls, roofs and windows, no laboratories or empty laboratories with broken water sinks and disconnected water and gas supplies, while textbooks are in short supply. In one of the schools in Omusati Region a textbook is sometimes shared by about seven learners. Figure 5.2 below shows a window frame in one of the classrooms without any glass in it.

Figure 14: Condition of windows in one of the schools



Figure 15: Teaching materials developed by teachers

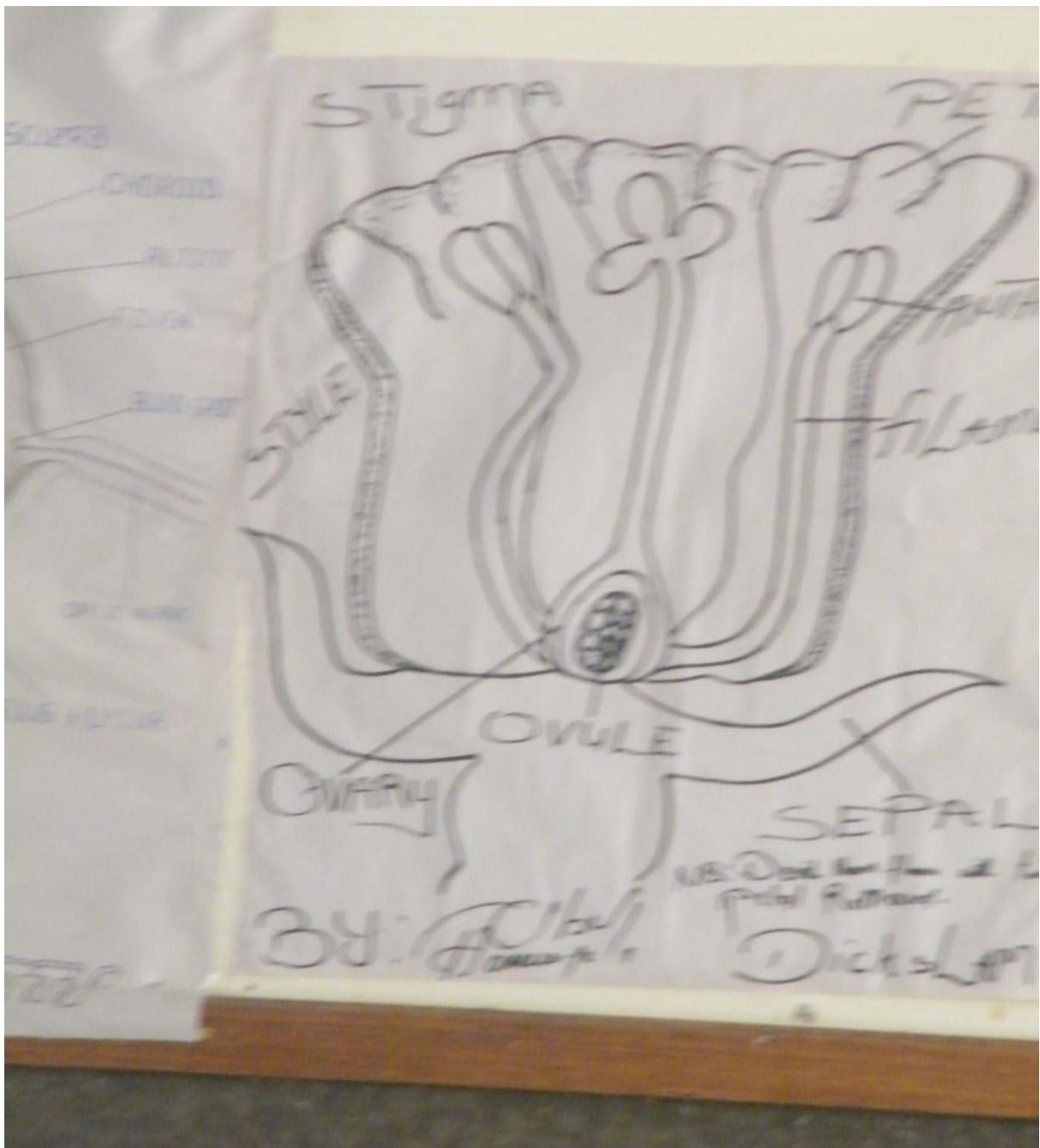


Figure 16: Another example of teaching material developed by teachers

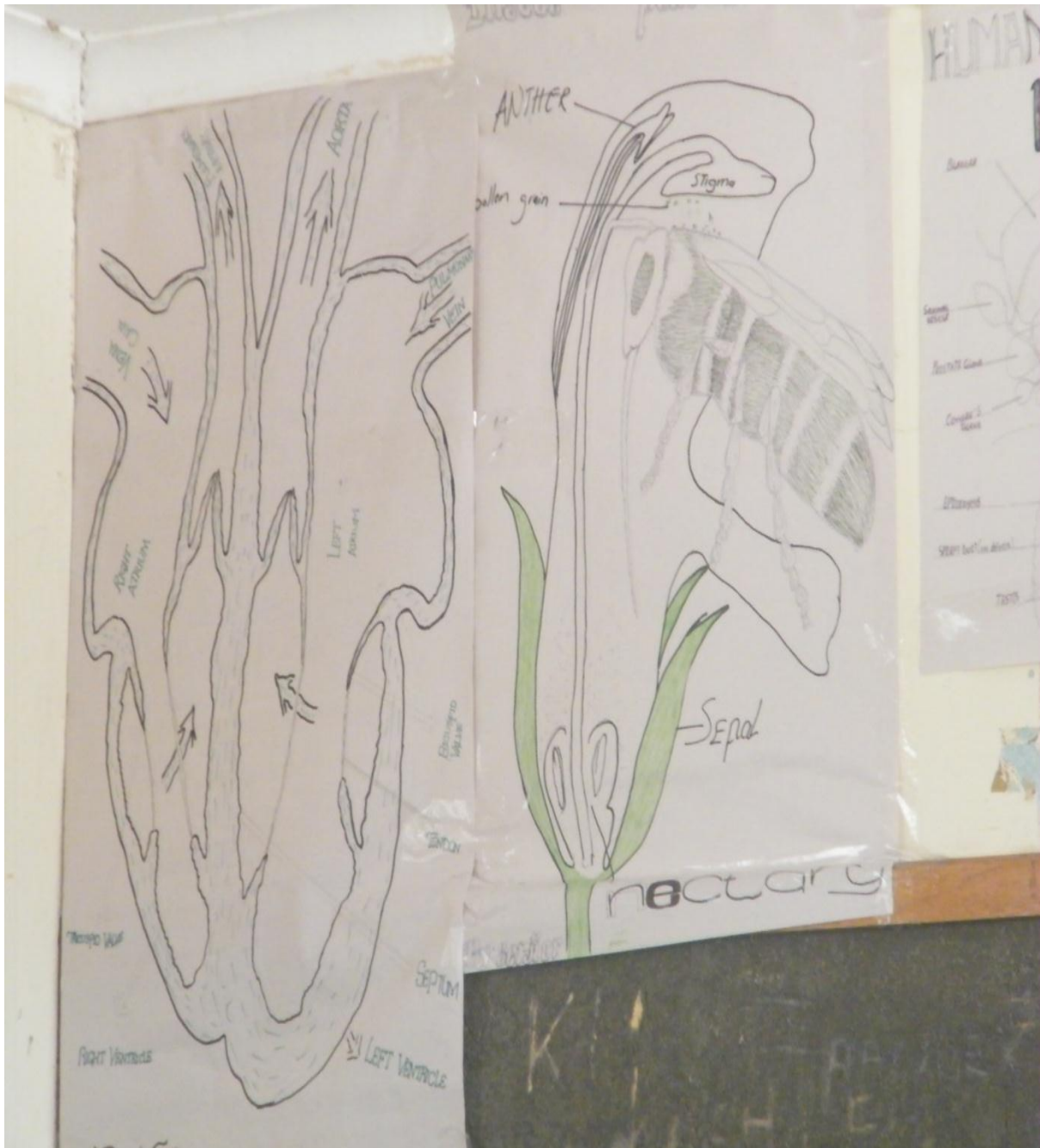


Figure 17: An example of teaching materials received by teachers



In some of the schools, teachers are able to obtain resources for Biology as shown in the background of the picture of the researcher (Nyeuvo) and one of the participants.

Poor provision of resources to schools is not uncommon in education, it is experienced in other countries in both EE and other parts of the curriculums. Kirkzog's (2008) study of how teachers adopt innovations shows that although understanding was the main factor, lack of resources was also another factor which affects implementation. Altinyelken (2010) studied the extent to which the curriculum is implemented and he identified lack of resources as a hindrance to curriculum implementation. According to Reddy (2000:26), poor provision of resources for education in the RSA due to apartheid, including a lack of chairs, leaky roofs and broken windows hindered curriculum implementation in general while large classroom sizes became a stumbling block for out-of-class activities. There was also a lack of teaching resources. Palmer (1998) and FedEx (30 May 2011) also obtained the same results for UK and Taiwan, pointing to a lack of resources being one of the factors which affect the implementation of EE.

Even though the lack of teaching material and other resources proved to be crucial in the experience of other countries and although implementations which are not accompanied with resources have failed elsewhere, Namibia ignored these experiences and introduced EE without consideration of both teaching materials and physical resources. Pratt (1994:335) Fullan and Hargreaves (1992:45-46), also warned that most of the innovations which are not accompanied with resources failed because teachers are very busy and producing material takes up most of their time. The availability of both teaching materials and physical resources is therefore crucial to the implementation of the curriculum including the EE curriculum. Does that mean that EE in Namibia failed before the implementation? It can be interpreted that Namibia might not succeed in implementing EE if resources are not made available for the implementation EE.

Many schools cannot afford to buy resources themselves due to low school development funds. Schools included in this study have school development funds below N\$ 1000 annually. In addition, some of the learners are exempted from paying school fees due to poverty and their being orphans. While (Sasman 2011:1) talks about schools in Namibia where learners pay as little as N\$2. In addition, the contribution of the government and NGOs to schools for EE is something which teachers do not know about. This shows that the implementation of EE in Namibia is hampered by a serious lack of resource provision. In cases like this, the schools may

decide to ignore providing for EE and concentrate on the basic curriculum, as happens in Taiwan (FedEx 30 May 2011)

In terms of teaching and learning resources, Robottom (2000) disapproves of environmental resources which are centrally developed for implementation in one scenario but end up being used in other scenarios. This is because, in his opinion, environmental problems are local and social problems. It is important to train teachers to develop their own materials which are locally designed for the environment that is familiar to the learners Robottom (2000). Training teachers to produce their own materials will not only solve the problem of being dependent on outside sources for provision of resources and funds, but will also help in contextualizing resources to situations where they are used (Robottom 2000). Teachers can use their local environment as a setting for learning instead of planning distant excursions which are expensive and end in failure if there is no adequate funding (Robottom 2000). The data have shown that teachers are willing to develop teaching-learning resources because they have been developing resources to teach Biology. The challenge can be their lack of expertise in developing the resources for EE, as it has already been shown that they have limited understanding of EE.

4.8.2 Absence of collegiality in schools

Collegiality refers to how the teaching staff work together to achieve envisioned goals. Participant 3 complained about lack of support from the principal due to lack of understanding about EE. Due to lack of understanding, principals do not provide money requested for EE activities.

“The office of the principal is sometimes a problem. Sometimes the people might not even know what you are talking about; they don’t know the importance of what you want to do... so they will not provide the money that you want to use” (T/E-3).

Participant 4 thinks that school management needs to understand about EE in order to support the teachers.

“When it comes to the management, they need too (sic) the information about... environmental education...therefore... there is a need in the

management itself to get that information (sic) so that they will be able to support the teachers in the environmental education” (T/KO-3).

Biology teachers also complained about lack of support from teachers other than science teachers when taking learners on outdoor lessons/trips. For example, Participant 8 took learners on a trip accompanied only by a physical science teacher:

“The support I get here is only from the science teachers, like when I took the kids to Gammams, like the physical science teacher also went with me” (T/I-3).

Participant 7 also observed that only the science teachers understand.

“Mostly, it is the science teachers and me as a biology teacher who understands (sic) it” (T/P-3).

Participant 3 also finds the involvement of other teachers rare, because he feels that they do not care about the environment being destroyed. He states that:

“In terms of teachers’ assistance, it is rare. Very few can assist but what I can say is that many teachers do not care with (sic) the trees being damaged” (T/NAT-3).

There is lack of togetherness among teachers and principals in terms of EE implementation in schools. Teachers do not help with and do not support EE. They also seem not to care about nature. This is blamed on lack of understanding of EE and its importance in teachers other than science teachers. Principals also do not support teachers in EE because they do not understand EE.

Research has proven that EE implementation did not succeed in the schools where teachers do not support one another (Reddy 2000). He mentioned this when teachers who were not involved in EE professional development made it difficult for others to implement EE. That shows lack of support and collegiality among the teaching staff. The implementation of EE in Namibia seems also to be at risk of failure because of lack of support and togetherness among teachers. This lack of collegiality among teachers jeopardizes the success of implementation (Pratt 1994:331).

Biology teachers are important in determining the success of EE but working together with other teachers is also crucial because teachers depend on one another for professional support (Pratt 1994:331). Collegiality in EE is expected to be strong because it is a cross curriculum theme and every teacher is expected to know about it and be helpful to other teachers. However, results point in a different direction. Collegiality and support are crucial because they go hand in hand with knowledge. Such support is said only to be offered by science teachers who have some EE understanding while other teachers do not lend support. When teachers do not understand, they do not support EE teaching.

The principals have a duty to influence teachers to make changes. This is done by monitoring and supporting the implementation of changes to make sure teachers are encouraged to implement changes (Fullan 1994:76). However if principals do not understand environmental education they may not support it and they may lose their influential role. Thus the monitoring and supporting role is not played. This may also influence the allocation of funds and other resources to EE.

Lack of collegiality in schools is one of the obstacles mentioned by teachers. It did not come as a surprise that teachers also suggested that co-operation in schools is needed to ensure the effective teaching of EE, because Biology teachers cannot achieve much on their own. Participant 6 said:

“Internally I would like to see co-operation especially from my management and from my learners as well, because together we can do better than trying to do something on your own. Yeah, co-operation, I would say” (T/SI-9).

4.8.3 Lack of professional support

Teachers

Professional support means the assistance given to teachers in terms of increasing their knowledge and skills in teaching. Teachers do not understand EE because it has only recently been added to the curriculum. Participant 5 explained that:

“This is even a new topic to me. It have (sic) never been talked about. We don’t understand it here; we don’t talk about it... the obstacles, you don’t know where to start... it’s like everything is obstacle (sic) plus myself” (T/KA-2).

Sometimes teachers also want to teach EE but they do not because of their poor understanding. Lack of understanding of the curriculum leads to some themes not being taught:

“You are supposed to do something with the kids but because of the poor understanding we just have to leave those topics. The poor understanding I am talking about is the poor understanding of the curriculum properly (sic)...”
(T/E-3).

Some of the participants requested EE workshops to be conducted by experts in order to increase their knowledge. The need is expressed by participant 1:

“It was... great if we say... let’s have a particular workshop just to tackle... environmental awareness... inside the school to be conducted by an expert”
(T/SH-3).

Due to the fact that teachers find EE new, they also expressed the need to increase their EE knowledge. All the teachers responded by saying that they had not received any training with regards to EE. Some of them received PD (professional Development) in Biology which excluded EE. Others did not receive PD even in Biology and their attempts to get help from advisors were not successful, as they did not even know who the advisors were. Participant 6 would like the workshops for EE to start soon:

“There have not been any environmental workshop (sic)... I would like to say so far we had no professional support from somewhere (sic) and I would love to see it in the near future” (T/SI-7).

Participant 7 who, like the other participants, has not attended workshops, wants the responsibility for training teachers in EE to be given to UNAM:

“No, that’s why I said, I would like UNAM to do something, which currently is not happening” (T/P-5).

Participants 1, 2, 7, did not make lengthy comments, they simply denied having attended any EE workshops .

“I have not attended any environmental related (sic) workshop” (T/SH-6).

“No I cannot remember them talking about environmental education” (T/P-6).

“Not really environmental education, they don’t mention specifically environmental education” (T/E-5).

Not only are there no workshops for EE, there is also very little support for Biology as a whole. This is confirmed by participant 8:

“Not at all. Even support in biology is not like offered anymore... I think it’s 7 years since I received a workshop (sic) in biology” T/I-4.

Participant 5 from the same region agreed that workshops are not provided and they don’t know who their subject adviser is:

“I will tell you zero support and you know that they rate the way you perform... we don’t even know who are subject advisors (sic). You go to those offices you don’t get any help... from the ministry zero support...” (T/KA-3).

Participant 3 from the other region admits that there was a workshops probably for Biology, but not for EE, during which they discussed marking and remedial classes:

“No, I never attended any workshop on environment... what people normally do they focus on the academic like... to mark, how you must have this remedial classes” (T/NAT-5).

Some of the participants requested EE workshops to be conducted by experts in order to increase their knowledge. The need is expressed by participant 1:

“It was... great if we say... let’s have a particular workshop just to tackle... environmental awareness... inside the school to be conducted by an expert” (T/SH-3).

Due to the teachers’ feeling that they might lack information and knowledge of EE, they suggested that EE be included in in-service training in order to improve the implementation of EE. Participant 8 thinks that this should be the responsibility of the two ministries namely the Ministry of Environment and Tourism, and the Ministry of Education. She thinks that these two ministries should come up with a strategy on how to organize teachers’ professional development in EE.

“... The ministry of education and ministry of environment and tourism they have to sit and then see how they can train teachers so that they can incorporate EE in schools” (T/I-5).

Participant 6 wants continuous professional development to be conducted in EE. The development proposed should be specific to EE and teachers should learn about environment-related issues and environment-related methodology.

“I would like to see continuous workshops, not general workshops in biology but specific workshops which only deal with EE in terms of what are the current environmental problems that are facing and what are some of things which we can do and how can we teach learners in terms of these procedures (sic) which we are faced with” (T/SI-9).

Participant 5 also thinks that a workshop is crucial to the successful implementation of EE. She is one of those who has never attended workshops in Biology.

“Workshops, my dear... it does not make sense really. A year will pass and a biology teacher did not go for a workshop (sic) and what I don't understand, I don't know may be it is just in urban schools that they don't do it because when I was in school you will hear (sic) the teacher is not there for a week; they are in the workshop (sic). Really, one needs to be trained in these things” (T/KA-4_ T/KA-5).

The workshop conducted in EE should not only be attended by teachers but by the whole school community. Participant 3 is of the opinion that including the whole school including the management, will increase understanding and cooperation among all the stakeholders. He also feels a need for the region to invite experts in EE when organizing these workshops.

“I need an expert to come and explain to the whole school community including the management so that there will be no one to oppose (sic). Also the region needs to organize workshops on environment. In those workshops experts in the field should be invited” (T/NAT-7).

The teachers in this case study, were trained at UNAM, which did not include EE in the pre-service training of teachers, unlike colleges of education, which did. Teachers thought that the inclusion of EE in the teachers' training programme at UNAM would help improve the teachers' knowledge of EE and enable them to teach it in the right way. Two teachers had this to say:

“One of the areas I would like to see is among others the introduction of EE in teachers' training programme. In a way, teachers already from institutions especially biology teachers, if they can in their curriculum like (teacher training curriculum) have a section that address or teach environmental (sic), that is the first proposal” (T/SI-8_T/SI_9).

“The environmental study as a subject should be implemented at the university level. When you are trained to be a teacher, you should also have environmental studies as a subject; that will help with the implementation of environmental education” (T/E-6).

Teachers are worried about the level of their knowledge in EE. They normally ignore teaching the topics which they think they don't understand. Their request for professional development seems to go unheard because professional development in EE has seldom been provided. This has prompted many teachers to suggest that professional development sessions be conducted, and EE be introduced in pre-service education to enable teachers to conduct EE lessons with confidence.

Advisory teachers

Advisory teachers acknowledged that teachers' knowledge of EE content and methodology is not good. Even though they mentioned lack of knowledge as a barrier, one of the two advisors thinks that only a little extra training is required in the teaching methodology because teachers are already aware of EE. One of the teachers said:

“We also need a bit of training, a bit not that much because we know, we are aware. They can be trained a bit on methodology... we do not say we know; we need to be guided... a workshop can be organized... (TNAM-3).

The main barrier, according to participant 9, is lack of knowledge. He thinks that knowledge could be catered for if EE was introduced as a separate subject. He feels that the way it is integrated, shows that EE is not considered important:

“To my knowledge, the main barrier is the information about the environmental education since it is not taught as a separate subject (sic); it is not thought as very important ... I think the main barrier is just content knowledge about environmental education” (T/F-3).

Even though he admitted that lack of knowledge can no longer be an excuse because of the availability of information on the internet, he also acknowledged that not everyone had access to it:

“What I can do now is that I can go into the internet... there is so much information on the internet, really. There is not excuse not to have knowledge about environment but not everybody has internet connections” (T/F-3).

According to their own job description, one of the main responsibilities of subject advisors is to provide professional development to teachers through workshops on both methodology and knowledge content. The researcher inquired whether they had ever tried to invite an expert in the field of EE to address the teachers' lack of knowledge. Both of them responded that they had never invited an expert in the field. Participant 9 gave the reason why he had not:

“Unfortunately, I have not because of the fact that I am mostly involved in mathematics” (T/F-3).

The other advisory teacher who also thought that only a little bit of knowledge was needed, and who understands EE as Ecology, also admitted that he had not invited an expert because teachers had never mentioned the need for development in the field. According to him teachers do not have any problem in teaching Ecology.

“... If our teachers did not indicate a need that they need to be helped under those topics are covered in ecology... conservation . Teachers in most cases they don't experience a problem in this topics (sic). Therefore, we don't even invite experts to help us in this topic. I can integrate it in but... there must be evidence ... indicate that teachers are having a poor understanding in this topic (sic), but teachers did not raise it... I need to have evidence so that I integrate it” (T/NAM-4_5).

He also complained that their budget can only support a limited number of workshops. It is as if advisory teachers are monitored to make sure that they conduct only a few workshops and then only if the need is expressed by teachers. They have to write a report before organising the workshop showing that there is a need.

“If it is coming to inviting an expert, also we are all aware of budget, same apply to the region, we are having a portion which is allocated to a certain advisory teacher. Yeah, among that portion I have to see the number of workshop which I have to organize but the number of workshop which I have organize I have to do the analysis, I have to have something in black and white written by teachers that we need assistance in the following if I want I can Integrate it in no matter they could not raise it up”

To summarise, teachers do not receive professional support in EE and in some cases they also do not receive help with development in Biology. Advisory teachers also acknowledge that teachers might have problems in EE. One of the two advisors who refers to Ecology in the Biology curriculum as the teaching of EE, thinks that teachers do not have a problem with EE because they did not mention this during workshops. Advisors do not assist where a need is not expressed. Another advisor thinks lack of knowledge is the main problem in EE. However neither of the two advisors invited an expert in the field of EE to assist teachers to improve their EE knowledge and practice because they are involved in other responsibilities and because no need was expressed. They also complain that their budget is limited and they have to reduce the number of workshops.

The findings above are the same as findings in Nigeria and Malaysia where teachers were not prepared to implement EE (Mansaray et al 1998; Said et al 2003:307). Teachers in these countries were not trained in EE, which impacted on their knowledge of EE and their attitude and they did not implement EE. However the positive attitude in Namibia could be utilized by providing professional development which encourages positive attitudes and increases teachers' knowledge of EE.

Implementation of EE in Namibia did not include providing teachers with professional support for EE. Professional support was supposed to be provided at the beginning

of the implementation because new skills, knowledge and doing things in a new way were involved. This is advised by (Pratt 1994). The only support offered was the support given teachers in 25 pilot schools where teachers were trained to teach EE in 1996. However the schools which participated in this study were not one of the 25 pilot schools. 1996 is also exactly 14 years before this research was conducted. Some of the teachers in the pilot schools may have died, others may have left the profession, and new teachers have joined the profession. Thus, it is important to train teachers at regular intervals.

It further seems as if this situation will not improve in the immediate future because the advisors also complain about a lack of didactic knowledge in environmental education. In addition advisory teachers do not tackle problems which teachers do not mention. However some of the innovations are new and teachers might not know about them. Therefore, they cannot express a need for something they do not know about. Advisory teachers are therefore not clear about what they are supposed to with regard to EE. Teachers need to be introduced to innovations and only then can they start raising questions. Fullan (1994) is in agreement with the above as he states that trainers and consultants are relatively ineffective and not clear about their responsibilities.

Another thing making it difficult to offer professional development is the limited budget for workshops. Advisors select what they think is more important and more needed by teachers. Cost barriers limit the number of EE professional development workshops in Greece (Papadimitriou 1998), in South Africa (Reddy 2000) and in Poland, Mexico and Hungary (Hendriks, Layten, Scheerens, Steen 2010). In most cases less professional development is done and little is covered, compared to what is planned. The recommendation for providing professional development which is sustained over time by (Robottom 2000) is not followed.

The fact that Biology professional development sessions do not include EE, and that experts in environmental education were not invited to assist teachers, the lack of funds to administer long and many workshops EE workshops and teachers low level of knowledge has an impact on teachers' teaching of Ecology.

4.8.4 Unavailability of EE coordinator

Different departments have heads of departments, and subject heads coordinate the activities taking place in their departments. The need for a head of EE at school to advise teachers on environmental teaching, has been expressed. This links with teachers' claim that lack of knowledge is a hindrance to the implementation of EE:

“If we had like a certain head of centre just to advise you here and there, that is then within the school (sic) then it was also going to be better” (T/SH-3).

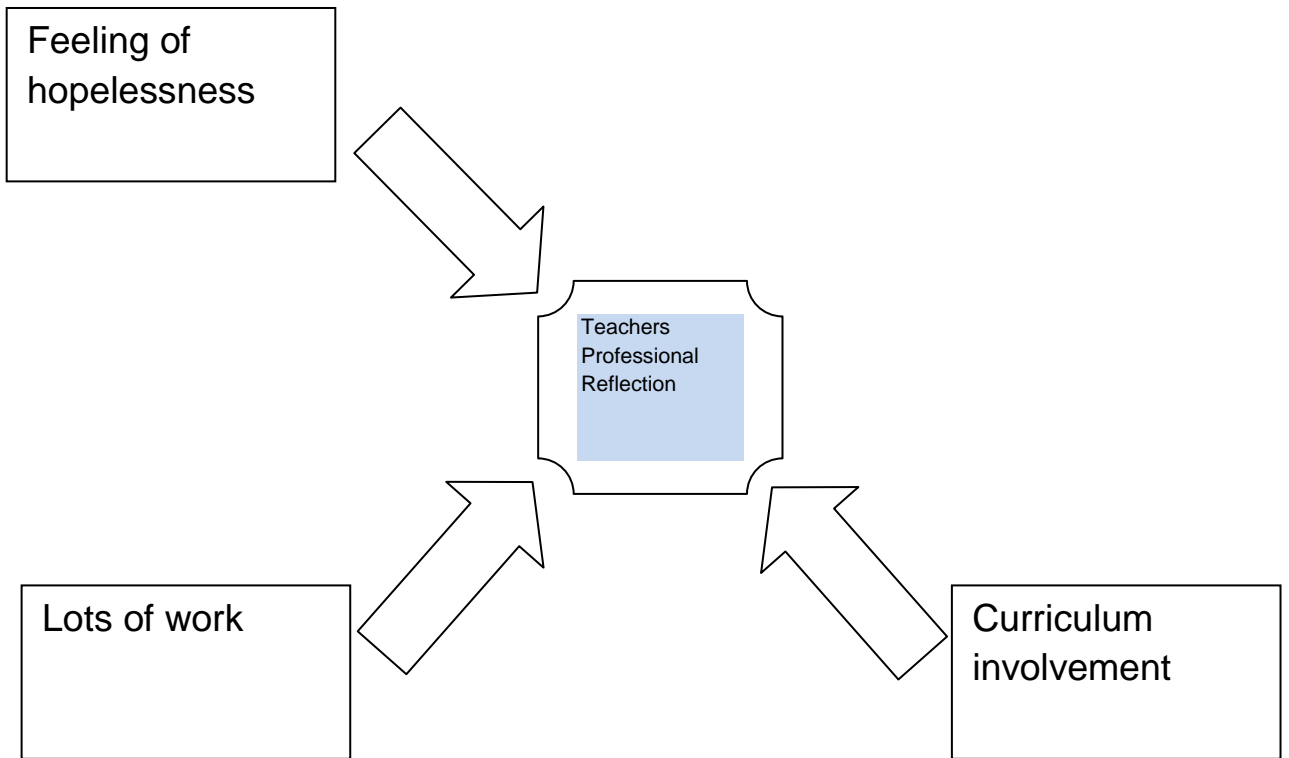
The fact that EE is a cross curriculum theme and needs to be introduced in all the subjects may be the reason why environmental education is not allocated a co-ordinator. Subjects are in different departments and every department has its own head of department. The logic may be that, EE is being coordinated by the heads of departments. That however has not been happening, causing EE to be marginalized. The curriculum makes it possible for extra- arrangements to be made for those themes that may not have a full place in the timetable. One of those is environmental learning. This means that schools should appoint a co-ordinator for EE, but this is only possible if the school staff and management understand EE.

Teachers expressed the need for a co-ordinator who organizes EE activities in the school. The absence of a co-ordinator affects the implementation of EE because there is no one to monitor EE activities and ensure that teachers' needs are addressed. Appointing a co-ordinator is an important step in the implementation of EE. The co-ordinator should be well informed about EE and its teaching methods and be interested in EE (Kanyimba 2002:75-76). According to Kanyimba, the co-ordinator should assist teachers with all aspects of environmental education.

4.9 Reflections of teachers.

In this section the aim is to describe how teachers see the nature of their work. The following themes have emerged as teachers reflect on their work.

Figure 18: Showing aspects of teachers' professional reflection



4.9.1 Feeling of hopelessness

Hopelessness refers to the situation when teachers feel that they are not effective in what they do. . Teachers incorporate EE in different ways but many feel that they might not be effective in teaching it. Participant 5 states that she worked hard to incorporate EE but her work is limited by her lack of knowledge. This affected her teaching in a negative way. There are things which she thinks she cannot do even if she tries and she is left with no option but to leave them undone.

“You try your best but anyway, if you can’t solve something the rest they will fail), so there is nothing you can do. So it have (sic) affected me negatively but at times you know there are battles you can fight and there are battles which you know even if

you fight... you can't go anywhere, you can't make miracles of the things that you do not know" (T/KA-3).

Participant 8 also sees herself as trying hard to incorporate EE but she struggles to understand some concepts because she has never received training in EE. Hence she is not sure whether she is implementing EE in the right way. However she did not mention about leaving EE untaught, like participant 5.

"Some of the concepts I am just struggling (sic), I really do not know what I am saying but I am trying my best because I have never gone through any training. I am just trying my level best, I don't know if I am following the right direction" (T/I-5).

Another of the teachers finds herself with little knowledge and knows that she can't be effective in teaching EE.. She also seems willing to continue with the struggle since she has not said anything about quitting.

"Having limited knowledge, of course, shows that you won't be effective..." (T/SH-6).

Participant 7 developed a mechanism for leaving out things which she does not know how to implement and only concentrating on what she knows.

"When I think I am not doing something right, sometimes I just leave, and you see that is negative" (T/P-6).

Another mechanism is to stick to the teaching of theory because teachers don't know other ways of teaching EE. The following quotation refers to the teaching of ecosystems as they appear in the syllabus.

"Somehow it has affected my teaching... due to the fact... we are just teaching theory" (T/E-5).

When reflecting on their work, teachers say they try hard to incorporate EE. Usually however, they feel incompetent, mainly due to a lack of knowledge. It is then that "individuals negotiate and re-negotiate in their mind ...and they continually set and reset the goal themselves in the process" (Troman & Woods 2000:253). After this "negotiation" they make decisions. Some decide to give up on the implementation, some become selective regarding what to implement depending on what they can do and what they can't, others continue with the struggle even if they are not sure

whether they are going about things in the right way, while the last group approach EE in the scientific way.

Even when teachers do not ignore EE completely one can tell from their responses that they are disappointed and they are not effective. This is not a good sign. .

4.9.2 Teachers' involvement in curriculum development

Involvement of teachers means to accept them as partners in the whole process of curriculum development. Teachers in this study state that they want to take part in the whole process of curriculum implementation. They should be important stakeholders in curriculum development, but the NIED seems to develop curriculums in isolation.

Participant 7 mentioned an official from NIED who was involved in the process:

"I know only Mr Ben Araseb. He is a senior education officer at NIED in Okahandja... about other teachers I am not really sure. That info you can get from Mr Araseb" (T/P-6).

Participant 5 feels that curriculum development is not teacher's work. Without knowing who really develops the curriculum, she assumes that it might be the subject advisors:

"I think is (sic) subject advisor ... that have been taking part... its mainly the work of subject advisors that are never at schools" (T/KA-3).

Participant 4 knows that a curriculum can be developed in isolation but feels that stakeholders need to be involved. Due to the fact that she has never been involved, she assumes that teachers from towns like Windhoek might be involved:

"Curriculum is developed by... stakeholders... taken from different communities... I don't know from which side they were taken, maybe from Windhoek or where I don't know" (T/KO-4).

The teachers described how they were introduced to the curriculum. Participant 2 stated that the curriculum document was a surprise, they did not know that a curriculum was being implemented. The documents were sent to schools and teachers were told to start implementing them. .

“Just to your surprise, here is the curriculum (sic). You have to teach that subject but how the curriculum was developed... we were not consulted. These documents were just sent to schools and teachers have to start using it. We did not even hear that people are busy developing the curriculum” (T/E-5).

Another teacher also observed that documents are sent to schools and one gets to know the curriculum by reading through it. She thinks that the curriculum would be more meaningful to teachers if they were involved.

“There is this thing of sending whatever is developed to schools. Of course, you get to know just by going through... but... you are not part of these developers (sic). Otherwise, it was going to make sense to you” (T/SH-6).

Curriculum development comprises four phases which are planning, dissemination, implementation and evaluation. The findings revealed that many teachers were not involved or consulted in matters of curriculum development. Participant 3 was partly involved. He was approached by officials from NIED to mention the topics to be covered but he did not know that it was for the purpose of curriculum development.

“It is hard to say. I think the people from NIED if I recall very well... were here... they were asking me... which topic do you think should be covered more... and gave him a few topics... but they did not tell me they were asking in order to develop a curriculum. It’s only now when you are asking (sic) that I think it was because of that (T/NAT-6).

He thinks that teachers’ involvement is a step in the right direction because teachers know more about the current situation in the classrooms than the curriculum development experts do. .

“I am of the opinion that it is good to be involved because... curriculum developers are having... knowledge from the background, but as time changes... for example you were teaching biology in 1995... the demand... that time is not the demand for now. Nowadays, once you are saying you come up with something (sic) you need to consult people at the root of it. You just don’t do things basing (sic) on the paper...” (T/NAT-6).

Participant 5 stressed the need for teachers to be involved in curriculum planning because they work at grassroots level. They know what works and what cannot work in practice, thus they need to be involved and to contribute:

“Of course, you need to be part of the planning. You know the relevance of the topic... because... I am mostly at the classroom level and... I see what is more needed and what is more working (sic)... you give your input... see where you need to make changes... where you need to do more... what you need to reduce...” (T/KA-4).

Participant 8 also thinks that teachers know more about the reality of the classrooms because some developers have never been teachers. These developers might suggest that certain equipment be used for practical work but these things might not be available in the schools.

“There is several things (sic) which developers do not know. Of course, some of these developers were not exposed to real life classroom situation because there is some instances (sic) where they just say: ‘you must view this under the microscope, you must do this using whatever technological instrument’ but they are not taking into consideration that... here in the north, we only may... have one microscope per school or none. How do you expect that to be effective? My contribution could be... to inform them to visit schools to find out what is really going on in that classroom everyday...” (T/SH-7_T/SH-8).

The development of curriculums in Namibia has followed a positivist approach which excludes the input of teachers, as shown by the fact that all eight of the teachers interviewed in this study were not involved in curriculum development. Teachers from the North assumed that their counterparts in the urban areas especially in WHK were involved in curriculum development, while those in WHK claimed that it was not their job but that of the subject advisors and NIED. Only one of the teachers was somehow involved, as he mentioned that an NIED staff contacted him to ask for his suggestion on what could be included in the Geography curriculum. He only recalled that the episode could have been related to curriculum development when the issue came up during the research interview. How can teachers talk maximum sense when they are approached in an unclear way and they have no idea how serious the

business is? Is this the way in which all the teachers who were involved, were approached? How many teachers are tricked in this way?

The perception of teachers today is differs from perceptions in the past. In the past teachers lived with the perception that their place is in the classroom only. (Carl 2002:249). The curriculums were also developed far away from where they were supposed to be used. Some teachers in this study still do not know if teachers are entitled to be involved in the curriculum development. They think that it is the job of curriculum development officers.

Studies show that teachers wish to be involved in the whole process of curriculum development, if they are to adopt it as their own. Teachers also feel the need to be involved. The result of this study supports the result of the study by (Carl 2005 South African teachers expressed the need to be involved in curriculum development because it would enable them to understand their work better and take ownership of the change. This implies that when teachers are not part of the curriculum, they find it difficult to understand and do not take the curriculum as their own. It is also possible that the curriculum will be rejected if teachers are not involved (Carl 2005). In the Namibian situation, teachers are not regarded as partners in innovation, the possibility is therefore high that they may reject the EE curriculum.

Teachers are considered the most important people in the implementation (Carl 2005). Hence they are also supposed to be the most important guests in the curriculum implementation. Teachers in Namibia also feel that they are the only stakeholders who know the real classroom situation and what learners can or cannot do. At the moment developments take place based on assumptions. Can such curriculums succeed if they fail to address or reflect the reality of the classroom?

The situation in Namibia is particularly bad because teachers were not even informed that new curriculums were being planned. They only see documents left at their doorsteps instructing them to start doing things in a new way. This is said to have increased their workload as it left them with no other option but to implement the instructions. It is therefore not surprising to find Namibian teachers filing the curriculum document unread and concentrating on other tasks. The teachers may feel that they are not important, not considered as professional and not capable of things other than the classroom teaching. Carl (2002:251) believes that teachers

should be involved in the planning of curriculums as will show respect for teachers as professionals because professionalism is linked closely with involvement. (Carl 2002:251). Namibian teachers need to be empowered to enable them to develop a curriculum which they consider to be ideal.

Teachers' responses show that they were generally not involved in the curriculum development despite their willingness. As a result, they call for a significant teacher representation in curriculum development in order to improve ease of implementation. Participant 5 is one of those who suggested this:

“Before even it is implemented one really need to sit with teachers (sic). Of course, you will not be able to sit with all the teachers in the whole Namibia to involve everybody but we need to get more samples of teachers to represent us. Because I believe... even if you are in different schools we encounter more or less the same challenges... teachers need to be involved in the curriculum in the first place so that we see where it really needs to be worked” (T/KA-4).

4.9 Teachers' Workload

Teachers' workloads are too high to allow them time to get fully involved in EE. The work is listed as marking, teaching, hostel work, meetings, etc. Teachers make decisions to implement only what they think is important.

“The other problem is the work that is I do, you talk of marking, teaching, hostel work and other. That one again is a problem, you see I don't know really what I can say, may be is time management or what. Also marking and others and other activities we are involved, they also prevent to be real involved in environmental issues. Just imagine that I want to have a lesson in the field and I have 400 books to be marked or I have certain work to be done for example a meeting or may be a meeting with learners also misbehaving also that will keep you from going there. And there you will make it like that one is not really important like this one. They are also put pressure on us those marking and others” (T/SH-3).

Even though teachers know that EE is important they can allocate only limited time to EE, less than what is ideal. This means that EE implementation can only succeed if it is perceived more important than other things in the schools. The situation calls

for teachers to understand environmental education to be able to understand its importance so that EE can compete with other things in the curriculum and ensure itself a place in the curriculum.

It seems that teachers can't implement every innovation because the high workload increases health risks, thus they only select some of the changes for implementation. (Troman & Woods 2000) mention stress-related diseases as some of the health risks caused by too much work. Therefore school principals need to distribute the workload in a way that gives every teacher a chance to teach EE. If only a few teachers are involved, they may work under pressure, get frustrated and give up on EE (Troman & Woods 2000). This means that teachers also might only decide to teach EE if does not increase their workload. According to (Lee 2000) this happened in Hong Kong.

4.10 Conclusion of chapter.

EE is incorporated in the basic education curriculum and in the Biology curriculum. The aims of the curriculum and those of EE are related. However teachers do not understand how EE is incorporated in the curriculum. In addition, there are many obstacles to the practice and implementation of EE, such as lack of knowledge of EE which causes EE to be taught in a cognitive way, lack of resources, lack of collaboration among the academic staff, lack of workshops, and unavailability of a co-coordinator for EE in schools. Due to these, teachers teach Ecology by lecturing. Some of the teachers realise that EE can be taught using learner-centred approaches such field trips; relating learning to real life situations; and teaching EE across the entire Biology curriculum. Teachers have a lot of work and they tend to choose what they consider to be most important. Teachers are not part of the curriculum development and they also doubt whether they implement EE in right way.

Chapter 5

Conclusion and further discussion

5.1 Introduction

In the previous chapter the focus was on the analysis, discussion and interpretation of the data collected from the schools in the study area. Data used in this study was compared with the data used in similar studies in other countries. In this chapter there is an attempt to draw conclusions from the findings of the research and further discuss the results. Before the final concluding comments of the chapter analytical conclusions are drawn using activity theory as a conceptual framework.

5.2 Support for the implementation of EE

5.2.1 Efforts by the government to incorporate EE

The Namibian government (Ministry of Education and the Ministry of Environment and Tourism) explored how EE can be implemented. The study led to the development of EE policy in Namibia, the Green Plan, Life Science projects and the inclusion of EE aims, objectives, approaches and teaching methods in the policy documents. In addition there is a chapter on Ecology in the Biology syllabus and questions on Ecology are included in examinations. Given all these developments, it can be concluded that the Namibian government made an effort to make sure that EE is part of the curriculum of all grades including secondary school grades, which are the focus of this study. (Ross 2007:659) mentions that setting clear goals for EE in the curriculum is the first step toward the successful implementation of EE. The incorporation of EE is done in different ways such as environmental education as a local problem-solving curriculum action, environmental education as a component within the subject, infusing environmental education across the curriculum, and incorporation through a single subject. This shows that rules and regulations are set for the EE activities in schools in Namibia. Teachers can follow these to implement EE. Setting clear rules is important if teachers are to know what is expected from them Johassen and Rohrer-Murphy (1999:70).

The government also introduced environmental education in teachers' education. All four of the teachers' education colleges introduced EE. The colleges produce teachers who teach grade 1 to 10. Teachers' educators were trained to prepare teachers to teach EE and provided with materials to assist them prepare teachers

successfully. The introduction of EE in pre-service teachers' education can be regarded as a positive step taken by the government, even if secondary education teachers who are trained at UNAM, were excluded. .

5.2.2 Biology is a good vehicle for EE

Generally, it is acknowledged that EE was first implemented in Biology where it was introduced as Ecology as a response to environmental problems (see 2.7.5) The Biology syllabus in Namibia also contains a chapter on Ecology. The Department of Science at the University of Namibia has a module of Ecology which teachers are exposed to during their teachers' education. The analysis shows that Ecology is learned in "education about the environment" but is largely Biophysical cognitive information. The UNAM Ecology is probably taught by transferring information because it is taught in the Science Department. However if teachers know more about EE, they can use the information provided in Ecology to teach EE in the proper way. Slingsby and Barker (2003) confirm that Ecology is advantageous to EE and that it is the source of EE knowledge worldwide because most of the literature used in teaching EE is adopted from Ecology and the findings of Biology and Science studies. Xingcun (2004) claims that there is no doubt that teaching Ecology as part of Biology is an excellent way to teach EE and many teachers in Namibia think of it as the only way. . It is at least a good start even if it takes a limited view of the environment as being biophysical only and merely the transferring of knowledge.

Biology is also important to EE because Science and Biology accord EE a place in the curriculum (Gough 1999:8) (see 2.7.5). Gough (1999:8) mentions that EE does not have a concrete place in the curriculum. Such themes can follow a co-curriculum route. (ME 2010) (see 4.2). Subjects which have a special relationship to the environment like Biology, have EE components in their specific curriculums . The commensalistic relation outlined above between Biology and EE makes Biology a good vehicle for EE.

Teaching Ecology in Biology is a responsibility understood by teachers; they teach Ecology as part of their curriculum and it is examined. Such Biology teachers worldwide have this responsibility ' responsibility. Evans (1988:136) sums it up in his statement, "We as teachers of Biology are responsible for ensuring that the population at large understands the ecological processes on which all life depends .

It is a responsibility that we must accept...". Ecology therefore provides a space for EE, thus making Biology a good vehicle for EE, but this teaching could be more effective if teachers knew how to implement EE effectively. However, many teachers in Namibia are not trained to do this.

The entire Biology curriculum is related to the environment. That makes it easy to introduce EE at different places in the Biology curriculum. Teachers are aware of this relationship but their lack of EE knowledge and EE pedagogical knowledge makes it difficult for them to implement EE across the Biology curriculum. (Evans 1988:136) concludes that even if Biology teachers are aware of their responsibility, they need first to have knowledge of EE and to know of effective methods for teaching EE.

5.2.3 Teachers' attitude toward the implementation

Biology teachers and advisory teachers have a positive attitude toward EE. They all find it important and they provided reasons for the importance of EE. They find the teaching of EE important because the environment is the source of food for people. Therefore when the environment is preserved, it means preserving the source of food. They also consider that preserving the environment for the future generation is important. Teachers and advisory teachers are also aware that destroying the environment causes catastrophic events and human diseases. Thus EE is a way to make learners aware of the importance of the environment and of the environmental problems which the world might face if the environment is not cared for.

Teachers' attitude on its own cannot guarantee successful EE implementation if it is not accompanied by support, but it is a good starting point, because it shows that teachers are willing and that the innovation is important to them. (Fullan 1994:69) cautions that innovations which are implemented are those which meet the needs of the teachers. Thus the probability is high that EE will be implemented in Namibia and that it may succeed because it meets the needs of teachers who are the implementers of the curriculum.

According to some authors, teachers of different ages and genders respond differently to EE (Osborn *et al* 1992:139, Troman and Woods 2000:253, and Hargreaves 2005). In the case of EE in Namibia, these variables are not contributing

factors to teachers' response towards EE. Biology teachers in Namibia have responded to EE by accepting the change because they consider EE to be important to children. Teachers may therefore have their differences, which in turn causes differences in the responses to change, but they can put their differences aside when they are faced with issues concerning important themes, and respond in the same way.

5.2.4 Advisory teachers and the knowledge of their responsibilities

Advisory teachers in Namibia know their duties and responsibilities. They have many responsibilities to perform which include assisting teachers with content knowledge, lesson planning, lesson preparation, methodology, and setting exams in Biology. They perform their duties by conducting workshops in the regions, each of which has its own subject advisor for each subject. Regional workshops are said to be continuous and cater for problems which teachers encounter in their schools, while the new curriculum is introduced during national workshops and what is learned in the workshops is monitored by subject advisors in schools.

The responsibilities which advisory teachers mentioned are those mentioned in their job description (ME 013:1). This is a good sign for the implementation because it is presumed that those who know their responsibilities will do their jobs better than those who do not. However the responsibilities outlined are general duties of advisers not specific to EE. It can be concluded that advisory teachers know their responsibilities with regard to Biology but they have shown no evidence of knowing their responsibilities with regard to EE because EE is not discussed in the workshops. In addition their limited EE knowledge and lack of knowledge of how EE is incorporated in the curriculum, is evidence of lack of knowledge of their duties with regard to EE. This lack of knowledge can be attributed to lack of training in EE.

5.2.5 Teachers' knowledge of learner-centered methods

Although teachers admit that most of EE (Ecology lessons) are taught by lecturing, it cannot be ignored that teachers have knowledge of learner-centred methods. Teachers claim that they teach EE through excursions, relating teaching to real life situations, and teach EE wherever it is applicable. These are all learner-centred methods. These teaching methods are also advised by the curriculum documents, and the policy document to be used in teaching the entire curriculum in Namibia (see

2.9). This is a bonus to the implementation of EE, as it is easier to help a teacher who already has some knowledge of learner-centred methods. However, I did not observe these methods being followed when I attended Biology lessons.

5.3 Problems faced during the implementation of EE

5.3.1 Teachers and advisory teachers' lack of curriculum understanding

Both teachers and advisory teachers do not understand all the ways in which EE should be implemented in the curriculum. The lack of understanding is due to not reading the curriculum documents. Teachers who show some understanding are those who understand EE incorporated as Ecology.

The researcher came across some teachers who don't read curriculum documents and as a result don't understand what the documents say about curriculum implementation. It is said that others hide the documents, but this is not always the case because teachers involved in this research had their documents with them during the interviews. It was also found that not all the teachers and advisory teachers understand the curriculum because they do not read it, but others may not understand because they perceive EE language as difficult (see 2.8 and 4.5.3). EE language may not be difficult as such but the reader needs to be familiar with it. Being familiar with EE language is therefore important because it determines how the curriculum is understood.

5.3.2 Tension between policy and practice

There seems to be tension between policy and practice in the implementation of EE. The Biology curriculum provides a chance for EE to be studied as a whole but the practice is dominated by the study of humans rather than other organisms. The knowledge in the Biology syllabus is, in addition, limited to "causal causality" and question papers follow the same style. Environmental study is broken into modules in which the contents are divided into sections. EE is also taught as part of separate school subjects. All this leads to EE being perceived as separate from society and limited to outcomes/objectives (see section 4.2). Policies may be well formulated, but aims won't be achieved because the practice may be different from the envisaged plan. In the Namibian case, there is a difference between what is envisaged in the policy, and what happens in the schools.

5.3.3 Teachers and advisory teachers' lack of EE knowledge

It was found in this study that Biology teachers and their mentors (subject advisors) demonstrate little understanding of EE. Many teachers understand environmental education as the transmitting of knowledge about Ecology. Most teachers mentioned some aspects of ecology as they read from their syllabuses. Ecology and conservation Biology were also science subjects which teachers learn at UNAM as science student teachers. One of the advisory teachers is also a UNAM student and understands EE in same way. Other teachers in this study disconnect humans from the environment and they understand environmental education as teaching about the human environment, and the ensuring of human health by reducing pollution. A few teachers also think that EE is meant to create awareness of how to care for the environment for the benefit the next human generation; or simply to create awareness about EE issues; or as teaching kids to conserve the environment; or think of EE as issues of global warming.

Understanding Ecology as EE is not a problem, what is important is how the teaching of Ecology is understood. The reason why teachers and advisors' understanding causes problems is that teaching EE is seen as merely transferring information. This perception leaves out the forming of values and skills. It is advised that the best way of teaching EE should comprise the three components knowledge; skills and attitude/values/action (see section 2.3 and 4.5.2). Ecology can be taught well if the methods meet with these criteria rather than merely comprise transferring information, and teaching the Biophysical aspects as they appear in the textbooks.

This calls for the professional development of teachers, but this will only partly solve the problem the problem as the teachers' advisors also understand EE in the same way or have an even more limited knowledge than the teachers do. It is therefore difficult for advisors to be effective in advising teachers in EE if they show a greater need for development. It is like the case of a blind man leading another blind man. O'Sullivan also points out that:

Educational policy implementation in developing countries has not received sufficient analytical attention, many aspect of the processes involved are not yet well understood. Policy makers have very little information about the

actual processes of change, the potential problems and issues that can emerge, and methods of addressing them, which can support their work (O'Sullivan 2002:221).

Knowledge is important in the implementation of EE because teachers' possession of that knowledge will not only help to ensure that learners are taught, but also ensure that the broader perspectives and the correct information are passed on to learners. It is therefore important that when policies are developed in Namibia, the policy-makers should be aware of and understand processes of change. Broader understanding and knowledge should then be passed on to advisory teachers who work directly with teachers and are in the position to identify teachers' problems and assist in appropriate ways.

5.3.4 Lack of professional support

Teachers do not receive professional support in EE and in some cases they also do not receive help with the teaching of Biology. Advisory teachers however think teachers experience no problems in teaching EE because they do not voice their concerns. Thus, no assistance is given in EE and no experts are invited to assist teachers in EE. In addition, workshops can't cover all the aspect of the needs of teachers because of the tight budget which results in shorter and fewer workshops.

It needs someone who knows what good practice of EE is, in order to identify the need for help. It was found that advisory teachers do not know what good EE practice is, they may assume that what is done by teachers is correct because they are not exposed to something different. Thus they don't know that they and the teachers need help and the intervention of an expert. Thus policy developers need to involve advisory teachers and train them to assist teachers.

5.3.5 Logistics and curriculum implementation

According to Ham *et al* (1988:25), logistics can be described in terms of barriers like those barriers which are a result of a lack of instructional resources, funding and suitable classrooms. Resources are important if teaching is to be effective. It is not rare to hear complaints about lack of resources. In Namibia teaching EE is not accompanied by any kind of funding specifically for EE. The lack of funds has resulted in a serious lack of resources for PD, lack of instructional materials, lack of

funds for transportation, and few buses to transport learners being taken on excursions. Thus, EE activities, especially out-of-school activities, rarely take place. Other problems include poorly resourced schools, lack of textbooks, broken windows, lack of chairs and windows, potholed classroom floors, large classes, and lack of time.

Some of these have very deep roots in the apartheid era during which some schools were better provided for than others. Thus, in Omusati region which was seriously marginalized, schools are poorly resourced compared to those in Windhoek (Khomas). Unavailability of resources in Namibia has made the implementation of EE difficult. While the government is concentrating much on ensuring the presence of EE in the curriculum, little will be achieved if resources are not available for teachers' development and for the implementation of EE.

EE seems to have a status like that of politically motivated innovations. Oslon (2002:131) says that one can identify innovation which is not a priority of the government by looking at whether the innovation is accompanied by funding or not. If the implementation is not funded, it is not a priority of the government, but initiated for political purposes. The implementation of EE in Namibia seems not to be a priority of the government because curriculum development is done but the implementation is not funded. Curriculums which are not funded don't succeed (see 2.8 and 4.8). Thus the implementation of EE in Namibia may not succeed because it is not funded. Teachers do not have teaching material, funds for transportation during excursions, and few workshops are conducted.

5.3.6 Teachers' involvement in curriculum development

Teachers in Namibia expressed the need to be involved in curriculum development because they find it advantageous to their work. Teachers explained that the process would enable them to understand their task better, air their grievances, and contribute to the discussion based on the reality in their classrooms. However, the development of curriculums in Namibia has followed a positivist approach which excludes the input of teachers, as shown by the fact that none of the eight teachers interviewed during this study were involved in curriculum development. One of them was approached but he was not informed that it was for curriculum development purposes. Many teachers might have been involved in the curriculum development

in the same way and they might not have understood the reason for curriculum developers' contacting them.

In addition, development takes place without the knowledge of teachers. Teachers are usually not informed about the government's intentions to develop a new curriculum. Documents are sent to teachers who are expected to start implementing the new curriculum without their having known that a new curriculum was under way. In other countries teachers hide the curriculum documents without reading them (see 2.8. 4.9.2). It seems to be high time for teachers to be involved in curriculum developments if policy documents are to be successfully implemented. Teachers nowadays express the need to be involved because they know how important it is. It may be argued that teachers in Namibia do not understand the curriculum and EE concepts because they were not involved in all phases of curriculum development. Participation will improve understanding.

In addition to the exclusion of teachers from the curriculum development process, the ministry of education seems to monopolize the process of curriculum development and treat teachers like "technicians" who implement a curriculum which is developed for them without being allowed to make suggestions. The impression could be that teachers are considered brainless, and all they can do is just to recite the curriculum documents prepared for them and deliver the information to learners. Carl (2005:228; 2009:198) advocates teachers' involvement when he says that: "Teachers participation brings about positive results, which may lead to dynamic curriculum development". However, positive results may not be expected in the implementation of EE curriculum in Namibia, if teachers remain excluded from the curriculum development process which takes place outside their schools, but which has an impact on the classroom practice.

Oloruntegbe *et al* (2010:708) assert that teachers are supposed to be considered important in curriculum implementation, but in most cases, they are not oriented about the development or are seldom informed. They might show resistance towards the curriculum or respond to it slowly if they are not involved. That could explain why most of the Biology teachers do not understand how EE is incorporated in the curriculum, and regard EE merely as ecosystems. Others confess that they did not read the entire curriculum to pinpoint what it says about EE. Keeping teachers in the

dark about the development of the curriculum therefore has proven to be a stumbling block for the implementation of EE in the sense that teachers often ignore the documents and in the process, they also overlook the new portions added to the curriculum, such as the inclusion of EE.

5.3.7 The wide gap between EE and the science subject, Biology.

EE can only be learned successfully if teachers are able to bridge the gap between EE approaches and science approaches. These two approaches differ. Biology teachers in Namibia tend to abide by the rules of science and EE is taught following the objectives in the syllabus and the content in the text books. Observation shows that teachers do not know how to bridge the gap because they were observed teaching many lessons, some of which are closely related to environmental education, while not incorporating EE. Some of them think that teaching Ecology means that they are incorporating EE. Teachers also confirmed during the interviews that, in most cases, they teach EE through lecture methods. If fieldtrips are taken in Science, they centre on identifying environmental problems and appreciating the beauty of nature without involving learners in problem-solving and debates.

The proposed method for teaching EE is different from the way EE is currently taught because values and attitudes cannot be achieved when EE is taught outside the affective domain. The inclusion of EE in the science curriculum means that EE is often treated as a science. (Evans 1988:136; Gough 1999:3; Van Rooyen 2011:109). Seen that way, Biology could be regarded as a bad carrier or vehicle for teaching EE because the values needed for EE are not realized. What the above authors say is also true about the teaching of EE in Namibia and observation has shown that the philosophy used in teaching Biology is a positivist one as teachers follow what is prepared by experts and contained in textbooks. If EE is taught as part of the science curriculum, it is taught to achieve the outcomes of science rather than those of EE.

There is therefore, a wide gap between EE teaching and science in Namibia which needs to be bridged because the aims of EE seem to be disappearing into the aims and objectives of science. Although learners are exposed to EE, they might not act according to its aims. This seems to prolong the debate on whether science is a good vehicle for EE, as it provides the foundation on which EE can stand even

though the aims of EE may be engulfed by the aims of science. Until now, EE has been taught in Namibia using empiricism (see 2.5). However, researchers have stressed that it is time to reconsider science as an appropriate vehicle and to recognise the need for contributions from other disciplines (Gough 1999:2).

5.3.8 Lack of EE co-coordinators in schools

There are no co-ordinators for EE in schools. However teachers would like to have co-ordinators for EE in schools. Such a coordinator should be someone who organizes the EE activities in the school. The absence of a coordinator affects the implementation of EE because there is no one to monitor EE activities and to ensure that teachers' needs are addressed. The coordinator should be someone trained and knowledgeable in EE approaches and who can assist teachers in the implementation of EE (Kanyimba 2002:75-76). Due to a lack of coordinators, few EE activities take place in schools. .

5.3.9 Lack of collegiality among teachers and principals

The school academic staff does not work together to make EE teaching possible. Teachers other than Science teachers do not render assistance to Science teachers, especially in the preparation of excursions. These teachers also seem not to care about nature. Principals also do not support teachers in EE and do not allocate funds for it. This is blamed on lack of understanding of EE and its importance by principals and teachers of departments other than Science.

Researchers have proved that in schools where there was a lack of collegiality, EE became difficult to implement. (Pratt 1994:331) also says that the successful implementation of the curriculum depends on collegiality among the teaching staff. Principals should also collaborate by monitoring, supporting and encouraging teachers to implement the curriculum (Fullan 1994:76). If there is no collaboration in schools, there is no support, monitoring and encouragement of teachers. Thus the curriculum is likely to fail.

5.4 An analytical review of Activity systems and boundary crossing

In this section, I will attempt to outline the activity systems in which teachers and advisory teachers operate to implement EE and support it. This is important because it is assumed that human actions can be implanted in a context. In other words, actions cannot be isolated from the context in which they take place (Johassen et al

1999:62; Tsui & Law 2007:1291). Thus, the unit of analysis cannot be human action but the activity system. Hence, the theory is referred to as Activity Theory.

Johassen (1999:62) recommends that when analysing a human activity, all the components of the activity should be analysed. This shows that there is a need for an analyser to study the activity system and identify all the components available in the system thoroughly, because when some of the components are ignored, the analysis cannot be complete. Any improvement meant for an activity in which the focus is on some components only, will not succeed because a component which is excluded from the analysis may keep on interacting with the activity system and interrupt the success of the system:

Activity cannot be understood or analysed outside the context in which it occurs. So when analysing human activity, we must examine not only the kinds of activities that people engage in but also who is engaging in that activity, what their goals and intentions are, what object or products result from the activity, the rules and norms that circumscribe that activity, and the larger community in which it occurs, (Johassen *et al* 1999:62).

From the next paragraph onwards I will present an analytical conclusion on the study, following the guidelines of the activity system as outlined in section 2.9).

In this case Biology teachers are the subjects of activity systems, who are expected to teach EE in Biology. Their activity does not take place in isolation but in the school community. Analysis has shown that Biology teachers find it difficult to work without the assistance of principals and teachers of other subjects. However such collaboration does not exist because of lack of understanding of EE among principals and teachers of subjects other than Biology or Science. They also do not understand the way EE is incorporated in the curriculum and as a result there is a lack of division of labour.

Johassen and Rohrer-Murphy (1999:70) advise that the purpose of the activity system should be defined and analysed if subjects are to understand what is expected of them. In this case the purpose of the activity system is to change the behaviour of students toward the environment through teaching EE. Students should

show their learning by caring for the environment. Such expectations are set at the national level and stipulated in the curriculum documents and other documents guiding the implementation of EE, such as the EE policy in Namibia, as stipulated in chapter 2. These rules guide the implementation of EE in formal education. It can be said that the teaching of EE is dictated and not voluntary because these documents are meant to guide every teacher. However teachers do not understand what is expected of them because they don't know what the curriculum says about the implementation of EE.

In addition, responsibility for the implementation of EE should be shared equally as the curriculum documents stipulate that all the teachers should be responsible for EE through cross curriculum teaching, while, the principle of curriculum implementation considers principals as implementation monitors (see section 2.8). Non-science teachers and principals seem to be unaware of their duties with regard to EE because there is no monitoring and support from principals and no collaboration from non-science teachers. This leads to a poor quality of EE teaching.

The object of an activity system is to teach learners to change their behaviour towards the environment. The results show that many schools have no programmes for teaching EE beyond teaching about ecosystems, that is cognitive learning. This might hamper the achievement of the aims of EE. Also in those schools where there are EE projects, learners are often not motivated to take this learning seriously because sometimes they absent themselves from EE related learning.

The communication between subjects and objects is done through artefacts/tools which can be instruments, signs, procedures, machines, methods, languages, formalisms and laws. These according to Johassen and Rohrer-Murphy (1999), mediate between the components of the activity system. Some of these tools are teacher knowledge, teaching materials, teaching methods, lesson preparation, and teacher's collaboration. Many of these artefacts such as teachers' knowledge, teaching materials, collaboration among school communities are mentioned as factors which hinder the implementation of EE. Moreover, few teachers use learner-centred methods which are effective for EE teaching, as is shown by the dominant use of the lecturing method in teaching. The absence of artefacts leads one to

question how EE is communicated between the subjects and objects and the entire academic community.

The components of the activity systems are disconnected in the teaching of EE in schools. The rules and artefacts specific for EE are not understood by subjects and they became factors which affect the success of implementation. The distribution of labour is clear in documents but not clear to teachers, principals and advisory teachers in terms of EE teaching and there is little collaboration among teachers.

I was therefore motivated to outline the activity systems for teachers and subject advisors to show how the activities and their components function, since activities do not take place out of context. The sketches were developed based on existing literature and the view of teachers and advisory teachers on the implementation of EE. The activity systems are shown below:

Figure 19: Teachers' activity system for teaching EE

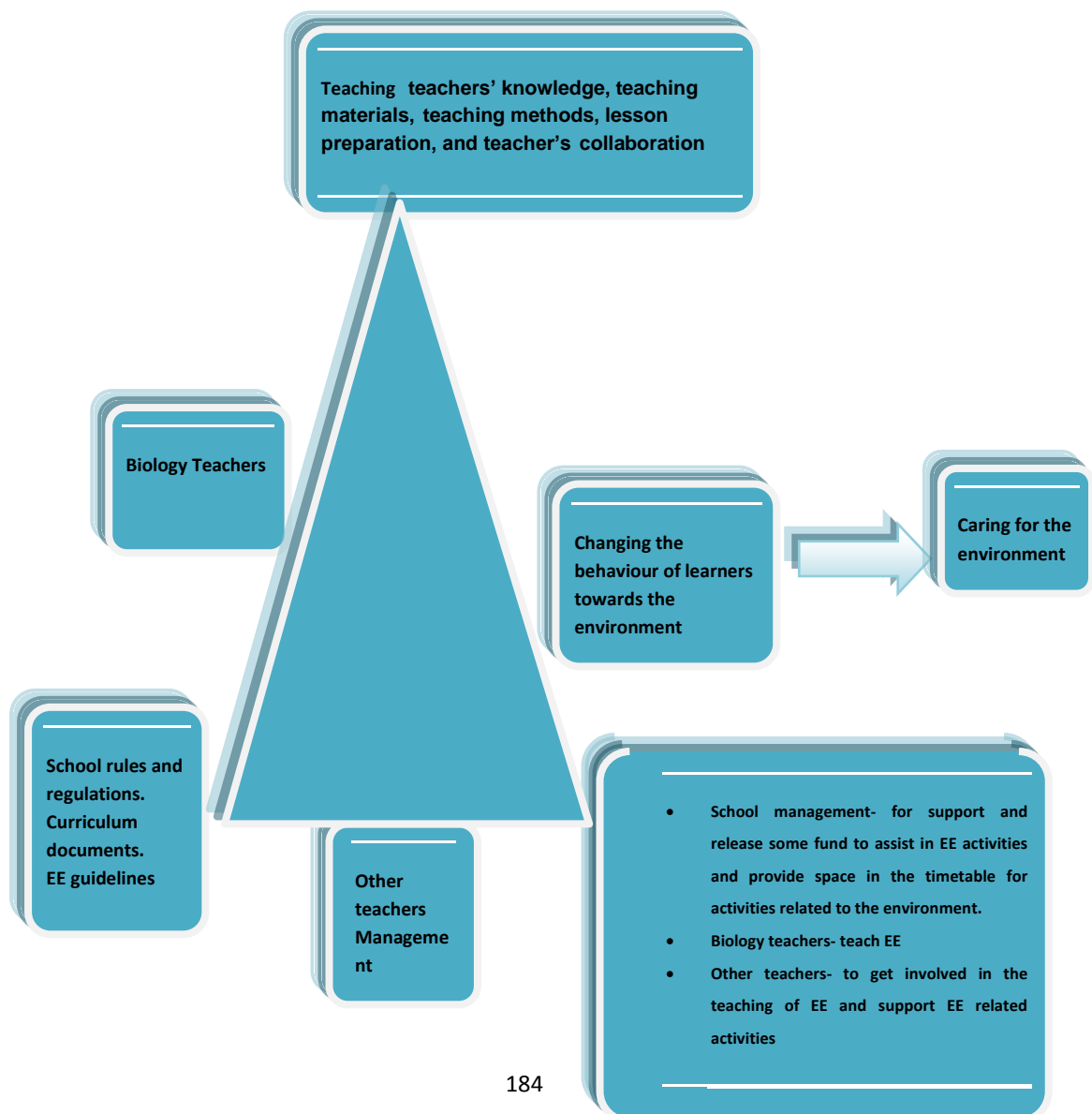


Figure 19 above illustrates the activity system for the biology teachers. Teachers use teaching as a tool to achieve their objective of teaching EE across the curriculum in order to change the behaviour of learners towards the environment, which in turn could lead to caring for the environment. In order to accomplish that goal, teachers need the support of the entire academic community in various areas especially in terms of flexible school rules which accommodate EE activities.

Figure 20: Advisory teachers' activity system for supporting teachers

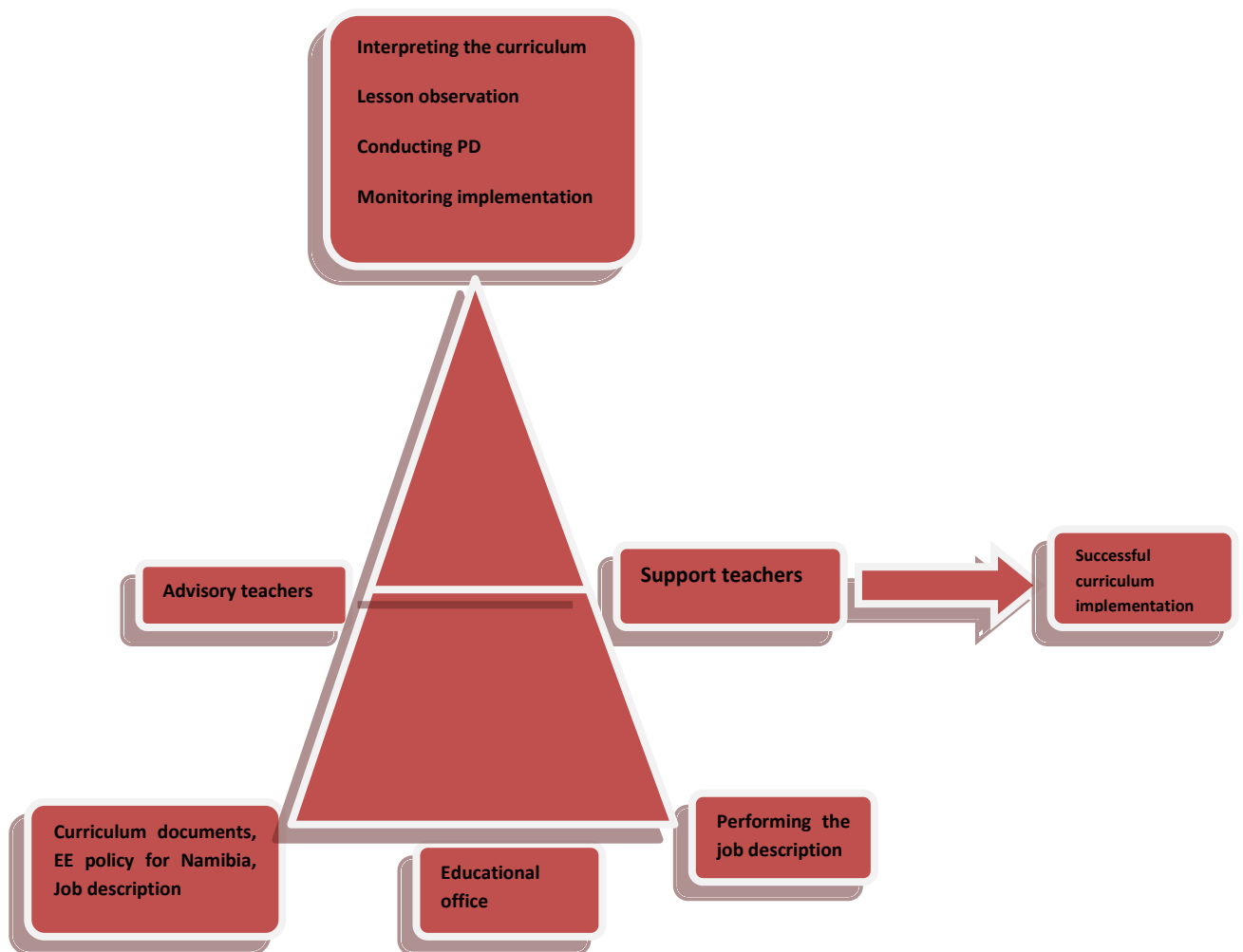


Figure 20 above illustrates the activity system of the advisory teachers who should help teachers to implement EE/ By virtue of their job description, the advisory teachers have a mandate to support curriculum implementation as the objective of their activity. They do that by interpreting curriculum documents, through classroom

observation and by providing professional development, and by monitoring the implementation to ensure successful curriculum implementation.

The two systems need to work together to maximize the objective of EE implementation. However, advisory teachers like teachers, have a poor understanding of EE (while in some cases, teachers have better understanding than the advisors). This is because no EE workshops are conducted or EE is not included in the workshops for Biology. Thus, in terms of EE, the two systems do not work together.

The analysis has shown that advisory teachers are not the only actors that should help teachers to make teaching EE in Biology (science) effective but that the Ministry of Education, Ministry of Environment and Tourism, subject advisors, the University of Namibia, management, other teachers, learners, the whole school community and the parents all have a part to play. Other systems could not be studied in detail because they were not considered central to the present study, but their value could be considered in future research. Little information was gathered about the other role players from the interviews which are outlined below in a skeletal fashion. Some of these role-players will be considered when making suggestions for further research and recommendations:

- University lecturers - needed to train pre-service teachers to teach EE
- Ministry of Education - to provide resources and train teachers through advisory teachers
- Ministry of Environment and Tourism - to provide resources
- Advisory teachers - to facilitate the professional development of in-service teachers
- School management - to support teachers, release some funds for EE activities and provide space in the timetable for activities related to the environment.
- Other teachers - to engage in the teaching of EE and support EE related activities
- Students - to attend EE activities

In Namibia, there are many problems with the implementation of EE . For example the university which is supposed to help teachers improve their teaching of EE, does

not do so. Advisory teachers are not fit to assist teachers in EE and they are also not equipped to do so because their knowledge (or lack of it) is on par with that of teachers. In addition, they have no idea of how EE is incorporated in the Biology curriculum. To make things worse, there is no support system in terms of human and teaching resources. Teachers also receive little or no support from the Ministry of Environment and Tourism, other teachers or parents. Furthermore, teachers' failure to teach EE effectively is often due mainly to lack of opportunities to improve their knowledge because the systems which are in place to provide support, do not function. Consequently, the teaching of EE is negatively affected, as teachers are not sure that they are teaching EE correctly.

5.5 Conclusion of Chapter

As is the case with other social problems, better education has been identified as a response to the environmental risks created by humans. Like many other countries, Namibia introduced EE in the curriculum through a cross-curricular approach, though other subjects especially Science subjects have environmental components in their curriculum. That means Biology teachers became environmental educators even though they were not trained to teach EE the way it should be taught. That prompted an investigation of how teachers implement EE in their teaching.

Although EE is taught in schools, it is taught in a limited and narrow fashion, with less than ideal methods, which limits the realization of the aims of EE. At present teachers have a limited knowledge of EE and they do not understand how EE is included in the curriculum. This can also be blamed partly on lack of training and the lack of teachers' involvement in the curriculum development. The implementation of EE is further hampered by the many barriers that accompany the implementation, such as lack of resources, lack of knowledge on the part of the advisory teachers, poorly resourced schools, and tension between policy and practice.

Teachers' professional development in EE is defective because subject advisors also lack knowledge of some aspects of EE. That makes teachers activity system seen to be out of the network in relation to advisory teachers' activity systems and there is no combination effort (boundary crossing). Boundary closing is believed to bring about expansive transformation through contradictions between the activities

systems Engeström (2001:136-137). That is lacking in the implementation of EE in the context of this research.

Even although, the activity theory advises that all these aspects should be in place for teachers to be able to implement the curriculum successfully, the Namibian government went ahead and implemented EE without considering the factors which may hinder the implementation of the curriculum. It therefore became difficult for teachers to implement EE successfully. These are the findings of this research and the contribution of my research to the on-going debate regarding the implementation of EE.

The researcher suggests a number of ways to improve the implementation of EE, namely introducing EE in pre- and in-service education, considering EE as a priority, including teachers in the whole process of curriculum development, and training teachers to use local environments as a source of learning. The researcher has also reflected on the study and its methods, and the reflection is presented in chapter 6.

Chapter 6

Suggestions and reflection

6.1 Introduction

Clearly, there are serious problems in the implementation of EE in Namibia namely logistical, educational, didactic-related and philosophical problems, as well as lack of support for expert-oriented curriculum development. Based on the findings, some recommendations will be made regarding the implementation of EE in Biology. The recommendations will also focus on teachers' suggestions for improving EE implementation because they deal with the situation on a daily basis, as well as on my observations as a student in the field of EE, and as a teacher. In this chapter I will also reflect on the study as a whole and its methodology.

6.2 Suggestions for the improvement of EE in Namibia

6.2.1 Introducing EE in pre- and in-service training

The teachers and advisory teachers interviewed demonstrated a lack of knowledge of EE and the way it is incorporated in the curriculum. Currently no workshops on EE are conducted and EE is not part of secondary education teachers' education. If the dream of achieving the successful implementation of EE is to be achieved, teachers should be trained to teach EE effectively and to understand how EE and Science can be taught hand-in-hand. Thus, EE needs to be introduced in all teachers' education programmes since it is recommended as one of the goals of the decade of education for sustainable development (see 1.2). Accordingly, the University of Namibia and other institutions which have not introduced EE need to make EE compulsory for all students because EE is introduced across the curriculum.

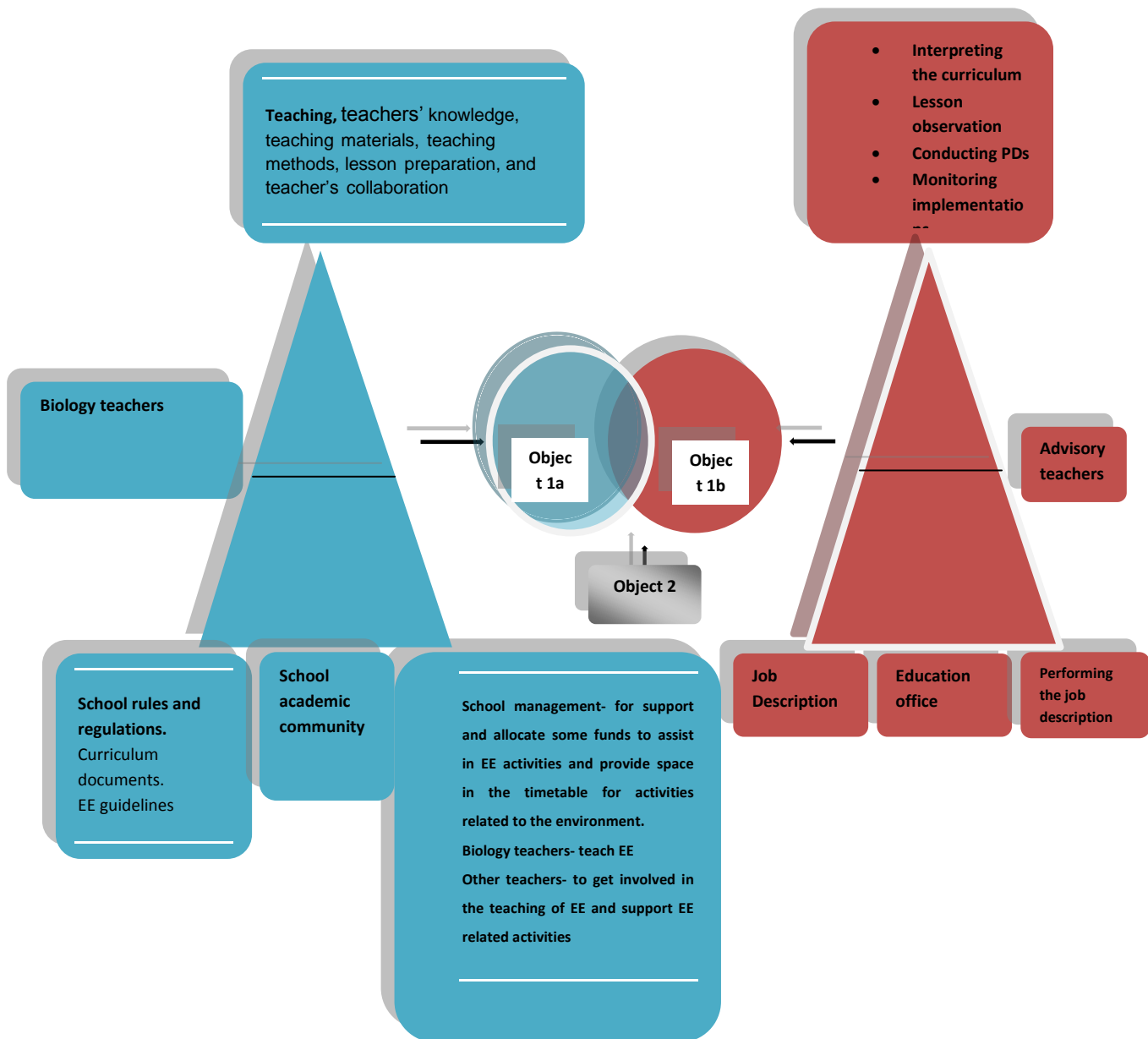
This proposal is contrary to UNAM's current practice where teaching Ecology and Conservation Biology are isolated from pedagogy in education. The act of separating Ecology from methodology makes teachers to be ecologists rather than EE educators because they know the EE content but they don't know the EE teaching methods. The teachers' programmes should be planned in such a way that EE is studied within Science subjects (Gough 1999:6). Teachers will then learn how to integrate EE in their Biology curriculum and also learn about the methods appropriate for teaching EE.

During teaching practice student teachers should demonstrate that they can drive a multipurpose curriculum and more practical assistance can be rendered by teachers and university lecturers. This implies that all teachers' educators in the university should be equipped with EE in order to assist teachers with the incorporation of EE in their respective subjects.

In-service training in EE for practising teachers and advisory teachers is needed to enable them to teach EE with confidence, and advisory teachers should assist teachers to teach EE effectively. EE content related to different subjects as well as EE-related teaching methods should be an important component of the course. During the interviews conducted in the course of the research, it emerged that there are serious lapses in these areas. For example in pre-service training, teachers should be introduced to the philosophical differences between EE and Science so that they can avoid neglecting the aims of either .

In this case, there is a gap (no boundary crossing) between the Biology teachers' activity systems and the activity systems of Biology advisory teachers in EE. These should work together to promote the teaching of EE. The advisers are supposed to mentor teachers in teaching methods of EE. However, this boundary crossing has never taken place. (Tsui & Law 2006:1290) caution that boundary crossing is difficult to perform because of the conflict of interests. However, Tsui and Law (2007) acknowledge that "crossing boundaries forces participants to take a fresh look at their longstanding practices and assumptions, and can be a source of deep learning". I propose that boundary crossing take place and is encouraged between the activity systems of teachers and advisory teachers, as outlined in section 5.4.

Figure 21: Boundary crossing in school-educational partnerships



Activity theory maintains that in the process of engaging in an activity, the motive of the activity is reconceptualised and new forms of activity as well as culturally new patterns of activity, are created (Tsui & Law 2006:1291). In seeking the success of the activity systems, one should think of engaging in other activity systems (Tsui & Law 2006:1290). Therefore, any system which does not consider uniting with other systems for maximum improvement of its output will continue to perform at its usual pace. At present, teachers do not receive any assistance in terms of the implementation of EE especially in the area of knowledge acquisition. It seems that teachers operate in isolation. In other words, the two activity systems have become

separate and as a result, EE is poorly implemented in Namibia. If the two systems (the systems of the teachers and the advisory teachers) could work together, their objectives would meet at “the third space” or a newly formed activity object (boundary object) which is designated Object 2 in the above diagram. The proposed Object 2 is where teachers and advisory teachers collectively work using their different job descriptions to find a common way of solving teaching problems. In that way, new elements are introduced from one community to another through boundary closers (Tsui & Law 2006:1290). Currently this does not happen because teachers and advisory teachers lack an activity system which is more knowledgeable in EE to assist them with EE knowledge, teaching and approaches. More can be achieved when another system is added.

Furthermore, the whole school academic staff including teachers of other subjects and the management should be included in training in order to improve collegiality. The results have proven that lack of understanding among teachers and principals has an impact on the implementation of EE. The individual may be the unit of change but change is the collective effort of the entire system (Fullan 1994 and Tsui & Law 2006:1290). Thus everyone who may influence the results of the implementation should be trained.

As Robottom (2000) has proposed, teaching materials should not be produced in one region and used in another. In-service training should also focus on training teachers to produce their own teaching materials which are specially made for their school and local environment, that is, the environment that they and the learners are familiar with, as well as the environment where they are expected to participate in solving environmental problems. Similarly, planning for fieldwork should not focus only on far places because in the end, the trip might not take place due to the high cost of transportation which the schools and parents might not be able to afford. Therefore, teachers should be trained to use their local environment, and fieldwork may be conducted in the vicinity of the school, in “gardens, school grounds and streets” (Kanyimba 2002:82).

6.2.2 Bridging the gap between EE and science

To bridge the gap means to plan a curriculum which teaches both cognitive knowledge which is the purpose of science and affective knowledge, which is the aim of EE. Science should be given some credit for accommodating EE in its curriculum through Ecology. However, I suggest that science be reconceptualised to accommodate both EE and its aims. Presently, EE content is addressed in science but the aims are overlooked. Gough (1999:10) argues that the science curriculum should be dynamic rather than static. For it also to be compatible with EE, it should be accommodative. Gough concludes that:

Rather than accepting the confines of traditional science education and its rejection of values and action which make it unattractive to many, the challenge is to change the science education curriculum so it can become an appropriate vehicle for environmental education... Not a simple task but a worthwhile one for all (Gough 1999:10).

Research has also shown that science subjects can be dynamic and can accommodate EE (Ashley 2000 and Hart 2002).

It is not expected that the task will be easy in Namibia, but if the present cosmetic status of EE in the science curriculum is changed and it is given a central role, then the possibilities of how best to teach it in science could be explored. Namibia should follow the methods used by those countries which successfully implement EE in science, like Ghana. These are described by Mueller and Bentley 2009) (see section 2.5.4).

6.2.3 Teachers as participants in curriculum development

During the interviews it was found that teachers in Namibia want to be involved in curriculum development and that they have valid reasons to do so; this however has not been happening. It was also found that when teachers are not involved in curriculum development, they do not understand the curriculum or the way EE is incorporated in the Biology curriculum. This therefore supports Carl's (2005) claim that teachers' professional status is jeopardized since there are benefits which come with participation but they do not reap them. He said

Quality teachers' involvement is essential, not only for the sake of institutional and curriculum development in schools and country, but also for nurturing the personal and professional growth of the teacher... sadly this principle is not endorsed in which case the teachers' professional status is placed in jeopardy. Purposeful strategies must therefore be developed in order to integrate the issues of teachers' participation and teachers' professional growth effectively. These strategies should take due cognizance of teachers need to be involved outside the classroom (Carl 2005:228).

Therefore, I suggest that teachers should always be involved in curriculum development, learn about the additions to the curriculum right from the beginning and indeed make their contributions known because they claim that they know the situation of the learners and in the classroom.

6.2.4 Prioritizing environmental education

It will be of no use if the teachers are trained but the government does not make EE a priority. When the government considers a subject a priority (e.g. Science), it puts measures in place to ensure that the teachers are well trained to teach the subject. This has not happened in the case of EE because it is not considered a priority. However, EE needs to be regarded as a priority like other subjects. Otherwise, it becomes a political issue, the country is seen as one of those which heed the international call to implement EE, but in reality, EE remains a paper project rather than a practical subject. Oslon (2002:131) points out that many reforms are problematic at the implementation stage because they are merely the result of political agendas. Such reforms end up without support and funding (as in Namibia) because they are not priorities of the government. Therefore, prioritizing EE is important because it comes with financial support, which is a door opener for other resources such as physical resources and instructional materials. These resources are currently scarce because EE is not a priority.

Some of teachers suggested that EE in secondary education in Namibia should be treated as a single subject with its own administration. The advantages would be that this will ensure that EE is taught and that funds are allocated to it. (See section 2.5.4). In the same section the disadvantages of implementing EE as a single subject are also depicted. A crucial one is that a single subject cannot lead to transfer because there is no link between what learners do in other subjects (Hungerford and Peyton 1994:10 and DRFN 2008:24). This is described as being the opposite to introducing EE in a cross curriculum way. Therefore I am suggesting that

EE remains a cross curriculum theme if EE aims are to be realised. I also suggest that ecology remain part of Biology, but that teachers be trained to teach the two together.

6.2.5 EE coordinator to be assigned to schools

Teachers suggested that the availability of an EE co-ordinator in schools would improve the teaching of EE. This should be someone who is trained in EE and able to assist other teachers, and co-ordinate the teaching of EE. The logic is that such a teacher should take responsibility for what happens in the school regarding EE. The co-ordinator is also someone, who organises EE activities for co-curricular purposes and makes sure that environmental clubs are developed and function the school. Alternatively advisory teachers can be trained in environmental education so that they can play this role.

6.3 Suggestions for Further Research

In this research the focus was on the teaching of EE in Biology. It has been shown that teachers have a poor idea of the way EE is currently understood. Their knowledge of EE is rooted in Science and they teach it as such. It is therefore suggested that research be conducted in other subjects with EE components to determine how EE is taught in those subjects. However not all subjects have EE components. In such cases, one could expect that teachers of those subjects would not understand EE at all. As a result, it is difficult to generalize the findings of this research in terms of the knowledge of all secondary teachers who studied at UNAM.

Assessing teachers' knowledge of different subjects is an issue that needs further research at both primary and secondary school levels. Understanding the level of teachers' knowledge of each subject could facilitate the way professional development programmes are organized. Similar research needs to be conducted with advisory teachers of other subjects and teacher educators of subjects other than Biology.

Although the colleges of education which became branches of UNAM have introduced EE in their teachers' training programmes, there is a need for follow up research on how these teachers implement EE in their teaching. The results could be important to education because they could be compared to the approaches used

by teachers who did not have EE training, like the Biology teachers involved in this study.

6.4 Reflecting on the journey of data collection

In reflecting on a study, one does not only consider the lapses or things that could be done to improve it, rather both the strength and limitations could help to improve future studies undertaken by both the researcher and others. Evans (2002:18) refers to reflective practice as a multi-purpose improvement tool intended to improve procedures. That makes research an educative tool that cautions one on dangerous ways not to follow and on clear paths to pursue. As Evans (2002) has noted, in reflective practice, one allows the development of advanced research skills to lead one to undertake to acquire more successful study skills. I will therefore reflect mainly on my journey to collect data, beginning from seeking approval and clearance to conducting the research itself.

Obtaining permission from the ministry and schools to conduct this research was not an easy task. It required maintaining a smiling face even when permission was refused. In most cases, I had to sit in front of the school computers and draft letters to the principals. This however was advantageous to my study in two ways:

1. I received answers quickly, and
2. I got the opportunity to become a comfortable insider since I had already started working with teachers, helping them to mark and bind question papers.

I left South Africa for Namibia early on 17 March 2011 before the school closed for the first trimester. I decided to start with data collection in Omusati Region on 23 March 2011. All the teachers were contacted and informed about the dates I should be expected in their schools. My plan was to spend two days in each school; the first day was for conducting interviews after school hours (in line with the ministry's instruction that interviews be conducted after school in order not to disrupt the normal teaching schedule). The second day was scheduled for observation. However, things did not always go as planned, because

- a. Teachers may have a lot of work and they may not be prepared to be interviewed.

- b. The bridges to one of the school were damaged by a flood. The school was planning to close because of the flood as sewage dams were overflowing and the air was polluted making both learners and teachers uncomfortable. Other schools which were affected by the flood in the northern part of the country were already closed by that time. I learned to consider the weather and select the best season during which to plan a field trip.
- c. Advisory teachers are also busy people
- d. Some schools were busy with exams

One can learn from my experiences how to obtain permission for research quickly and how to be a comfortable insider. On the other hand, one should also learn that things do not always take place as planned.

I managed to get the results I expected, but also unexpected results. The paradigm I moved in made it possible for me to use methods which describe the experiences of teachers and advisory teachers in detail. The methods I used make it possible to hear from teachers about their experiences and to observe what is experienced in practice. Some of the experiences tallied with observation while the opposite was seen in some instances. All the data are important to the study and shaped the conclusions made.

6.5 Limitation of the study

Maila 2003 explains that limitations do not imply that the research has failed to achieve what it was intended to achieve. They only imply that data collection methods and research processed might not have been as successful as was intended. I will therefore mention below what I consider to be the limitations of this study.

Unavailability of time to go back and follow up on some aspects

I wished to follow up on some important aspects of the study as they manifested from the data, but time did not allow this. For example I expected teachers to teach EE across the entire Biology curriculum but teachers seem to see EE as the teaching of Ecology. Teaching EE across the curriculum which should be

multidisciplinary in approach is the way EE is currently understood internationally. I wanted to study how teachers in other countries teach ecology but time did not allow for this. I recommend this as a direction for further research.

The sample was not big enough

I used eight schools in this research. This is a big number in qualitative research due to the nature of interviews and analysis but it is not big enough to provide results which one can use to make a judgement because it is just a fraction of the number of schools both in the regions under study and in the country as a whole.

To sum up, I feel that I tried hard to extract all the information needed but due to the large data set collected, it is possible that some information was neglected. I should also admit that this is my first research and I am inexperienced. This might have impacted on the way I conducted the interviews and in turn on the responses.

6.6 Conclusion of the chapter

In this chapter I made suggestions on how the implementation of EE in Namibia can be improved. I suggested the introduction of EE in pre- and in-service training, bridging the gap between EE and science, teachers as participants in curriculum development, prioritizing environmental education, EE teaching to remain as suggested in curriculum documents and EE coordinators being assigned to schools. I also suggested that the implementation of EE in other subjects be studied as it is difficult to generalise the results of this study to other subjects.

My last words: this study has answered the research question. I conclude in short that EE implementation in Namibia is complicated and is taught using approaches not suited to it. There is a need for the professional development of both teachers and advisory teachers.

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Appendix A:

An Environmental Education Policy for Namibia

①

AN ENVIRONMENTAL EDUCATION POLICY FOR NAMIBIA

NEEN Document approved by the
Presidential Commission with additions
through SEEN/NIED

1 January 2004

2

1. Introduction

1.1 Why do we need an EE policy?

The main reason for developing a policy on Environmental Education is to ensure that :

- ◆ The responsibilities of the State in promoting the welfare of the people through the sustainable management of natural resources are met
- ◆ Co-operation and co-ordination between Ministries, NGO's and other individuals and agencies is encouraged
- ◆ Environmental responsibilities across different sectors of government are better integrated
- ◆ Educational goals for all areas of environmental management are set
- ◆ The sharing of resources such as facilities, staff and materials is encouraged
- ◆ Public participation as a tool for implementing policy is promoted

The policy takes account of

- ◆ The need for participatory policy development
- ◆ The development and implementation of other government policies affecting education, training and the awareness by the public of environmental issues
- ◆ National priorities and international obligations affecting both the environment and education

1.2 How this document was developed

The development of an environmental education policy for Namibia has been a lengthy process involving stakeholders from Ministries, NGO's private individuals and the donor community from 1991 until the present. Coordinated originally by the Ministry of Wildlife, Conservation and Tourism, it has involved many national and regional workshops, and the formation in 1994 of an Inter-Ministerial Working Group on EE and later in 1995 of the Namibian Environmental Education Network (NEEN) as organizations tasked specifically by the MET to promote and co-ordinate the policy making process.

Consultations with stakeholders through meetings and workshops continued in the period between 1994-8 in order to develop a policy document representing an agreed and shared vision of environmental education in Namibia. This document was accepted by the 1999 Presidential Commission into Education and Training as one that "should be adopted by government.....and supported by a team at NIED".

Renewed funding for environmental education since 2001 through the SEEN project has resulted in the document approved by the Commission being disseminated, discussed and amended further. Subsequent agreement between the MET and MBESC has resulted in the MBESC being given the mandate and responsibility to finalise this policy making process through the re-formation of an Inter-ministerial Committee and final review of the document by all stakeholders prior to its submission to Government. It is our fervent hope that this process will be finalized in 2004.

2. The Policy Context

2.1 The State's Responsibilities

The Government of the Republic of Namibia and endorsing agencies recognize that:

"the State shall actively promote and maintain the welfare of the people by adopting policies aimed at...the maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and the utilization of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future."

[Constitution of the Republic of Namibia – Article 95]

2.2 Important Related Policy Statements

The importance of environmental education is also reflected in policy documents from a number of Namibian sectors.

Namibia's First National Development Plan (1990-) identifies sustainable development as an important national development strategy. It notes that Namibia's economy is almost totally reliant on natural resources and that a shift towards sustainable development requires deep-rooted changes in policy and practice, attitudes and skills across a broad range of sectors. An important strategy in achieving this is the need to promote environmental education amongst children and adults by incorporating environmental issues into the school curricula.

Within the Green Plan Government states that it will "enable Namibians to move from environmental awareness to understanding and action; the Namibian Government will aim to provide all Namibians with access to EE whether at the formal or non-formal level"

(Update from second plan needed here)

In turn, the MBESC responsible for formal education has set out its aims to encourage and promote in learners:

- ◆ a holistic understanding of the dynamic interdependence of all living things and their environment..
- ◆ a sense of responsibility toward restoring and maintaining ecological balances through the sustainable management of natural resources and...
- ◆ an involvement in practical activities to preserve and sustain the natural environment through...a learner-centred methodology that promotes learning through understanding....continuous assessment of the learning process....and introduces practices that reflect and reinforce both the values and practices of democracy

(Ministry of Education and Culture: Towards Education for All)

Environmental education is also important, as Namibia is a signatory to many international agreements including the *Convention on Climatic Change*, the *Convention to Combat Desertification*, the *Convention on Conservation of Biological Diversity* as well as *Agenda 21* which recognizes environmental education as an integral part of the move towards sustainable living.

3
The way EE is implemented in a cross curriculum in Nam. This means every teacher is an EE teacher including Science teachers.

2.3 The role of environmental education

Consequently there is an urgent need for the inclusion of environmental education in all spheres of life and that it should be grounded in critical and innovative thinking and promote the transformation and construction of society. Fundamental issues in relation to the environment and development include population, health, peace, human rights, democracy, hunger, and degradation of flora and fauna. Striving for sustainable living is an ongoing process of learning and adapting to changing present and future conditions.

Namibia is dependent on natural resources and certain biophysical components are vulnerable to environmental degradation. It is specifically acknowledged that Namibia is an arid country and has a scarcity of water and thus requires wise management. Natural resources are intimately linked to sustainable development. It is also acknowledged that Namibia's past has led to inequities in access to biophysical and other resources. Environmental education, through the development of skills and attitudes, has an important role to play in both enabling wise management and contribution to redressing problems that are legacy of our past.

Environmental education must facilitate equal partnerships in the process of decision making at all levels and stages. It must integrate skills, values, attitudes and action and convert every opportunity into an educational experience for a sustainable society. Environmental education is not neutral but is value-based. It is an act for social transformation.

5

3. Namibia's Environmental Education Policy Statements

"We the people of Namibia, will actively encourage, support and implement environmental education as a means of achieving and fulfilling Article 95 of the Constitution. Environmental education should aim to empower Namibians, from all sectors, to critically evaluate environmental information and options, to make informed decisions, and to take actions that will contribute to the goal of environmental and economic sustainability."

It is declared that the following are fundamental to Namibia's Environmental Education Policy:

- ◆ Central to the concept of environmental education is the development of environmental literacy. Just as reading becomes second nature to those who are literate, interpreting and acting for the environment ideally would become second nature to the environmentally literate citizen. Such a citizen would be informed scientifically, have the skills to be able to take action and be motivated by a concern for people and the environment.
- ◆ Environmental education will place emphasis on:
 - stimulating dialogue and co-operation among individuals and institutions in order to create new lifestyles which are based on meeting everyone's basic needs – regardless of ethnic, gender, age, religious, class, physical or mental differences – in a sustainable fashion.
 - developing an ethical awareness of all forms of life with which humans share the planet.
 - recovering, recognizing, respecting and utilizing indigenous history and local cultures, as well as promoting cultural, linguistic and ecological diversity.
 - recognizing interdependence of both living and non-living systems. Actions in one system can have effects on other parts of the system or other systems.
- ◆ Namibia shall pursue an active programme to achieve sustainable living through, inter alia, an active environmental education programme in accordance with the principles which follow.

5

4. Guiding Environmental Education Principles

The following principles guide Namibian environmental education. Environmental education:

- ◆ Considers the environment in its totality: natural and built, technological and social (economic, political, technological, cultural-historical, moral, aesthetic);
- ◆ Is a continuous process, beginning at the pre-school level and continuing through all formal and non-formal stages and involves all sections of the Namibian population. Education is the right of all; we are all learners or educators;
- ◆ Must involve an holistic approach and thus an interdisciplinary focus in the relation between human beings and the environment;
- ◆ Examines major environmental issues from local, national, regional and international points of view so that Namibians gain insights into geographical areas;
- ◆ Values all different forms of knowledge. Knowledge is diverse, cumulative and socially produced and should not be patented or monopolized;
- ◆ Promotes the value and necessity of local, national and international co-operation in building environmental literacy;
- ◆ Enables people to have a role in planning their own learning and provides an opportunity for making decisions and accepting the consequences;
- ◆ Relates environmental sensitivity, knowledge, problem-solving skills and values clarification to every are, but with special emphasis on the youth;
- ◆ Enables people to discover the symptoms and causes of environmental problems and explore and critically evaluate solutions and apply them where possible;
- ◆ Emphasizes the complexity of environmental problems and thus the need to develop critical thinking and problem-solving skills;
- ◆ Utilizes diverse learning environments and a broad array of educational approaches to teaching/learning about and from the environment with due stress on practical activities and first-hand experiences;
- ◆ Is carried out in an environmentally sound manner.

5. Aims of Namibian Environmental Education

Namibian environmental education aims to:

- ◆ Develop an understanding of the local, regional and global, environment; its associated benefits, problems, solutions, and procedures for implementing those solutions;
- ◆ Foster attitudes and values that develop environmental responsibility and active participation in achieving a higher quality of "being";
- ◆ Share and develop skills for identifying, critically evaluating and solving environmental problems;
- ◆ Actively encourage participation of individuals, groups and government in acting positively in the prevention and solution of environmental problems and to support mechanisms (social, political and moral) which enable people to take control of their lives and environment;
- ◆ Be flexible and dynamic, thereby adapting as new problems and issues arise;
- ◆ Where appropriate, follow guidelines and recommendations set out in those international Treaties, Conventions and Agreements ratified by the Namibian Parliament;
- ◆ Recognize and incorporate local and traditional knowledge and take cognizance of cultural and religious beliefs.

6. Namibian EE approaches

The following constitute the basic approaches for the implementation of environmental education in order to achieve the broad aims outlined in this policy document.

6.1. Networking

The policy recommends that environmental education in Namibia be developed through networking between and among government, donor community, NGOs, CBOs and the private sector. The emphasis will therefore be on participation, sharing, exchanging of ideas and skills among the interested groups. Other functions of the network will include promotion of environmental education in Namibia, ensuring quality curriculum, programme and material development

6.2 Sensitising, lobbying and advocacy

A concerted effort will be made to sensitize Namibians to environmental issues through, amongst others, the education system, electronic and printed media, the entertainment and advertising spheres. Sensitizing and campaigning are to follow the approach outlined in this policy document.

6.3 Training and Capacity Building

The environmental education community will strive to improve its capacity, effectiveness and efficiency through continuous training and capacity building programmes and endeavor to develop human resources within the interest groups.

6.4 Curriculum Development

Environmental education initiatives should be involved in curriculum development, whether through the production of their own curricula or through the incorporation of environmental education in formal and non-formal curricula. Curriculum development is a participatory process, and should involve all stakeholders. Curricula affected include those from pre-school to university, including adult education. Curricula should be reviewed and evaluated to ascertain their environmental education approach and content.

6.5 Programme Development

All new project, programmes and initiatives being developed within the environmental education community should take cognizance of this policy document and attempt to contribute to its broad aims.

6.6 Development of learning support materials

Ongoing participatory production, testing and evaluation will form the basis of resource material development for environmental education programmes. Materials will reflect principles and aims outlined in this policy.

6.7 Research, monitoring and evaluation

Research, monitoring and evaluation are important aspects of environmental education. Research plays an important role in determining opportunities and future directions for environmental education in Namibia while monitoring and evaluation will form the basis for continuous improvement.

Appendix B

A component of EE in the Biology curriculum (syllabus)

SECTION IV – RELATIONSHIPS OF ORGANISMS WITH ONE ANOTHER AND WITH THEIR ENVIRONMENT (15% of teaching time)		
TOPIC	GENERAL OBJECTIVES Learners will:	SPECIFIC OBJECTIVES Learners should be able to:
1. Energy flow, food chains and food web	<ul style="list-style-type: none"> Understand the flow of energy through an ecosystem 	<ul style="list-style-type: none"> state that the Sun is the principal source of energy input to biological systems describe the non-cyclical nature of energy flow define the terms food chain, food web, producer, consumer, herbivore, carnivore, decomposer, ecosystems and trophic levels (using local examples) describe energy losses between trophic levels, and the advantages of short food chains describe and interpret pyramids of biomass, numbers and energy explain that there is an increased efficiency in supplying green plants as human food and that there is relative inefficiency, in terms of energy loss, in feeding crop plants to animals
2. Nutrient cycles	<ul style="list-style-type: none"> Understand the importance of nutrients to be cycled in the biosphere 	<ul style="list-style-type: none"> describe the water cycle describe the carbon cycle discuss the effects of the combustion of fossil fuels and the cutting down of forests on the balance between oxygen and carbon dioxide describe the nitrogen cycle in terms of decomposition by micro-organisms; nitrogen fixation in roots; the absorption of these nitrogen compounds and their conversion to proteins; the role of microorganisms in decay and the return of nitrogen to the soil or the atmosphere (names of individual bacteria are not required)
3. Population	<ul style="list-style-type: none"> Recognise the factors that affect population size and distribution 	<ul style="list-style-type: none"> define population as a group of organisms of a single species that live in a given area state the factors affecting the rate of population growth for a range of living organisms describe the importance of food supply, predation and disease (including AIDS) on population size identify the phases of a sigmoid curve of population growth resulting from the action of a limiting factor describe the increase in population size in the absence of limiting factors (human population growth) and the social implications of current human survival rate) interpret graphs and diagrams of human population growth

TOPIC	GENERAL OBJECTIVES	SPECIFIC OBJECTIVES
4. Human influences on the ecosystem	Learners will:	Learners should be able to:
4.1 Damage to the environment	<ul style="list-style-type: none"> • Consider the effect of human activities on ecosystems (including tropical rain forests, oceans and rivers) • Consider the need for conservation of species, their habitat and natural resources 	<ul style="list-style-type: none"> • discuss ways in which the use of modern technology has resulted in increased food production (using suitable examples) • describe the undesirable effects of deforestation • describe the overuse and dangers of fertilizers on the land (e.g. nitrates) • discuss alternatives to the use of large amounts of industrially produced fertilizers • discuss the effects of irrigation • describe the undesirable effects of water pollution by sewage and chemical waste (pesticides and herbicides) • describe air pollution by sulphur dioxide (acid rain) and pollution due to pesticides and herbicides and nuclear fall-out • discuss the causes and apparent effects on the environment of acid rain, and the measures that might be taken to reduce its incidence • assess the significance of non-biodegradable plastics and other materials used in the manufacturing industry
4.2 Conservation		<ul style="list-style-type: none"> • define conservation as maintaining the environment and natural resources in a state that maintains biodiversity • describe the need for conservation of species and their habitats and of natural resources • discuss the advantages and disadvantages of tourism for conservation • describe the principle of recycling materials, including sewage (water), plastics and paper

Suggestions for practical work:

- compare biological oxygen demand in water from different sources, e.g. above and below a sewage outfall, using methylene blue as an indicator
- investigate the effect of sulphur dioxide on plant seedlings, using matches as a source of sulphur dioxide

Appendix C: Ethical clearance letter



UNIVERSITEIT • STELLENBOSCH • UNIVERSITY
jou kennisvenoot • your knowledge partner

4 July 2011

Tel.: 021 - 808-9183
Enquiries: Sidney Engelbrecht
Email: sidney@sun.ac.za

Reference No. 540/2011

Ms N Haindongo
Department of Curriculum Studies
University of Stellenbosch
STELLENBOSCH
7602

Ms N Haindongo

LETTER OF ETHICS CLEARANCE

With regards to your application, I would like to inform you that the project, *Environmental education in Namibia: A case study of Biology teachers*, has been approved on condition that:

1. The researcher/s remain within the procedures and protocols indicated in the proposal;
2. The researcher/s stay within the boundaries of applicable national legislation, institutional guidelines, and applicable standards of scientific rigor that are followed within this field of study and that
3. Any substantive changes to this research project should be brought to the attention of the Ethics Committee with a view to obtain ethical clearance for it.

We wish you success with your research activities.

Best regards



Sidney Engelbrecht
MR SF ENGELBRECHT

Secretary: Research Ethics Committee: Human Research (Humanoria)

Appendix D

Permission from the Regional councils to conduct the research



REPUBLIC OF NAMIBIA



OMUSATI REGIONAL COUNCIL

DIRECTORATE OF EDUCATION *Team Work and Dedication for Quality Education*

Tel: +264 65 251700
Fax: +264 65 251722

Private Bag 529
OUTAPI

18 January 2011

Enq: Ms. Apollonia Nakale


To: The Inspectors of Education
The Principals of
Shikongo Ipinge SS
Mwaala SS
Ruacana SS
Onesi SS
David Sheehama SS
Okalongo SS
Omusati Region

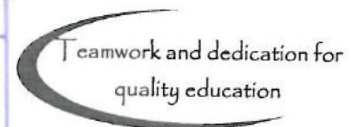
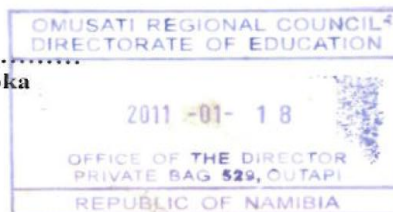
Subject: Permission to conduct a survey at the identified schools in Omusati Region.

This letter serves to notify your good office that **Ms. Nyeuvo Haindongo** granted permission to conduct the above said survey at your school. The Omusati Education Directorate is pleased to inform you that hence permission is granted, the survey undertaken at school should by no means whatsoever disrupt teaching and learning.

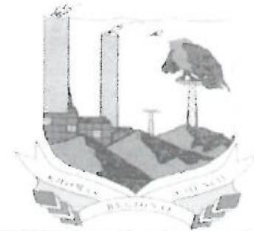
We hope and trust this exercise will enhance quality education in the region.

Yours faithfully


.....
Mrs. Ester Anna Nghipondoka
Regional Director



All official correspondence must be addressed to the Regional Director.



**KHOMAS REGIONAL COUNCIL
DIRECTORATE OF EDUCATION**

Tel: (09 264 61) 293 4364
Fax: (09 264 61) 231376

Private Bag 13236
Windhoek

Enquiries: Ms.T. Seefeldt

25 January 2011

Dear Ms Haindongo

RE: Research on Environmental Education in Namibia

Your proposal on the above mentioned subject has reference.

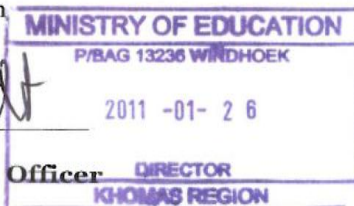
Permission is hereby granted to you to do some research on Environmental Education in Namibia based on the following conditions:

- The Principal of the school to be visited must be contacted before time and an agreement must be reached between you and the principal.
- The school programme will not be disrupted.
- Teachers who will take part in this exercise will do so voluntarily.
- A copy of your final report/thesis will be provided to the Regional Office.

We wish you all the success in your endeavour.

Yours in Education

**Ms.T. Seefeldt
Chief Education Officer
Khomas Region**



Appendix E

Consent forms for Teachers and Advisory Teachers



UNIVERSITEIT•STELLENBOSCH•UNIVERSITY
jou kennisvennoot • your knowledge partner

STELLENBOSCH UNIVERSITY
CONSENT TO PARTICIPATE IN RESEARCH

Title: Environmental Education in Namibia: A Case Study of Biology Teachers

Subtitle: Biology Teachers

You are asked to participate in a research in a research study conducted by Nyeuvo Haindongo, a student from the faculty of Education at Stellenbosch University. The result of the research will contribute to the research thesis. You were selected as a possible participant in this study because you are a Biology teacher who studied at UNAM (University of Namibia).

1. PURPOSE OF THE STUDY

The study is meant to find out whether Biology Teachers implement Environmental Education in their teaching.

2. PROCEDURES

If you volunteer to participate in this study, I would ask you to do the following things

- a. To answer to the interview questions
- b. To accept the classroom observation
- c. To answer follow up questions if necessary in the second interview

Interviews are done individually within less than one hour. Two teaching periods will be observed. This whole process is done at your school.

3. POTENTIAL RISKS AND DISCOMFORTS

This process involves classroom observation, you might not feel comfortable to teach in my presence, but I think this is not a threat to cause the termination of your involvement.

4. POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

The results of this research might persuade the ministry of education to look into the matters facing teachers in the implementation of Environmental Education and act wisely to make sure that environmental education is implemented successfully. The institution of high learning which is responsible for teachers' preparation might also look into the matter and decide to introduce environmental education in their teachers' education programmes.

5. PAYMENT FOR PARTICIPATION

You are requested to participate in the research on a voluntary basis, therefore no payment will be granted.

6. CONFIDENTIALITY

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law.

Confidentiality will be maintained by means of keeping the recorded information in my laptop with the password only known by me and I am the only one who will have access to it. The information will only be released for academic purpose and personal names or school names will not be disclosed.

7. PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

8. IDENTIFICATION OF INVESTIGATORS

If you have any questions or concerns about the research, please feel free to contact [identify research personnel:

Supervisor: Prof Chris Reddy

Phone: 0027 21 8082300

Address: cpsr@sun.ac.za

9. RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research subject, contact Ms Maléne Fouché [mfouche@sun.ac.za; 021 808 4622] at the Division for Research Development.

SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE

The information above was described to by [name of relevant

person] in [Afrikaans/English/Xhosa/other] and [I am/the subject is/the participant is] in command of this language or it was satisfactorily translated to [me/him/her]. [I/the participant/the subject] was given the opportunity to ask questions and these questions were answered to [my/his/her] satisfaction.

[I hereby consent voluntarily to participate in this study/I hereby consent that the subject/participant may participate in this study.] I have been given a copy of this form.

Name of Subject/Participant

Name of Legal Representative (if applicable)

Signature of Subject/Participant or Legal Representative Date

SIGNATURE OF INVESTIGATOR

I declare that I explained the information given in this document to _____ representative _____. [He/she] was encouraged and given ample time to ask me any questions. This conversation was conducted in [Afrikaans/*English/*Xhosa/*Other] and [no translator was used/this conversation was translated into _____ by _____].

Signature of Investigator

Date



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STELLENBOSCH UNIVERSITY
CONSENT TO PARTICIPATE IN RESEARCH

Title: Environmental Education in Namibia: A Case Study of the Biology Teachers

Subtitle: Biology advisory teachers

You are asked to participate in a research study conducted by Nyeuvo Haindongo, a student from the Faculty of Education at Stellenbosch University. The result of the research will contribute to the research thesis. You were selected as a possible participant in this study because you are a Biology advisory teacher who offers professional development to biology teachers.

1. PURPOSE OF THE STUDY

The study is meant to find out whether Biology Teachers implement Environmental Education in their teaching.

2. PROCEDURES

-If you volunteer to participate in this study, I would ask you to answer to the interview questions.

Interviews are recorded and done individually within less than 30 minutes but you should not hesitate to expand your answers due to the suggested time. The whole process will take place at your work place.

3. POTENTIAL RISKS AND DISCOMFORTS

Interviews have an element of discomfort, but I think this is not a threat to you to terminate your involvement.

4. POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

The results of this research might be used by the ministry of education to look into the matters facing teachers in the implementation of Environmental Education and act wisely to make sure that environmental education is implement successfully. The institutions of higher learning which are

responsible for teachers' preparation might also look into the matter and decide if it is necessary to introduce environmental education in their teachers' education programmes.

5. PAYMENT FOR PARTICIPATION

You are requested to participate in the research on a voluntary basis, therefore no payment will be granted to you.

6. CONFIDENTIALITY

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law.

Confidentiality will be maintained by means of keeping the recorded information in my laptop with the password only known by me and I am the only one who will have access to it. The information will only be released for academic purpose and personal names or school names will not be disclosed. The recorded information will therefore be deleted from the laptop when analysis is completed.

7. PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and remain in the study.

8. IDENTIFICATION OF INVESTIGATORS

If you have any questions or concerns about the research, please feel free to contact

Supervisor: Prof Chris Reddy

Phone: 0027 21 8082300

Address: cpsr@sun.ac.za

And

Researcher: Nyeuvo Haindongo

Phone: 0724814957

9. RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research subject, contact Ms Maléne Fouché [mfouche@sun.ac.za; 021 808 4622] at the Division for Research Development.

Signature of the research subject

The information above was described to by Nyeuvo Haindongo in English and I am in command of this language or it was satisfactorily translated to me. I/the

participant was given the opportunity to ask questions and these questions were answered to my satisfaction.

I hereby consent voluntarily to participate in this study I have been given a copy of this form.

Name of Participant

Signature of Participant

Date

SIGNATURE OF INVESTIGATOR

I declare that I explained the information given in this document to _____. [He/she] was encouraged and given ample time to ask me any questions. This conversation was conducted in English and no translator was used.

Signature of Investigator

Date

Appendix F

Interview Schedules for Teachers and Advisory Teachers

ENVIRONMENTAL EDUCATION IN BIOLOGY RESEARCH

INTERVIEW GUIDE FOR TEACHERS

General information

- (a) Age
- (b) Gender.....
- (c) Teaching experience
- (d) Region.....
- (e) School name.....

Interview questions

1. How do you understand the concept of environmental education?
2. How important do you think is EE to the teaching of biology?
3. How you understand the way EE is incorporated in the biology curriculum?
4. Do you implement EE in your practice as a biology teacher?
 - a) What do you do?
 - b) How do you do it?
5. What are the internal obstacles if any (in your school context) to the implementation of EE?
6. What are the external obstacles if any (in the broader community) to the implementation of EE?

7. Do you receive professional support in terms of resources to enable you to implement EE?
 - a) If yes, what have you received?
8. Do you receive professional support from the ministry of education?
 - a) If yes, what have you received?
9. How has the implementation affect your teaching, if at all?
10. Were you involved in the development of EE curriculum?
 - a) If yes, explain how you were involved
11. What do you think could be done to improve the implementation of EE?
12. Did you receive EE training in your teachers' education?

ENVIRONMENTAL EDUCATION IN BIOLOGY RESEARCH
INTERVIEW GUIDE FOR ADVISORY TEACHERS

General information

- (a) Age
- (b) Gender.....
- (c) Teaching experience
- (d) Qualifications.....
- (e) Region.....

Interview questions

1. How do you understand EE?
2. How is EE presented in the biology curriculum?
4. How important is EE in your own opinion?
5. How do you promote and support the implementation of EE in biology?
6. What are the barriers to the implementation of EE in your opinion?
7. What in your opinion should be done differently to effectively implement EE?

Appendix H:
Classroom Observation Schedule

ENVIRONMENTAL EDUCATION IN NAMIBIA - A CASE STUDY OF THE BIOLOGY TEACHERS

Teaching Observation Schedule

- (a) Grade
- (b) School
- (c) Topic
- (d) Number of learners per class.....

Observation

1. For each of the following statements, please indicate the physical conditions of the classroom whether good or bad. The questions were formulated to the five point likert scaling; 5 stands for very bad and 1 for very good:

	1	2	3	4	5
What is the condition of the classroom windows?					
What is the condition of the classroom floors and walls?					
What is the condition of the chairs and desks?					

Others(specify).....

2. Indicate in the box below the teaching materials used during the observation:

Teaching materials	Tick
Posters	
Pictures	
Books	
Articles	
CD ROMs	

Others (specify).....

3. Indicate in the box below the types of methods used for teaching:

Teaching methods	Tick
Activity based	
Information transfer	
Student centred	
Group work	

Others (specify).....

4. Tick in the appropriate box when questions are asked to indicate if the question is a high order question or a low order question. Examples of high and low order questions are listed in the boxes:

High order questions e.g. inferences, projection, predictions	Low order questions e.g. memory recall, information only, require simple answers

5. Is EE incorporated in the lesson?

6. If yes, indicate how environmental education was incorporated in the teaching?

How EE is incorporated in the lesson?	Tick the appropriate box
Activity based	
Information transfer	
Discussion of issues	
Discussion of issues including students viewpoints	

7. Was environmental education central to the topic taught?.....

- a) Did the teacher make links between biology and the environment?

- b) If she/he made a link, how was it

done?.....

Appendix I

Transcripts for Teachers' Interviews

Interview transcripts Participant 1	Points taken from the transcripts
<p>1. How do you understand the concept of environmental education? Respondent: I think that has got to do with the education and then the <u>awareness of how we may make use of sustainable natural resources.</u></p> <p><u>I think there we can teach about things like effect of the pollution on the environment, effect of littering on the environment, effect of deforestation on the particular environment and what else, let's say those.</u></p>	<p>T/SH-1 Awareness of how we can make use of sustainable natural resources</p> <p>T/SH-1 Teach effects of pollution, littering, deforestation on environment</p>
<p>2. How important do you think environmental education is? Respondent: Yes EE is very important, it is very very important especially now in the teaching of biology. Of course u know there are certain topics that u can teach in Biology now to be specific, let's talk about photosynthesis for example. We all know that all humans which are living organisms need food now how do they get those food? <u>Most of us know that human are omnivores meaning that we depend on plants for food and also animals. So now there is no way that we are going to talk about maintaining our living through the intake of food without talking about manufacturing of the food that we need by plants.</u></p> <p><u>I think it is very important since now it is guiding them to be aware, it's just like letting the learners now aware of whatever they have to do. For example if we are talking about photosynthesis that we just talk about and we know plants are very important so that we have oxygen that we need from this plants and also the food, so now is good for the learners because they will know that it's not a good idea to cut down all the trees, why? Because if I do that I am cutting away my survival because I need the O₂ for breathing and the food from that particular plant.</u></p>	<p>T/SH-1 Humans depend on plants and animals for food</p> <p>T/SH-1 Plants are important for human nutrient cycle</p>
<p>3. Do you implement EE in your teaching as a biology teacher? Respondent: <u>Of course, because now all almost all the topics that we talk about, have a relation now to the environment.</u> That's why now it is like an integration of</p>	<p>T/SH-1 Implement</p> <p>T/SH-1 Teach it in all the topics &</p>

<p>Foibe: Yeah, I took them out for adaptation</p> <p>4. How do you understand the way EE is incorporated in the Biology curriculum? Respondent: <u>Of course, the main emphasis is just to make learners aware of the environment which they are living in and then to make them aware to use all the resources in the sustainable manner, that is the main emphasis. That is what they are advocating. They want to make the learners aware and help them appreciate the environment.</u></p> <p>5. What are the internal obstacles that you encountered in the implementation of environmental education? Respondent: <u>Of course no its ok now it's just like the incorporation within the biology subject itself, but I think it was going great if we say even, let's have a particular lesson or a particular workshop just to tackle now just on environmental awareness for example inside the school to be conducted by any experts. There are various factors, if have to look at, of course we work according to this syllabus we have a certain time frame to do particular activities for example, now if I only have to give them 3 practicals per term, I don't really think that is enough for this learners, of course there are many things that you can do. But now because of the limited now time, and you are only going to undertake three of those. Then if we had like a certain head of centre just to advise you here and there, that is then within the school then it was also going to be better. The coming to funds, not at all. If you have to take learners for example for a certain excursion, let's say for example you know how far that is from here, it always create a certain burden to this parent of this kids because we don't have enough funds each learner must contribute N\$500 and for a parent living here , you know how we live in the north, most of this parents are old age people and the kids depend on this parents for this money, it will be like a lot for this old age person. It will real hinder now what you want to do there. The school coffer contributes but not to a full extent, of course they only give assistance but that can't be enough for</u></p>	<p>Create awareness for sustainability and appreciation of the EE</p> <p>T/SH-3 Need workshops by experts</p> <p>T/SH-3 Limited time to fit in practicals for EE</p> <p>T/SH-3 Head of EE centre needed for advice</p> <p>T/SH-3 Funds needed to support EE activities because parents and schools alone cannot afford the cost</p>
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everybody. The school money is meant for several activities not only for excursions only and just imagine how many teachers are in school in need of different things. This money can't be sufficient for every teacher.

The management can support, but the problem is only that they are also now in a difficult position, just because they understand it and it does not mean that they will help you every step of the way. Of course, they are willing to do that because every person in the management is advocating for the awareness of the learners, they want the learners to do better. It is only when they are exposed to the real environment for example. Of course, they understand it but the problem is the funds that is inhibiting now.

What did they do to make you think they understand it?

Foibe: they always explain for teachers especially science teachers, we are always encouraged to take now this learners to certain excursions to show them the reality of whatever is happening in the environment and you must make this learners aware, to real see also with their eyes that yes it is true that this is what is happening. For example now if I have to deforest what will be, what will be the effect for that. They are always encouraging us to do that.

6. What are the external obstacles to the implementation of EE?

Respondent:

Lack of training, I can say. Because now it's just like you have to incorporate now environmental studies into biology let's say but there is no specific person who is coming here to guide you, you like know this is what exactly need to incorporate environmental study into your biology lesson or life science lessons effectively. I think we could have like a training or several workshops then that would help. I am expecting that to given even by the ministry.

I appreciate the help I get from the community, if we ask them something for example the old kukus, you ask them how do I grow a certain plant? They will tell you. We work hand in hand with the community there is no way you are going to teach without now involving now

T/SH-4
Ministry need to provide training which enable teachers to incorporate EE in Bio effectively.

<p>this older people for example. So for example, the subject that we are doing here biology and life science, of course we know this old people know a lot about them. There several things that we can learn about this people - a lot that we can learn from them.</p> <p>We also work hand in hand with the hospital because we deal with health education for example. We always try to invite this nurses and the take the learners through because we believe they are at a better position and more experienced that use, because they are they are exposed to that real life situation. So we bring them in and then they educate the kids on the health related matters.</p> <p>7. Do you get support in terms of resources to enable you to implement environmental education?</p> <p><u>We receive nothing. What we do is, like we try to use local materials that we can find. I did not get something of that nature. And even last year I did not get a poster or something of that nature.</u></p> <p>8. Do you get professional support</p> <p><u>I have not attended any environmental related workshop</u></p> <p>Did you so far attend any workshop on biology?</p> <p>Yes. Just recently a couple of weeks ago, but that was just about looking at the content part, it was all about looking at the learners performances. Of course, we have talked about how we can relate real life situation to what our learners are learning in order to perform better.</p> <p>In those workshops, did they ever mention anything about EE or how you can incorporate EE in your teaching?</p> <p>Yes. Because now we have to look at different activities that you can give to the learners and what we exactly can give to learners in order for the learners to make sense of what we have to show to them for example.</p> <p>Can you remember exactly what they have said about EE?</p> <p>The only thing that we discussed the one that I can remember now, we can talk about adaptation for example, we looked at several plants and how this</p>	<p>T/SH-5 Lack of resources</p>
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<p>plants are adapted to the environment and we discussed about the features that help this particular plants to be adapted to such conditions.</p> <p>9. How has the implementation of EE affected your teaching?</p> <p>Of course, if you come to a particular topic if learners have no clear understanding of environmental concepts for example and then you have to go out there and then you know this thing let's say grade 10 and 11, you know there is a connection you continue from where you left . let's say now this particular learner had a problem with a certain environmental concept and you have to continue with them to the next stage, the problem will be like now as soon as you start talking about something that they were not clear of may be the previous year then it means now the whole process there will be inhibited. I means that you expect this learners to perform poorly in answering a particular question about that particular topic. It can real have an effect to that extent.</p> <p>I also have limited knowledge on that's why I think the ministry should do more about workshops so that we are aware of what exactly we must teach these learners. <u>Having limited knowledge of course shows that you won't be effective with the limited knowledge which you have and we know things are changing now there is new discoveries and new studies and if you only have knowledge from some years ago, it means that knowledge is outdated and it's like you are limiting the learners as well.</u></p> <p>10. How were you involved in the development of the new curriculum?</p> <p>Respondent: <u>I was not involved at all.</u></p> <p>How did you get to know the new curriculum?</p> <p><u>There is this thing of sending whatever is developed to schools. Of course, you get to know by just going through like that but of course you are not even given any workshop, you are not part of this developers. Otherwise it was going to make a lot of sense to you</u></p> <p>If I have a better understanding of something that I would be at the better understanding of exposing it to learners, instead of just receiving it at the end and no one is like taking you through.</p>	<p>T/SH-6 Limited knowledge leads to ineffectiveness in what one is doing.</p> <p>T/SH-6 Not involved in curriculum development. Curriculum sent to school without development to make sense of it</p> <p>T/SH-7....T/SH-8 Developers do not know what is happening in classrooms</p>
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<p><u>There is several things which developers do not know about, these are certain factors which can inhibit also this environmental education to be well incorporated within our lessons . of course some of this developers, they were not exposed to real life classroom situation because there is some instances where they just say: you must view this under a microscope, you must do this using whatever technological instrument but they are not taking into consideration that let’s say for example our schools here in the north we only may be have one microscope per school or none, how do you expect that to be effective. My contribution could be now to inform them to visit schools to find out what is real going on in that classroom every day. It is not just standing there, and say because it is a school view this under in the microscope. How are we going to do that if we don’t have that resources. My contribution could be to inform them about the real situation that is going on in schools and the experiences that we have as teachers.</u></p>	<p>T/SH-7 Workshops needed</p> <p>T/SH-7 Excursions to be made compulsory</p>
<p>11. What do you think could be done better to implement EE</p> <p><u>More information is needed through workshops, which can be expected from the region, it can be like circuit-based thing or a national thing, I think it will real help. Excursions should be compulsory because now excursions are only there if teachers initiated them. But it should be done like learners of this grade should go for excursion because of this thing which they learn in biology. Of course we know we have different environments, there is those who are living at the coast for example they don’t have to go anywhere to look at the sea or whatever because is already there, it is exposed to them already but for people that are living far it better for them to be compulsory.</u></p> <p><u>Now in case of subject management to be specific, I think it can also be a better idea if we can meet regularly and come up with ways about how we can effectively incorporate EE within our teaching. Of course you know that, they always say that 2 heads are better than one head if we are many we can come up with variety and then the suitable one which can help us incorporate EE effectively.</u></p> <p><u>The management should also try to initiate some of the</u></p>	<p>T/SH-7 Teachers need meet regularly to discuss ways of how to implement EE</p> <p>T/SH-7 Schools should generate funds to cater for excursions</p> <p>T/SH-7...T/SH-8 Conservation biology attended but no teaching methods attached</p>

<p><u>ways in which we can generate funds to they can encourage some of the stakeholders to fund for the excursions.</u></p> <p>12. Did you receive training to teach EE at UNAM? Yes. <u>We did conservation biology at UNAM, where we learned about EE.</u></p> <p>Did you learn about methods to be used in the teaching of EE Foibe: <u>No, Biology is taught in the science department and they have nothing to do with education.</u></p>	to it
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Interviews for transcripts Participant 3	Points taken from the transcripts
<p>1. How do you understand the concept environmental education?</p> <p>Respondent: <u>Environmental education is whereby people or learners are made aware how to care about the environment and at least to apply methods that are not harming the environment so that may be the next generation can benefit from the environment.</u> This can include factors which cause global warming, factors that are causing may be what else, may be deforestation, wind erosion and others.</p> <p>2. How important do you think is environmental education</p> <p>Respondent: <u>Environmental education is very important and this one is to many aspects but let me start with the very important ones, the generation to come if you are not caring for the environment the generation to come won't know what the tree is, they won't know, may be that they will talk of the flood, they will talk of the sea rising, they will never know if swakopmund was there and again it help people just to be aware that yes that we are environmentalists. And it also help it help nature resources just to be conserved. I think those are the points I am having.</u></p> <p>Yeah, specifically I will say it's important to teach EE I will say in biology and also in all subjects in general. <u>Because basing on my first argument that for the next generation to know that there was this things, there was a tree of this type, there was something of this type they must know that one through us who are here now to conserve the environment.</u></p>	<p>T/NAT-1 Awareness of how to care for E</p> <p>T/NAT-1 Awareness of how to apply methods that are harmless to EE to benefit the next generation</p> <p>T/NAT-1 For the future generation to know nature</p>
<p>3. How do you understand the way environmental education is incorporated in the biology curriculum?</p> <p>Respondent: <u>In case of biology curriculum I think it is just there two % because there you can just talk of this cycles and once you talk about the cycles that learners wont real be aware they will just say Ok this one are just problems but once you make it may be to cover 10% of the environment it will help the learners to become aware of the subject itself or the problems and consequences it might have.</u></p> <p>Researcher: What does the curriculum say about the incorporation of environmental education</p>	<p>T/NAT-1 Less is covered</p> <p>T/NAT-1 Did not read</p>

<p>Respondent: <u>Ok there I did not real go through it but I think it is also part of the curriculum where we have to make the learners aware.</u></p>	
<p>4. Do you implement environmental education in your practice as a biology teacher?</p>	<p>T/NAT-2 Implementing but there is a contradiction</p>
<p>Respondent: <u>Yes, we are implementing it for example in case of deforestation , you have to make the learners aware that one you cut down trees it will be a problem and again another problem will be that we are at rural, you say learners should not cut down the trees for firewood at the same time you tell learners not to have firewood to cook food to eat, you see where the problem is. But we are trying we are trying we are implementing it.</u></p>	<p>T/NAT Inform them about new ways of living but people can't afford.</p>
<p><u>You see what am doing once I am at that specific topic, I will let them be informed that on the renewable and again on the problems for renewable some of us cannot afford that renewable for example may be having a solar system in your house, we cannot afford and may be to buy a transformer to have in the house we cannot afford.</u></p>	
<p>Researcher: <u>you said you implement environmental education and in a way you have also mentioned what you do. How do you do it?</u></p>	<p>T/NAT-2 Teaching theory in class and relate to real life outside.</p>
<p>Respondent: <u>Ok, like in case of, I can recall one time , I went there (pointing) down there at the forest there, then I was talking of : now just imagine, we have this forest , let's assume we cut down all the trees , how the wind will blow then they say it will blow fast and cause soil erosion. Another case also related to biology, you said human being and plants are helping each other, in what way they are helping the human beings? Now let's remove one, what will happen, obviously once we remove one for example the trees now human are going to suffer. You are going to hear in future no enough oxygen something like that one. In the class I mostly do the theory and may be just may be make them aware of what I m talking about before I go in the field.</u></p>	
<p><u>I can say I am lucky, for most of my lessons I have double lessons which is almost an hour and I can spend I can just go in the nearby bushes there then I can just explain is not a real field trip. Yeah.</u></p>	<p>T/NAT-2 Planning for excursion</p>
<p><u>Now we are planning for a field trip, especially for science. The one we had 2009 it was mostly on geography. We went to the sea and the desert and we were mainly discussing this</u></p>	

<p><u>things of geography, we did not real include this things of Biology and other things.</u></p> <p>5. What are the internal obstacles that may hinder that implementation of environmental education?</p> <p>Respondent: <u>One, it will be time and the other can be resources and resources can be money, for example let me say I am taking my learners let me say to Etosha, obviously you need money and our parents mostly cannot afford.</u></p> <p><u>Again the other one is... this one is the major one and can go hand in hand with the transport. For example, the government and mostly the region, I don't know if they can say, they don't have enough buses for learners to use or they are stingy with the buses.</u> But those are the main ones for example I remember when I was one of the organizing committee when we went for a tower, the main problem was money, learners cannot afford to pay but learners are willing to go and transport and time itself. You can go once u spend there for too long you spent more money, once you stay for a short time learners won't get the details. That is what I mean by time.</p> <p>I like the management in this school because they give us support, for example like in June, we are planning to go to Ruacana and because we know that our learners cannot afford, the school itself will be responsible for the cost of the tour to Ruacana for one day only. That is in science because it is a science club which is going there. The science club include Biology and other subjects. I can say the principal as a manager understand also even if he is a mathematics teacher. because also he always complains about learners vandalizing the trees here.</p> <p><u>In terms of teachers' assistance, it is rare , very few can assist but what I can say is that many teachers do not care with the trees being damaged.</u></p> <p><u>The other problem is the work that is I do, you talk of marking, teaching, hostel work and other. That one again is a problem, you see I don't know really what I can say, may be is time management or not. Also marking and others and other activities we are involved, they also prevent to be real involved in environmental issues. Just imagine that I want to have a lesson in the field and I have 400 books to be marked or I have certain work to be done for example a meeting or may be a meeting with learners also misbehaving also that</u></p>	<p>T/NAT-3 Funds for excursions because parents cannot afford</p> <p>T/NAT-3 Government buses are difficult to get</p> <p>T/NAT-3 Lack of support from teachers</p> <p>T/NAT-3 Too much work and teachers choose to do what they think is more important than EE</p>
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<p><u>will keep you from going there. And there you will make it like that one is not really important like this one. They are also put pressure on us those marking and others.</u></p>	
<p>Researcher: Which one you might think is not important? Respondent: The environmental thing</p>	<p>T/NAT-4 Regional office seems not to have enough, transport needed for learners to experience nature</p>
<p>6. What are the external obstacles to the implementation of environmental education Respondent: <u>I think on that one external I have to go to the region. May be the region they don't have enough buses or I don't know about how they allocate buses to the schools. For sure and I know about that one if I say I want to go with the government bus to the tour once I book this month, I will go there either December or January, what they will say is that one is booked or something like that one. The region does not have transport for learners to experience what nature hold for itself.</u></p>	<p>T/NAT-4 Have never attend workshop on EE</p>
<p><u>There is also a problem of workshops. I have never attended one.</u></p>	
<p>Researcher: Did you attend workshops in biology? Respondent: Yes, I attended even just last week, there was a workshop.</p>	<p>T/NAT-4 EE related matters are not included in Bio workshops</p>
<p>Researcher: what did you discuss in the workshop about environmental education in the biology workshop? Respondent: <u>Ah, ah (shaking his head) that one will only depend on the topic which was there but in this case if I recall very well there was no topic on the environment because our main topic was on marking.</u></p>	<p>T/NAT-4 EE is not discussed in Bio workshops</p>
<p>Researcher: have you ever attended one in which EE is mentioned? Respondent: <u>I never attended any, where EE is mentioned since I started working, but it is very important to know how to create a proper awareness because if you make learners aware you make the community aware because learners are not staying here they are staying at their houses where, mostly at the rural areas and if they are aware about the damage to the environment , then they pass the message to the community in general.</u></p>	
<p><u>I failed in inviting people to plan with me. But inviting people is important like sometimes I invite nurses even if not, to talk</u></p>	<p>T/NAT-4 Teachers need to use time wisely to finish the syllabus and prepare learner for exams.</p>

<p>about environmental education, it's for methods of birth control. <u>But inviting people to talk about things which we already have in books is a wasting of time since we are expected to finish the syllabus and prepare learners well to pass the final exam.</u></p>	<p>T/NAT-5 Resources not provided.</p>
<p>7. Do you get support in terms of resources to enable you to implement environmental education? Respondent: <u>We have some, in my class there is one, but this are old posters I don't know even if we are the same age with them very very old. No one ever came to me with resources but we real need them.</u></p>	<p>T/NAT-5 No development for EE</p>
<p>8. Do you get professional support from anywhere? Respondent: <u>No I never attended any workshop on environment what may be what people normally do they only focus on the academic like e.g. how to mark, how you must have this remedial classes</u> but no one will say I am going to but this resources for you to improve. Ah, nothing like that one.</p>	
<p>9. How does the implementation of environmental education affect your teaching of biology? Respondent: We look at the positive things and the negative things and we have to look at the assessment. Are the people assessing environmental concept or what? In case of positive, I think learners are made aware the problems is only that. It is too little, on plants and last last is where you have topics like for example (searching through the syllabus) topics like mmmh evolution and damage to the environment and conservation and they are there but mostly they are not even being assessed, not assesses like other topics. You see when we are teaching, we are teaching everything and people who are assessing , they are selective, and learners as they have resources like question papers and others, they find out that this unit or chapter is not asked often then it is also discouraging. They will then not even focus on the simple information we are having here(pointing at the syllabus). <u>Another thing is that I feel I don't have enough knowledge about how to implement environmental education</u></p>	<p>T/NAT-6 Negatively affected because of lack of knowledge.</p>

<p>because I think also myself luckily I did what I did, I did this geography and I can combine my knowledge of geography and biology. Let me say at the tertiary level at UNAM where I came from, we did a little of EE in Geography but in Biology we did real small for example deforestation. Deforestation in geography is mostly there, you have to know that this one is occurring this one this one is not. In biology, you give the definition according to the syllabus and how it occurs.</p>	<p>T/NAT-6 Involved very little</p>
<p>10. How were you involved in developing the curriculum Respondent: <u>It is hard to say, I think the people from NIED if I can recall very well, there are some professor who was here I can't recall the time very well they were here and there were that something. I think I was involved to a little %.</u></p> <p>Researcher: To what extent were you involved, how were you involved and what did you do? Respondent: <u>Like those people who were here from NIED, they were asking me: which topics do you think should be covered more when it is coming to Geography? and gave him a few topics but its few degree but they did not tell me they were asking in order to develop a curriculum its only now when you are asking that I think it was because of that.</u></p>	<p>He was asked to list the topics which he think could be taught more. But did not know it was for curriculum development</p> <p>T/NAT-6 To involve current teachers is important because previous teachers don't know what is happening in classes today</p>
<p><u>I am of the opinion that it's good to be involved because people like the curriculum developers may be they are having this knowledge from the background one, but as time changes if you for example were teaching Biology in 1995 that knowledge from that time has already changed that demand from that time is not the demand for now. Nowadays, once you are saying you come up with something you need to consult people at the roots of it. You just don't do this basing on a paper that you have to do this one or this one.</u></p>	<p>T/NAT-7 Separate subject is needed to detach EE from science because of the contradiction between them</p>
<p>11. What do you think could be done to improve the implementation of environmental education? Respondent: <u>I think is to implement environmental education in all the subjects, if not that one may be we can have a specific subject which deals with environmental science. Because educating scientists who cause environmental problems as we said, can cause contradictions. Educating a scientist with the environmental education is opposing because for example a scientist will decide that I will have a nuclear station here and again the</u></p>	

<p><u>on other hand will say no the nuclear what about radiation</u> In schools, we should make every one aware. This can be done by making a meeting where you can invite someone who is specialized on environment and may be tell you about the problems and the consequences of it if you are harming the environment. Or you want something from the environment but you are not giving it time to give it to you, to recover so to say.</p> <p><u>You need an expert to come and explain to the whole school community including the management so that there will be no one to oppose. Also the region needs to organize workshops on environment in those workshops experts in the field should be invited.</u> Yeah, it seems there is lack of planning, if this thing could be well planned, recourses and funds could be made available. Or if the government doesn't have money may be to have recourses like when you are introducing new experts on that one, may be they can try to get donors for them at least to implement.</p> <p>12. Did you receive training in environmental education in your pre-service training? Respondent: Yeah, as I said, I did to the certain degree because if I compare the training which I got in biology, you can compare it to geography. Researcher: Did you do teaching method of that environmental education? Respondent: AA. <u>Do you know where the problem is again? They are not incorporating biology with education. You are taught biology there on its own and you are taught education on its own.</u></p>	<p>Workshops needed where experts are invited</p> <p>T/NAT-7 Did environmental related subject detached from teaching method?</p>
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Interview transcripts Participant 3	Points taken from the transcript
<p>1. How do you understand the concept environmental education Respondent: If I remember in Grade 1, no no, in Grade 3, there was a subject talking about environmental study and mainly <u>it's talking about environment itself where human are, how food is prepared, how people are taught how to conduct themselves.</u></p> <p>2. How important do you think is environmental education Respondent: Yeah, it is important. In biology I think there are a lot of topics that talk about EE, so so like there is personal hygiene, the way of living, conservation for example, all this things are talking about environmental education. <u>It helps learners with how to conduct them, how to keep themselves clean and how to keep their places where they stay.</u> Is not only that it is helping them thereafter, how they will be able to live for example the difference between sewage and clean water, all this are environmental problems, how to conserve some of the endangered species for example, so I think it will help them in life. It is very important.</p> <p>3. How do you understand the way environmental education is incorporated in the Biology curriculum Respondent: More or less. <u>I don't real know how but more or less.</u></p> <p>Researcher: What do you remember about that? Respondent: Ok, like now the way they incorporate environmental for example in Biology is like they are dividing like the, <u>I think it is wrongly included in the Biology curriculum because it is more like telling kids I mean learners for example that the environmental studies is only about living</u></p>	<p>T/E-1 Talking about the human environment</p> <p>T/E-1 Kids learn how to be hygienic</p> <p>T/E-1 Don't know</p> <p>T/E-1...T/E-2 Referring more to Plants and animals</p>

<p><u>organisms. They are either only concentrating on plants or on animals or this things of nitrogen and carbon cycles without even thinking about the other things which are now which are personal hygiene, they think who ever now have come up with the curriculum that think environmental studies they think environmental education is only how non living and living organisms interact that is how I see it.</u></p> <p>Researcher: Have looked at what other parts of the curriculum like the rationale and aims of the biology curriculum say about environmental education?</p> <p>Respondent: <u>Not really</u></p> <p>4. Do you implement environmental education in your teaching</p> <p>Respondent: Yeah, I think so</p> <p>a) What do you do?</p> <p>Respondent: <u>In most cases, when you are teaching, most of the concepts that are in the syllabus somewhere somehow environmental study is included. For example when you are teaching certain topics let's say even circulation, blood circulatory system, so environmental study is there because it is part of that topic also, the kids are learning for example how to take care of themselves when it is coming to heart problems the type of food they need to eat, how to get them from the environment, so I think it is included.</u></p> <p>b) How do you do it?</p> <p><u>There are some of the things that you give a task for kids to go and collect things from the environment, that is one way of doing it like they go out into the environment either around the school or at home and then they get those things and then we come and discuss with them at school. That is what sometimes happens because in most cases we are just within the boundaries of the curriculum.</u></p> <p>5. What are the internal obstacles to the</p>	<p>T/E-2 Have not checked what the entire Bio curriculum say about EE.</p> <p>T/E-2 Unsure</p> <p>T/E-2 Teach it where ever is applicable.</p> <p>T/E-2 Sending to collect things from the environment.</p> <p>T/E-2 Teachers are confined by the curriculum</p>
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<p>implementation of environmental education?</p> <p>Respondent: Sometimes the kids might not bring what you send them to collect because they don't know their environment. <u>I think that is one of the problems and may be what I think is there are some of the things we need to learn for example with the kids but they are not to their exposure.</u></p> <p>Researcher: Give examples of what is not exposed to them</p> <p>Respondent: <u>If we want to learn for example about wild animals some of the animals we would like to view are not to our exposure, we need for example to use funds for us to be able to go and get we especially want to, which we might not be able to do. Because we may not have enough money to take that certain trip to go somewhere. We tried that but sometimes we failed sometimes the fund is not enough.</u></p> <p><u>Sometimes you initiate something, the thing is there and you are suppose to do it with the kids but because of the poor understanding we just leave those topics. The poor understanding I am talking about is the poor understanding of the teacher about the curriculum properly of what you are suppose to do to get certain information.</u></p> <p><u>Let me go ahead, the office of the principal of the school is sometimes also a problem, sometimes the people might not even know what you are talking about they don't know the importance of what you want to do. You know because you have read, you know it will help the kids but otherwise not see the importance of it so they will not provide the money that you want to use. Also in Biology to make someone to understand you, you need teaching models until now we don't have those things, maybe we can go to edumeds and get some but we don't have enough cash to buy those models.</u></p> <p>6. What are the external obstacles to the implementation of environmental</p>	<p>T/E-3...T/E-3 Funds are needed for learners to be able to learn what is not to their exposure</p> <p>T/E-3 Lack of curriculum understanding by teachers cause teachers to skip some of the things</p> <p>T/E-3 The management does not provide funds if they don't know what you are doing</p> <p>T/E-3 Parents do not provide what is requested by teachers because they do not understand</p>
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<p>education?</p> <p>Respondent: <u>There are sometimes what we need to use but sometimes the parents do not understand, they might not provide what the kids are send to bring to school. So regionally, I think the ministry is not doing enough because they are suppose to help teachers with the implementation of the curriculum, which now we are talking about the environmental studies, sometimes if workshops are not conducted teachers would not be able to have knowledge in how to teach certain topics.</u> <u>I can talk also about transport , most of the times schools do not have gardens and just to save time you plan to take your learners to a certain project, let's say Etunda project there, since now the school does not have money you ask transport from the regional office they will answer you that they don't have transport but transport are there.</u></p> <p>7. Do you get support in terms of resources to help implement EE?</p> <p>Respondent: Yeah, yeah, like we visit clinics and conservancies Yeah those are some of the external help that we get. <u>But from the ministry ah not really because for example when you teach high level when you even request for chemicals they don't real provide, they only do that during examinations but when you want to do practical things like here they hardly provide they will tell you that the school suppose to buy or they will either they, they won't help and they school only buy sometimes when they are able to. We have nothing just imagine we don't even have a microscope at school. We don't, we we we the very few resources that we have they will not be able to help us. We still need more. Yeah some of the companies are helping like Nampower we the previous year we told them we don't have a lab but at least they promised that they are going to build us a lab, they were here again last week, that is something.</u></p>	<p>T/E-3 Workshops needed to help teachers to implement EE curriculum.</p> <p>T/E-3 Lack of transport for learners to reach what is not available in school surrounding.</p> <p>T/E-4 No resources are provided by the ministry, only for higher-level examination.</p> <p>T/E-4 Some companies trying to assist with resources.</p> <p>T/E-5 No development for EE</p>
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<p>8. Do you get professional help to enable you implement EE?</p> <p>Respondent: <u>Not really, environmental education, they don't mention specifically environmental education</u> because to them somehow you would want to think that environmental study is something different like it is not part of the curriculum, so it's like something else. Not really. When you are teaching life science or biology it's not is only partly included like a certain topic like HIV, that is how it is understood. That is why it is not really mentioned at workshops. During workshops when you are in the workshop is not really about environmental study they only talk about a subject biology and then the concept that are there the think there is little concept that are included in that which is now called environmental study.</p> <p>Researcher: But do they help you to understand the way EE is suppose to be taught?</p> <p>Respondent: No</p> <p>9. How has the implementation of environmental education affected your teaching?</p> <p><u>Somehow it has affected my teaching, because due to the fact in term of obstacles I gave you, it affected it since we are just now teaching theory.</u> Yeah, learners well end up just understand the thing but they don't know the things in reality, so I think it's much better if let's say everyday you talk about Impala but kids did not see it if it comes in examination in terms of a picture if the name is there, then learner will fail because they did not see it before.</p> <p>10. How where you involved in the development of the curriculum?</p> <p>Respondent: <u>No, not at all. Just to your surprise, here is the curriculum you have to teach that subject but how the curriculum was developed or how they come up with that curriculum so we were not conducted. These documents were just sent to schools and teachers have to start using it.</u></p>	<p>T/E-5 Affected because only able to teach theory.</p> <p>T/E-5 Not involved in curriculum development</p>
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<p><u>We did not even hear that people are busy developing the curriculum.</u></p> <p>Researcher: do you think it is important to be involved?</p> <p>Respondent: There, I think we need to be part because some of the topics now I think you need to. This people who are developing the curriculum they put in things even themselves they did not research. So topics are there. Difficult for teachers to teach them to implement it, even if you ask this people who developed it they will not give you a hint on how to teach it, why did they include it in the curriculum. When we are included there we will be able when we are taking part at least when you go back to school you will be able to know how to conduct a certain topic. We know the kids better and we know what kids need, they have been teachers but <i>aaaaye</i> they don't know perhaps they are following the guides which they are using but they don't do the things as they are happening in the real world.</p> <p>11. What do you think can be done to improve the implementation of environmental education?</p> <p>What I think can be done? <u>The environmental study as a subject should be implemented at the University level. When you are trained to be a teacher you should also have environmental studies as a subject, that will help with the implementation of environmental education in schools.</u></p> <p><u>What the government should do is to provide funds for people to further their studies in environmental studies so they should provide the funds and provide everything necessary.</u></p> <p>12. Did you receive training in EE during your teachers' training?</p> <p>Respondent: <u>No. Not at all, I will rely on you when you come back.</u></p> <p>Researcher: Thank you for your great contribution to my work.</p> <p>Respondent: Welcome, Nyeuvo</p>	<p>T/E-6 UNAM to introduce EE</p> <p>T/E-6 GRN to provide funds for teachers to study EE</p> <p>Did not receive training in EE</p>
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Interview transcripts Participant 4	Points taken from the transcripts
<p>1. How do you understand the concept of EE? Respondent: The concepts we are talking about the environment, and the environment is normally referring to the place where you are living, so it can be in the school were you a living can be in your village , can be in your region or overall the whole country. and then we add now that term education so were by <u>we are looking at that we need to understand the things they are living in the environment of that composed of what to be called environment, so we need to understand the nature of those living organism and non living.</u> So that is where I am putting my emphasis on the term environmental education so we need to <u>study of what is in the environment for us to be able to associate with them and also those organisms to be able to associate with us.</u> Yeah, yeah.</p> <p>2. How important is environmental education to you? Respondent: <u>It is very important because in the classrooms of today we are taught to keep our nature safe so that the young generation they should still have a room to understand what existed and what is going to be existing for the other new generation to come.</u> <u>So there is a need to observe that, knowing that, in the nature referring to the animals we depends on them, referring to plants we depend on them because we are getting food from them, so destroying the nature we are destroying our life.</u> We need to understand to be educated to keep it going on. So, I look at it as important to teach EE in biology because in biology we are concerned with the living organisms in most cases. <u>We need to understand our bodies; we need to understand the plants that we depend on so it's out of the plants were we are also getting these medicines that we need to keep ourselves to be alive.</u></p> <p>3. How do you understand the way environmental education is incorporated in the Biology curriculum? Respondent: <u>It is normally concentrating on the point of knowing our nature.</u></p>	<p>T/KO-1 Understand what the E is composed of, to understand living and non-living</p> <p>T/KO-1 To study to associate with organisms and vice versa</p> <p>T/KO-1 For future generation to know nature</p> <p>T/KO-1 Organisms are interdependent</p> <p>T/KO-1 Understanding plants is important because they provide medicine</p> <p>T/KO-2...T/KO-2 EE not well highlighted in the syllabus</p>

<p><u>It is like environmental education is not well highlighted in this, yeah, this syllabus of mine, yeah, I may not get a well-defined clue. Sorry.</u></p>	
<p>4. Do you implement EE in your practice as a biology teacher?</p>	<p>T/KO-2 Implementing it</p>
<p>Respondent: <u>We are implementing this, I am implementing EE. And biology that we are going to do them in the future because there are some topics in biology which have a relation to the environment so not to mention here that the body is also, to prevent disease we are hammering on that, yeah. And there is also a number of factors also to the environment itself (the nature), so there are some topics which is also highlighted in of this so we are putting it into practice. I remember also teaching it, I think that is also environmental education when you are talking about reproduction and then we went as far as touching about the diseases and talking about the diseases in I use to put emphasis put emphasis now going even out of the book which of what is given and then give a brief to the learners how they should go about to take care of themselves of not to be infected with virus diseases and what is the importance of someone to keep her body safe or the importance of taking care of one's body before getting married or yeah what are the benefits and what could be the disadvantage if you were so, what disadvantage of playing around with your own body the way you feel at that point of time you were sure, what will be the consequences after all, yeah, those are some of the issue I highlighted to them yeah, and I used to sound.</u></p>	<p>T/KO-2 Teaching it through topics which are related to EE.</p> <p>T/KO-2 Teaching it when teaching reproduction and STD</p>
<p>b) How do you do it?</p>	
<p>Respondent: The curriculum said we use learner centred approach. Learner centred approach is a method which is just brought recently when you can say after independence but the concept may get meaning when it is new but once the concept lose its value and the system may require to be changed now, well I use all the methods but mostly you find me using a learner-centred approach sometimes or most of the time and only it comes a time when you find it may be some learners they favour what some they favour what</p>	

<p>and when you engage them maybe in sort of debating a little bit, yeah, for them also to cover their ideas now hearing from this group and hearing for the others and for them to come out now with what is maybe really important is what our colleagues are saying or is maybe what they are saying they end up with something in minds that they are not maybe we should go this way.</p> <p><u>This learner centred approach means learners should be grouped and discuss in their groups now you find few are getting something others are not taking part but is it still learner-centred. They say learners should do 80% while teachers facilitate. In this case is impossible for me to restrict myself but to teach the way I feel they will understand. So I will not utilize that I should only teach 20% but I might do 80% and for them to do 20% looking at the level where they are. It is not meaningful for me to result myself to 20% while the learners are not benefiting from this method.</u></p> <p>5. What are the internal obstacles to the implementation of environmental education</p> <p>Yeah, I should say yes because these are different fields in the school now. <u>When it comes to the management, they need too information about the those environmental education, yeah, there might be some in the management who are shorting information about the environmental education so, therefore, yeah, there is a need in the management itself to get that information so that they will be able to support the teachers in the environmental education.</u></p> <p>6. What are the external obstacles to the implementation of environmental education?</p> <p><u>One of the factors I may bring to your attention is that I may be expected to do a lot of things about environmental education and other things but how to do it is a challenging obstacle. I don't know if this is an internal or external obstacles.</u></p> <p>7. Do you get resources to enable you implement environmental education?</p> <p>Respondent: <u>not at all, not even in biology we get.</u> Those posters you will see in my class are made by the</p>	<p>T/KO-3 Using teacher centred approach mostly</p> <p>T/KO-3 The management need information about EE, so that they can support teachers</p> <p>T/KO-3 Lack of knowledge in what teachers are expected to do like EE</p> <p>T/KO-3 Do not get resources</p>
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<p>learners themselves with my guidance. I expect at least the advisory teachers and the region to offer them. Yeah. But sometimes you may end up frustrated if you phone the region they get nothing also so... there are many things like me I use to require from my advisory you may end up sitting in your office you want to learn.</p>	
<p>8. Do you get professional development to enable you to implement environmental education?</p> <p>Yeah, we do get Biology workshops , even last before last week I had one teacher went attend that professional in biology and even last year at the end of the year there was another one who attend that workshop. Myself I did not attend I did not go I only delegated my colleagues to go there because I was also busy again with other activities which not allow me to go there. Usually I only attend the physical science because I am a facilitator there, I have never attended one in Biology.</p>	
<p>Researcher: what did they say about EE in the physical science workshops which you attend?</p>	
<p>Respondent: you asking questions now I want to say 80% no. they don't, they normally focus only on the content of what you have to take to your colleagues but even though maybe it was maybe we need to think that it should be an independence subject.</p>	<p>T/KO-4 Feel uncomfortable that learners to dot pick up anything because of the lack of knowledge in the methodology.</p>
<p>9. How has the implementation of environmental education affected your teaching of biology?</p>	
<p>Respondent: Yeah, teaching is gaining experience so if you are starting at the first point <u>you maybe have some short of information when you give to the learners, maybe you see to it as either they are not picking it up or they don't feel maybe that it is important and you maybe feel the methods you are using if it was not more effective. and you see some documents, some plays a role so... You get worried on which note are you sounding for people to take it serious so is also important</u> but as time goes on you are trying to improve on giving those information until such a point when you feel that Yes now the learners they are at a position now for them to get this information, and the way also they start also questioning. So it is a way now</p>	<p>T/KO-4 Was not involved T/KO-5 Don't know where</p>

<p>of looking to that now this is now somehow related to the knowhow to bring change. <u>I lack the knowhow, my sister. A lot.</u></p> <p>10. Where you involved in developing the curriculum?</p> <p>Respondent: <u>No, I should give you a negative answer by saying no. No, no I was not. Because they normally the curriculum is developed by developers and those developers we are saying they are the stakeholders they are taken from different communities so I was not part of them. And I don't know from which side they were taken. May be from Windhoek or where I don't know.</u></p> <p>Researcher: Do you think it is important for you to be involved in the curriculum development?</p> <p>Respondent: <u>it is important in the sense that this curriculum developers so those who are called who develop this curriculum, I only think or I might be wrong that: among those who developed those curriculum there should be teachers who are representing teachers.</u></p> <p><u>Yeah, here we are talking of experience. Experience, from there if you become a curriculum developer you gain a wide knowledge you will contribute much to what maybe is significant to be taught to the learners only if you become part. that first you learn and then once you learn and you hear about what your colleagues are saying. you contribute your little knowledge and as you are there then your knowledge will extend. as your knowledge extend then you are learning in the process you may also find what is not good and then you debate that, that, maybe this is not good for this level or need to be not in or what we are leaving out is important it must be in so through the debating of that.</u></p> <p>11. What do you think could be done to improve the implementation of environmental education?</p> <p>For EE to be implemented better is only if there is re-enforcement, if re-enforcement is there. but not that much. Its better if the curriculum is there in front of</p>	<p>stakeholder in the development came from.</p> <p>T/KO-5 Not sure if teachers are suppose to be part of curriculum dev.</p> <p>T/KO-5 Through curriculum development teachers contribute and learn from other</p>
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you, informing you that you should put it in practice what do you expect again to come from outside? As a teacher implementing it so, we need also to learn not to dependent but to be independent. You are given the information to give it to the learners, so give it.

Yeah, maybe we should talk about money for you to take this learners out so, the school coffer will not able to cater for your needs to take the learners out, now externally we may depend on parents but still they are the one paying the money already in the school for kids. For environmental education they might be willing to pay but they don't understand this environmental education.

12. Did you receive training to teach environmental education in your teachers' education?

Respondent: No at UNAM or maybe I should say yes or I may be talking under correction. When I was at UNAM I use to be taken to the forest there to study organisms and insect, ok I did not enjoy it due to the number of reasons, I was just alone because my colleagues did not progress well. Studying classification of trees and plants and others so I have done it. I don't know now whether that portion that I have learned is really playing a role on what we are discussing now or maybe there is something left out that need to be brought in so that one maybe should get it from you.

Researcher: In which subject did you do that?

Respondent: I have done it in ecosystem ecology, oh two subjects this ecosystem I have talked about and conservation biology.

Researcher: Did you do teaching methods about those parts of environment?

Respondent: I cannot recall if I have done those methods of teaching environmental education, I can only remember when I was doing some practical there in the bush. No it was related to biology.

Researcher: Ok. It was a very interesting interview. Thanks for accepting to be a participant in my research.

Respondent: Welcome, all the best with your studies

T/KO-6

Confused whether what he has done in ecosystem ecology is EE or not. But later recalled that it was not connected to teaching methods

Researcher: Thanks	
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Interview transcripts Participant 5	Points taken from the transcripts
<p>1. How do you understand the concept environmental education Respondent: something to do with the environment, I don't know I am not teaching it but if I am looking at the environment it just something that is like maybe you are looking at the way you are looking , I don't know. But look at it in what way, <u>even if we are talking about nutrition it goes back to the environment we are getting the food from the environment but the topic that mainly concerns the environment as besides when we deal with ecosystem and so far.</u></p>	<p>T/K A-1 When dealing with ecosystem</p>
<p>2. How do you think environmental education is important ? Seems of what I have in the syllabus like now how to <u>take care of our environment its important but because I mean it has to do with the future if you did not take care of the environment than we will have problems.</u></p> <p>Yes, it important this learners that we are teaching here they are the future leaders and this are the one that have to take care of the environment. for example if I can give you like now an example of global warming <u>so if they are not aware of what is happening and even if they go in their work related environment or whatever, say they won't know how to take care of the environment, so it will become worse and worse, so we need to at least inform them of this things or whatever.</u></p>	<p>T/K A-1 Prevent future environmental problems</p> <p>T/K A-1 They should know how to take care of the environment to prevent the worsening of environment</p>
<p>3. How do you understand the way environmental education is incorporated in Biology? Respondent: <u>it does not say anything but it does not say anything it is just part of the topics I have to teach.</u> <u>Because we are teaching about living organisms but they don't leave in isolation we live in environment so that's why we have to look at after habitants and all those things.</u></p>	<p>T/K A-1 Said nothing</p> <p>T/K A-1 Teaching about living organisms</p>
<p>4. Do you implement environmental education in your teaching Respondent: <u>Yes, it's required by the syllabus so!</u></p> <p>a) What do you do?</p>	<p>T/K A-1 Implement it</p> <p>T/K A-1 Teach according to topics</p> <p>T/K A-1</p>

<p>Respondent: <u>I only teach according to the topics</u></p> <p>b) How do you do it? Respondent: <u>Just my normal everyday method</u></p> <p>Researcher: Which method do you use every day? Respondent: <u>I present the lesson that I involve the learners, they come up with their suggestions if we are doing group work that day just depend on the lesson for that day in our classroom</u></p> <p>5. What are the internal obstacles to the implementation of environmental education? Respondent: <u>Transport, yes, if it's not there you cannot take the kids out.</u></p> <p><u>Then the time also it's always a problem, you don't only one class you have hundreds of kids.</u> <u>And I telling you in this community I find myself teaching, income is a problem very very poor, don't even make a mistake that you are organizing something to go out, you already know before you start that you have failed.</u> <u>This is even a new topic to me it has never been talked about we don't understand it here, we don't talk about it the obstacles you don't know where to start it is like everything is obstacles plus myself.</u></p> <p>6. What are the external obstacles to the implementation of environmental education Respondent: <u>I can't say no because it's not something that really I look at it as environmental education in such thought. Yeah but I don't see any obstacle from outside only maybe when really I get involved with it that is when I can say, when you have your hands on it because up to this point I cannot say anything about external. I have both knowledge and expertise about what I am expected in my syllabus and if there is something extra outside the syllabus. I don't teach it because I need the knowledge in it and then go on. I don't teach things I don't know.</u></p> <p>7. Do you get support in terms of resources to enable to teach environmental education? Respondent: <u>Wow! Biology, yes, Biology is such, ne, it's really it's especially for grade 11 and 12 there are a lot of, you know we write the paper for practical and you need to do some of this things you need really to do them but it is not easy, the resources are not there and now according to our school you are told to make a list of what you need, then you do it , two years will pass. Nothing. And most of</u></p>	<p>Using everyday methods that involve the learners</p> <p>T/KA-2 Lack of transport to take kids out.</p> <p>T/KA-2 Lack of time</p> <p>T/KA-2 Lack of fund due to poverty.</p> <p>T/KA-2 Lack of knowledge</p> <p>T/KA-2 Do not implement</p> <p>T/KA-2 Lack of knowledge</p> <p>T/KA-3 Get no resources</p>
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<p>the solutions we have some of the things expired already, so they are there we do not even use them anyway so the resources are a bit of a challenge. a bit challenging, yeah. Kids they even apply for high level but the lab is not in functional I think we will reject this, because most of kids that really gets good marks they want high level but they end up going to the other schools because we do not have higher level and the lab is not functional. Yeah, we don't have high level. I buy my own poster, Some of those that are there you buy. But things like that like practical's you need certain equipments to do a certain practical that you want get because it cost a lot of money. Sometimes I use learners you tell them we need sugar, we need salt, we need what, they bring it, we need potatoes they bring it. The things that learners can get from home you use the learners but things like for example you want to find out how environmental factors are affecting photosynthesis you need a photometer, who will get a photometer from their home and you know how expensive is one single photometer and so far, for the things you are able to send the learners they are willing to bring some of them, but some of you cannot send the learners.</p>	<p>T/KA-3 No development is received on EE</p>
<p>8. Do you get professional support to enable you to implement environmental education? Respondent: <u>I will tell you, zero support and you know ne, it's like even when they come, you know that they rate the way you perform, then they will come and they will say no this and that and we don't even know who are subject advisors , you go to those offices you don't get any help so you sit here and you expect miracles, but you are not even helping us. From the ministry is zero support zero support. There was a group of inspectors here from different places here and different subject advisors so I don't even know if it is our subject advisor I don't know him, they only visit when they come with external evaluators.</u></p>	<p>T/KA-3 Affected negatively because lack of knowledge</p>
<p>9. Ok. How has the implementation of environmental education affected your teaching? Respondent: <u>You try your best but anyway if you can't solve something the rest they fail so there is nothing you can do, so it have affected me negatively but at times you know there are battles you can fight and there are battles which you know even if you fight them you can't go anywhere, you can't make miracles of the things that you do not know.</u></p>	<p>T/KA-3 Not involved or consulted</p>
<p>10. How were you involved in the development of the new curriculum?</p>	

<p>Respondent: <u>Since when teachers are involved? My dear, not at all. Not even any consultation or anything nothing you just get the implemented thing so. whether you have and you know for grade 11 and 12 I would say it's good because its 2 years it's really not a big deal but when you look at the work of grade 10 it's not that they give you this long syllabus and you know the time for grade 10 is very short.</u></p>	<p>T/KA-3...T/KA-4 Thinking that subject advisors are responsible developing.</p>
<p>Researcher: Do you know of any teacher who represented you? Respondent: <u>Not really, I think is subject advisors that are doing it or maybe I am not aware of the teachers that went that have been taking part but its mainly the work of subject advisors that are never at schools .</u> <u>And you know what is happening, of course you need to be part for planning. You know the relevance of the topics also because we are I am mostly at the classroom level and I am, I see what is more needed and what is more working. It's a, yeah, you need to be involved at least then you give your input. you see where you need to make changes and where you need to do more and what you need to reduce and something like that, yeah.</u></p>	<p>T/KA-4 Need to be involved because teachers know what is working and what not because they are at classroom level.</p>
<p>11. What do you think could be done to improve the implementation of environmental education?</p>	<p>T/KA-4 Bigger samples of teachers need to be involved in curriculum development.</p>
<p>Respondent: <u>What I think could be done now, is it now schools, the ministry and all those things?</u> <u>One, first of all before it's the planning. Before even its implemented one really need to sit with the teachers. Of course you will not be able to sit with all the teachers in the whole Namibia to involve everybody but we need to get more samples of teachers to represent us. Because I believe me, even if you are in different schools we encounter more or less the same challenges or same problems so to say, there will be differences here and there but in general it's more or less the same thing. The teachers need to involve in the curriculum in the first place so that we see where it really needs to be worked and all of this things.</u> <u>And on top of that the resources now. the support from the ministry, especially now the subject advisors I don't know now they are too few that they are not able to go to the schools, they need to visit this teachers and you know get to the roots of what exactly is happening in the schools.</u></p>	<p>T/KA-4 Subject advisors should visit schools and get to know what is happening.</p>
<p><u>And as a school may be as a school we really need to work hard to make sure that at least there are some resources that you only need to get from the ministry but there are</u></p>	<p>T/KA-4 Fund rising needed in school to buy resources.</p> <p>T/KA-4...T/KA-5 Workshops needed to refresh the knowledge of teachers and update</p>

<p><u>some resources that we need to work together to create some capitals to buy them as a school. So you have to work somehow as a team.</u></p> <p><u>Lastly, workshops my dear if you have even, if you have the best knowledge, nay! you know things every time are changing even if you have knowledge that you think you will need it is not possible you need to be refreshed every now and then you need to get new development. it does not make sense really a year will pass and a biology teacher did not go for a workshop and what I don't understand ne, I don't know maybe it's just in the urban schools that they don't do it because when I was in school, you will hear the teacher is not there for a week they are in the workshops. Real one need to be trained in these things.</u></p> <p>12. Have you received training to teach environmental education?</p> <p>Respondent: a bit, but a bit in geography because me I did geography, <u>I can't remember. I don't remember if I was doing environmental education in biology. Mmmm I did not.</u></p> <p>Researcher: Thanks very much for accepting to be a participant in my study.</p> <p>Respondent: Welcome</p>	<p>teachers on new developments</p> <p>T/KA-5 Did not receive training on EE</p>
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Interview transcripts Participant 6	Points taken from the transcripts
<p>1. How do you understand the concept of environmental education?</p> <p>Respondent: thank you very much. I will refer to environmental education as any kind of <u>learning or education that tempt to sensitize people about their environmental.</u> Some type of education where you talk about environmental issues in general. If you are teaching about environmental education, in the first place you have to make people understand what is the environment. <u>The environment will comprise of major things for example the atmosphere, you have the land</u> <u>Yeah, this are the major components. You talk of the land and the air. So when you talk about EE you need to talk about how to look after this major components of the environment.</u> the air around us is important to us, what should we avoid in order to save the air around us, pollution the land on which we live littering and stuff, how should we go on handling our waste. In general when you talk about <u>environmental education you talk about managing of solid waste but also the emission of gasses and all other pollutants that might pollute either the air or land around us.</u></p> <p>2. How important do you think environmental education is?</p> <p>Respondent: Thank you very much. I think biology and geography are the right subject to address EE so it is very important because biology is a subject where we are mostly talk about living thing and being living things we are highly connected to the environment where we live and therefore <u>I believe as a biology teacher that it is very important to always talk about EE because if you don't take care of the environment the our environment will cease taking care of us and what becomes of us.</u></p> <p><u>Of late, you hear about different catastrophic event taking place you talk about tsunamis, we talk about earthquake, you talk about a lot of things like skin cancer and all this environmental related diseases.</u> We are not solely saying that, they are as a result of the way we are living but in one way or another especially if you talk about the emission of several gasses in the</p>	<p>Sensitize people about their environment</p> <p>Teach about land and air</p> <p>Teaching to manage solid waste, emission of gasses and pollution</p> <p>T/SI-1 When caring for environment, environment will also care for us</p>

<p>atmosphere, global warming is one of the global topic which is being discussed. This is one of the results of the emissions which is coming from us. <u>As a biology teacher, I think it is very important because if we sensitize our learners from a young age, they will grow up understanding that our environment is very important, if we can't look after it, it won't look after us.</u></p>	<p>T/SI-2 Learners grow up with the understanding of interdependence.</p>
<p>3. How do you understand the way environmental education is incorporated in the curriculum? Respondent: <u>I will say in general that in a way, not specifically or particularly incorporated.</u> <u>But for example if you look at let's say certain topics like pollution and so on This are obviously matters pertaining to the environment in a way it is incorporated. Even though I feel not that much because certain other areas are not included, of course it although it is not as much because certain other areas are not included. But to an extent it is included. I will say it is among the reasons why to my own capacity I initiated in my own capacity the introduction of an environmental club at my school to take care of other issues.</u> In a school, for example you only find certain learners doing the science field who are exposed to biology. That is only a fraction of the learners. You have learners who are doing social sciences. There is a need for an inclusive approach, where each every learner take the responsibility for their environment, that's why I thought in supplement to the biology curriculum which is only taught to science learners. We should include a club which takes care of everyone in the school irrespective of which field you are using, commerce, natural science, social science everyone. To an extent, the syllabi also try to incorporate environmental issues. But there is a need for a more intense approach to the environment because if you look at the amount of effect that we are exerting in the environment . It is so much that the curriculum of biology alone cannot be able to handle all of them. That's why I opened the environmental club.</p>	<p>T/SI-2 No incorporated T/SI-2 Incorporated as ecosystem but less.</p>
<p>4. Researcher: Apart from those topics present in the</p>	<p>T/SI-3 Do not know</p>

<p>curriculum under ecosystem, what else does the curriculum say about EE? Respondent: <u>I have no clue.</u></p> <p>Respondent: <u>Yes, I do.</u></p> <p><u>What I do is, certain topics are very related to the environment like for example if you can talk about types of respiration related diseases and most of the respiratory related diseases which you acquired as a result of the dangerous substances that you may inhale. When you are dealing with such kind of topics you bring practical examples in the environment, like for example in the environment like for example if you live in an area where the whole family is smoking for example if you live in an area where the whole family is smoking for example the dangerous emissions which comes from smoking among others Nicotine , tar are all substances that may have advisory impact on your respiratory system. So whenever applicable or whichever topic has a close link to the environment we bring in practical environmental examples to make it clear or to make it more visible to the learners that environmental problems are not a false is something that is clear and it is true and they can observe it as well.</u></p> <p>b) How do you do it? Respondent: <u>At different times, you may use different methods.</u></p> <p><u>Among others we use the real type of practical experience kind of teaching where you may take learners to one of the , we always see smoke coming from one of the power station somewhere there (pointing), which is a very practical good example of the environment being harmed by the emissions which are coming out from the.</u></p> <p><u>Sometime you also may also use a lecture method where you give some posters or pamphlets on which there are people smoking and how it might affect the lungs.</u></p> <p><u>At one occasion, I had a video show, where you relate</u></p>	<p>T/SI-3 Implementing EE</p> <p>T/SI-3 Give practical example when dealing with E related topics</p> <p>T/SI-3 Use different methods</p> <p>T/SI-3 Learners shown practical examples</p> <p>T/SI-3 Use lecture method</p> <p>T/SI-3 Show video</p>
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the impact if e.g. I am using smoking as one of the most prominent example because most people smoke. The video show how people randomly smoke and how the chemicals which are contained in the smoke are adversely affect the lungs of the second-hand smoker to the first-hand smoker.

The different intervals depend on the resources you have.

You can use practical example where you physically go to an area where the learners observe how a lot of smoke and with an understanding of a lot of smoke and with an understanding of a lot of smoke, and with an understanding of a lot of smoke, and with an understanding of a lot of smoke for example sulphur dioxide is one of the content that may have some advertising impact, especially during the rainy season on the rain that we receive. You give an understanding or the theory to the learners and from the theory then you take them to physical places to see or you give them of you can give them combined with video shows to connect what they see and what they hear. For example the previous year with my environmental club I went to the coast and one of the place I visited was the Rosing mine, there was a lot of questions asked by the learners to the consultant who took us around or the guide. Among others I took them to Etosha because the question was I wanted them to find out how Rossing Uranium is taking care of the environment in relation to their mining crisis, because you know because you know it an open caste of mine whereby they drill the land then they exploit minerals on that specific on that land they might be a lot of microscopic organisms. We wanted to find out if there is any measures which are put in place to take care of the environment as opposed to acquiring manners of minerals. I did it last year. I took the learners there at Rosin and they asked a lot of questions but all in all, they said that they always seek to strike a balance between economic development and the sustaining of the environment. They kind of give us some kind of Environmental Act No 7 of 2007 which is concerned with e.g. when you do economic activities in a given area, you should reconcile them or strike a balance between economic activities and sustainability of the

T/SI-4
Using different methods depend on resources available.

environment. It was said that if the benefits are exceeding the effect such kind of activities cannot be allowed to take place in a way they are also concerned with the sustainability of the environment that is a practical example I have.

Researcher: It is a good example.

5. What are the internal obstacles to the implementation of environmental education?

Respondent: I would say one of the obstacles is ignorance. By ignorance, I am referring to certain types of learners that you talk about in particular around the school. We are more concerned about solid waste among others littering and stuff so we talk to learners about the importance of throwing litters or empty cans in the dust bins, time and again you see learners drinking from cans and throwing there I would say ignorance is one of the internal obstacle.

The other one is time, it is not so much that for example I said:

In my environmental club we include everyone even those from the other fields even though I don't meet them every time I only meet on Mondays and sometimes most of them comes and sometimes none of them comes that is one.

Other obstacles are I would like to say may be lack of resources so that so that we could be taking a group of a very large group of learners to certain places where we might have a practical effect of the effects of not looking after our environment properly so that they can have a second hand information and real believe that if you don't look after your environment properly at the end of the day our environment will look like this particular place. Those are still like some of the internal stabling blocks to the success of environmental education. I can also talk of resources. Resources are needed to transport learners e.g. from one place to another. Let's say for example in Ruacana may be there is a lot of deforestation there, there is no trees because people have cut down the trees and this kids live here in WHK of course we have a lot of trees bushes and stuff, we want to take that there and let them see a practical experience of how deforestation affect the

T/SI-5

Learners do not show up for environmental related lessons.

T/SI-5

Lack of fund for transport to take a lot of learners for trips their parents cannot afford .

<p><u>environment, in terms of the amount heat it endure without trees or shelter. The resources I am talking about among others is transport with transport you need money and only if you have that that you will be able to transport a group of specific learners from here to Ruacana. Our school is not one of the hint school we struggle even with normal school fees even running of normal programmes within the school. Even last year when we went to Etosha we struggled, first wanted to ask N\$ 300 from all the kids but they were not able to pay. I also asked from the ministry of environment, I could not get I could only get a little amount from Namibia nature foundation, they only gave us N\$3000 and we were run about 20 learners eventually I have to drop the amount I asked the kids from N\$300 to N\$150 per learners that means that I also have to shorten my days of visiting where I had to go. We only visited for 2 days then we come back. Is a challenge like I have said that's why I call it an obstacle.</u></p> <p>Last year, when I travelled, I went with the principal from the way they respondent to my request I can see they understand the importance of environmental education. There are also days we set aside for our cleaning campaign if I ask the management to give us a certain time especially during break time, I want to use this group of the learners to clean around the school, they are cooperative and their response is good. I would say they say are doing that because they understand the importance of environmental education. I would say to an extent they understand.</p> <p>6. What are the external obstacles to the implementation of environmental education?</p> <p>I don't see too much support from the ministry of education itself. Although there is in the syllabus, to an extent some coverage of environmental education topics, <u>but I would love to see several workshops especially being held by to schoolteachers teaching biology. Not necessarily teaching biology but only concentrating on the environment only like EE in particular because most of the time we have workshops about biology in general which we may not even talk about EE. So I would say if there is more platform or more opportunities. Where we talk about</u></p>	<p>T/SI-6 Workshops needed and platforms for teacher to discuss how to teach EE</p> <p>T/SI-7</p>
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<p><u>EE. And also where we educate each other or share ideas on how we can best teach EE to the school learners, that is one of the obstacles I would say.</u> <u>To the different organizations, I would also have love to see if each and every environmental organization or any other kind of the organization related to the environment could kind of provide or create some kind of projects that they would make available to the schools so that through doing this environmental project, that through making this environmental project the learners can also have some king of EE in the process, I would love to see organizations even ministry of environment and tourism having may be environmental competitions or something like a project related to the environment, where learners can be actively involved and have a clear understanding about EE and its importance.</u></p>	<p>Projects related to EE needed to be organised by environmental organisations, ministry of environment and tourism</p>
<p>7. Resources? 8. Do you get professional support to enable you to teach environmental education? Respondent: <u>That is one of the obstacles I mentioned as far as I am concerned I have been doing this out of my own initiative, there haven't been any environmental workshop where we have sat together with a group of people and discuss, may be this is a good opportunity that I can host our own environmental workshop where we can talk about it. I would like to say so far we had no professional support from somewhere and I would love to see it in the near future.</u></p>	<p>T/SI-7 No development in EE is received</p>
<p>9. How has the implementation of environmental education affected your teaching of biology? I would say if any if have affected my teaching, I am sending a message to my learners out there that the environment is the place in which we live and time and again we always mention you need aaaah, a healthy body need a , a healthy mind needs a healthy body and unless the environment is which the body is existing is health and ultimately the mind as well. I would say EE as far as I have been incorporating it did not give me any negative feedback or any kind of disturbances, <u>I would just say if for example we could have workshops and discuss more about it, so that I can have more</u></p>	<p>Lack of knowledge to deliver EE affectively affected his teaching</p>

<p><u>knowledge on how I can share environmental knowledge with everyone and have more way of delivering environmental knowledge with my learners. the little knowledge which I have is making it difficult to deliver it to the level I would want to see it going.</u></p> <p>10. How were you involved in the development of the curriculum?</p> <p>Personally, I was not. But from the principle of the curriculum when you develop the curriculum there is stakeholders to be involves but I believe there was a sample of teachers who were involved in the formation of the curriculum. <u>To answer it short I was personally not involved but I believe there was a representative of all teachers that was involved in the planning of the curriculum. To be precise I did hear anyone represented us but from the principle of the curriculum according to what I know for any other curriculum planner, you can't sit there in the corner and plan there have to be stakeholders , the ministry of education, the head offices, the teachers, if not teachers necessarily teachers organizations for example NANTU which is still teachers anyway. I would have love to be involved because of several obstacles that I have observed like if I could be involved, I would also suggest in our curriculum could be also incorporate some kind of workshops, like opportunities for workshops so that at least we could be kind of give workshops to teachers like in a term or in a year you meet several times, where you can only address certain problems which I don't see being given priorities in most of workshops that people have. I would be very happy to be part of the curriculum.</u></p> <p>In biology so far I have never attended any workshop; there is a workshop coming however in the next holiday, I won't be able to attend the workshop because I am taking my environmental club to Etosha. Ms Kasoma the other Biology teacher will attend the workshop it's a biology workshop. We have what I call cluster meeting where we plan together and try to standardize everything but not even in that they bring up discussion about EE.</p> <p>11. What do you think could be done to better</p>	<p>T/SI-8 Personally not involved</p> <p>Feel like being involved in terms of curriculum principle</p> <p>To suggest that workshops should be part of the curriculum</p> <p>T/Si-8... T/SI-9 Proposing that teachers should have EE in their pre-service training</p>
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<p>implement environmental education</p> <p>Respondent: <u>Thank you very much, one of the areas I would like to see is among others the introduction of EE in teachers training program. In a way, teachers already from institutions especially biology teachers, if they can in their curriculum like teacher training curriculum have a section that address or teach environmental, that is the first proposal.</u></p> <p><u>The second is that I would like to see continuous workshops, not general workshops in biology but specific workshops which only deals with EE in terms of what are the current environmental problems that we are facing and what are some of the things which we can do, and how can we teach learners in terms of implementing this procedures which we are faced with.</u></p> <p><u>And the other thing I would love to see is more support from the ministry of education for example even giving scholarships for example Mr (mentioned his name) has a key interest in studying I would just like to give you a briefing of a situation I find in myself.</u></p> <p>Two years back, I applied for a masters degree at the University of Liverpool, I was struggling for almost two years trying to get a scholarship, I wanted to do environmental planning and management I could not get a sponsorship from the ministry of education, ministry of mines and energy I could not get a scholarship. This is how difficult it is when you want to study environmental education. I don't know if people understand the level of importance environmental education is but to an extent I feel it is not been prioritized as much it was suppose to be, like I said from the beginning my own understanding is that the environment is which you live is very important if you see someone who have a key interest like you and me, we are suppose to be the utmost support either financially or to go for a good course. I would also like to see more support from ministry of education and all other related stakeholders.</p> <p><u>Internally, I would like to see cooperation especially from my management and two from my learners as well because together we can do better that trying to do something on your own. Yeah, cooperation I would</u></p>	<p>T/SI-9 Workshops needed for teachers on EE</p> <p>T/SI-9 Ministry of education should provide scholarships for teachers to further in EE</p> <p>T/SI-9 Cooperation needed in schools</p> <p>T/SI-9...T/SI-10 Received no training on EE</p>
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say.

12. Did you receive any training in EE?

Respondent: No. there was no EE training that I received just some initiation that I came up with based on your understanding of environmental issues and your interest in EE but there was no training that was designed to train you as an environmental training officer or something. Yeah, there was not any.

Interviews transcripts Participant 7	Points taken from the transcripts
<p>1. How do you understand the concept environmental education?</p> <p>Respondent: Generally speaking, environment refers to environment and education <u>is about informing people to conserve their environment</u>, because if you look around yourself you will see not necessarily people have a motive to damage it but because of livelihood and because of maybe preparing food as a general activity they need the firewood but they do not mean to destroy the environment but they still have to live. So if we could find a way to do it in a sustainable way that is what I understand, <u>to inform people to learn them, that you must sustain the environment .I see to assist people to learn them how to look after our heritage then you can save it that way.</u></p> <p>2. How important do you think is environmental education</p> <p>Respondent: Biology there is one section that specifically concluded on conservation , conservation and especially conservation of species, <u>conservation of the environment, how the abiotic and biotic environment interact and how they cannot be without each other so if you destroy one link the whole system will collapse and affect the others. so directly or indirectly we are depended therefore people should know that the environment is important and they should be learned that they should they should be educated so to speak that the environment is there for our benefit but should not be destroyed it can be used and should be looked after and sustained</u></p> <p>3. Ok, How do you understand the way environmental education incorporated in the curriculum</p> <p>Respondent: <u>I think due to the biology syllabus mostly 70% of it is human physiology so that means there is a small portion of it given or allocated to this conservation.</u> Environmental education receive cooperative in there. I think then at primary school they got environmental studies or something like that in natural studies, is something like that also and I think if we could reduce a little bit of human physiology and may be expand environmental studies or even make it a separate subject on its own because at the</p>	<p>T/P-1 Informing people about conservation</p> <p>T/P-1 Informing, learning people about sustainability</p> <p>T/P-1 Learning the importance of interdependence</p>

<p>end of the day there is a lot learner that can of possibilities for careers can open up in that as a separate subject.</p> <p>Researcher: Ok. So apart from the ecosystem appearing in the curriculum what do the other parts of the curriculum say about environmental education e.g. the aims and rationales of the Biology curriculum?</p> <p>Respondent: Yeah, it is mentioned there it is in the aims in the domains but not covered as wide as one would like to have it. So it's mostly human physiology that got to do with human body.</p> <p>Researcher: But can Mr remember what is said in the aims and the rationales of the biology curriculum about environmental education?</p> <p>Respondent: <u>My dear I must now think I can't remember.</u></p> <p>Researcher: If you can't remember, it is ok.</p> <p>Respondent: <u>Because then I have to because I usually work on my scheme of work but I did not go check that, but there is a portion of that I can remember very vaguely that there is a mention of protection of the environment that learners become aware that we should look after the environment and that should be stressed. But I think is not stressed enough because what I learn my learners physically in class once you gathered is some organisms from the environment, and if still alive put it back where you got it. If it dies, it's not because of you but then it's an insect. But organisms we strike to study them in the natural environment where you can observe them. So do actually to do with lot of work of protection. <u>Protect and conserve our future generations so it is in there it's mentioned in the objectives.</u></u></p> <p>4. How do you implement environmental education in your teaching of Biology?</p> <p>Respondent: Yes, when learners go out we normally, we when they have to get some plants if the plants is in abundance we try to remove one or two specimens not the whole and if we cannot find if we only find one, we only take one leaf of branch so that the specimen can still survive. And then of course see so that means we do not actually damage the environment and that I stressed with my learners that we should protect the environment so it is included into what I constantly learn them that because of that what is</p>	<p>T/P-2 Can't remember</p> <p>T/P-2 Vaguely remember that environment should be protected.</p> <p>T/P-2 It is part of objectives</p> <p>T/P-3 Giving worksheet</p>
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some classes.

Researcher: Mr..... you have been talking about taking learners out for excursions, does the school provide funds for that?

Yes, we don't have a problem with that. if I arrange an excursion maybe for the day to Avidam or to Daan Viljoen then I arrange with people there sometimes you get people that is students there, people whose doing research in that area. Then they invite you, then take the learners through like there was one guy who was doing research that was long ago. Schoolteachers went but then you just arrange with the management luckily I am in the management. Normally the learners can contribute also, so then the school pay half. Mostly, most of the learners pay and many times teachers also pay for the learners and in many cases, if the learners cannot pay we make arrangements and the school pay.

Researcher: Ok

Respondent: Yeah, so we would like especially when learning is involved and then learning about the environment we always try to include all the learners especially we have some orphans to include here so we really cater for them. That is our principle and that is allowed according to the education act.

Researcher: ok it is very much interesting.

6. What are the external obstacles to the implementation of environmental education

Respondent: external is not from much that we cannot bridge as long as the parents are properly informed the only obstacle that I sometimes find is that the teacher do not inform the parents beforehand in writing but then we have process and procedures they must go through management and management tell them later. We must gave the approval of letters to the parents, which parents are going to accompany us, we want parents to be involved but short excursions the parents are welcome to come with us. I usually encourage that and then we go with them.

Researcher: Ok

Respondent: Yeah, so because the parents are also part that is so. I would not say we have much obstacles from the ministry our ministry is very supportive. The municipality is very supportive if you go before. We arrange with Meatco,

<p>you go the botanical gardens or you go to geological reserve laboratories, if you arrange with one of them they are very supportive. They can take you through or even allocate a person that can explain to you everything how you should go through the process.</p> <p>Researcher Ok, but Mr Personally, do you think you have enough knowledge to teach environmental education?</p> <p>Respondent: <u>Personally, not in depth and I would like to really do little bit more on that. We can search in internet but internet sometimes is very general.</u> Like you have to know about international laws, you would know how to connect with people who do research in the field, even take your learners out so that they can talk with those people, do little projects only that learners can get involved in that.</p> <p>Researcher: Ok. Where do you expect to get that in-depth knowledge?</p> <p>Respondent: <u>Well, even University, usually cater for us . UNAM they will cater for us, but at the moment it seems they are not really working so much on that one, I would like them to expand it more to teachers.</u></p> <p>Researcher: Ok</p> <p>Respondent: Yeah, like one-year course or six months course where they can at least assist us. They can even do it in a half holiday, they do the Mastep course you know. I am not a tutor now I do Mastep in Biology, so in depth I mean more about the laws international laws, international organizations, green peace movement those people who fight for the environment. You understand? But when it comes to the types of organisms and all of that I have a lot of info and knowledge on that, yeah.</p> <p>7. Do you get support in terms of resources to enable you teach environmental education?</p> <p>Respondent: <u>No. I don't get any teaching material those you have seen in my class I developed them myself.</u></p> <p>8. Do you get professional support to enable you teach environmental education?</p> <p>Respondent: <u>No that's why I said I would like UNAM to do something, which currently is not happening.</u></p>	<p>T/P-5 Shallow knowledge on EE</p> <p>T/P-5 UNAM doing less in the provision EE knowledge to teachers.</p> <p>T/P-5 Get no resources</p> <p>T/P-5 No development offered.</p> <p>They use to have in Bio but it stopped now</p>
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<p>Researcher: I understand. But do you get workshops on Biology?</p> <p>Respondent: <u>We had previously but it stopped , so now it's about general education facilitators workshops but I would really love to have especially not only for Biology but for all the subjects teachers are asking for that they want it especially biology.</u> There is life science they sponsor upgrading workshops and assisting the teachers with setting question papers and latest technique that has been teaching techniques in the subject in the science field. So I would really like that to UNAM really to initiate that.</p> <p>Researcher: The few workshops that you had, did you discuss anything about environmental education?</p> <p>Respondent: <u>No, I cannot remember them talking about environmental education.</u></p>	<p>T/P-6 They never said anything about EE in Bio workshops</p> <p>T/P-6 Forced to do research (positive) but lack of knowledge</p>
<p>9. How has the implementation of environmental education affected your teaching of biology?</p> <p>Respondent: <u>I would say it affected it negatively but in fact positively because it forces me to do research. But I am also telling you that even if you look for information of something, you still need first hand assistance to do it right, when I think I am not doing something right sometimes I just live. You see that is negative.</u></p> <p>Researcher: Ok, now I have seen that there is new curriculum for Biology written 2010</p> <p>Respondent: Yeah, a new syllabus, yes.</p>	<p>T/p-6 Was not involved. Mentioned the name of someone from NIED who was involved</p>
<p>10. How you involved in developing such a curriculum?</p> <p>Respondent: <u>No I was not part. I know only of Mr Ben Araseb he is a senior education officer at NIED in Okahandja. He is my mentor actually he is very good he is excellent. About other teachers I am not real sure , that info you can get from Mr Araseb.</u> I don't have my cell now but you call at NIED and ask Mr Araseb tell him I referred him to you.</p>	
<p>11. What do you think could be done to improve the implementation of environmental education?</p> <p>Respondent: I think they could advertise it more. I think people should also get with the city of Windhoek they have good environmental programmes and the ministry of wild life and tourism because they are all involved in that. and of course other institutions, international institutions that is</p>	

<p>based in Namibia, which and even give us books which even give us books on how we can, I can tell you the Namibian syllabus require us to “Namibianise”, in this way that we should look at our, that we should look at our own Namibian organization. I was trying to do research on Namibian xerophytes, I did find something interesting. I am busy with that research now. So we can make people more aware by posters, adverts by campaigns, you understand! It will be good.</p> <p>I can list the following as areas for improvement, I can say development to impact teachers with knowledge. Funds to set us free to plan as much as we want, Support from parents, let me say those.</p> <p>12. Did you receive training to teach environmental education at UNAM</p> <p>Respondent: <u>I did when I did MASTEP at UNAM. When I did teachers’ education diploma in Biology. We did some environmental education based on the biology content.</u></p> <p>Researcher: Did you do the teaching method for EE?</p> <p>Respondent: <u>In biology as science in the science department.</u></p> <p>Researcher: Thank you very much, sir. It was a nice interview, I really enjoyed it.</p> <p>Respondent: Welcome, my friend.</p>	<p>T/P-7 Teachers need development T/P-7 Funds should be provided T/P-7 Parents support needed</p> <p>T/P-7 Teachers did not do environmental education teaching methods, but ecology</p>
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Interview transcripts Participant 8	Points taken from transcripts
<p>1. How do you understand the concept environmental education</p> <p>Respondent: well I think environmental education is part of biology whereby <u>we have to teach our kids the issues related to the environment how to take care of our environment and then to make them aware of the environmental issues that is how simple I understand it.</u> Well at this moment which things can I say is part of the environment? <u>I can mention conservation of our wild animals and then plants and then we should also teach them human influence on the ecosystem and then ok I think those are some of them.</u></p> <p>2. How important do you think is environmental education</p> <p>Respondent: <u>it is very very important especially nowadays there are these natural disasters that are occurring. I think they are the result of the environment being upset, a lot of things are going on, especially now we have what we call the global warming . human are contributing to the global warming so I think it is good that the learners are being taught so that they can be aware and then they can also pass the message to the community how to take care of the environment so I think a lot of natural disasters that are going on are results of the environment which is not taken care of. and it is also important to conserve our resources our resources need to be conserved for future use.</u></p> <p>3. How do you understand the way EE is incorporated into the curriculum</p> <p>Respondent: <u>Ok like the damage to the environment like the effects of deforestation , the use of fertilizers and then pollution and then conservation of maintaining the environment and the natural resources and then to maintain our biodiversity as well.</u></p> <p>Researcher: what else is mentioned about EE in the curriculum apart from the ecosystem</p> <p>Respondent: <u>I think that is the only thing I have seen in biology that talks about EE otherwise I have not come across with anything else related to that. But to</u></p>	<p>(T/I-1) Teach learners how to care for E (T/I-1) Awareness of environmental issues</p> <p>(T/I-1) Teach learners things like conservation, human influence on ecosystem</p> <p>T/I-1 Important to teach to be aware of natural disasters</p> <p>T/I-2 Ecosystem</p> <p>T/I-2 Have not read</p>

<p>be honest I have not gone through it. Researcher: ok that is also an important information.</p> <p>4. <u>Do you implement environmental education in your teaching?</u> Respondent: Well, I don't really incorporate it in the other topics apart from the topic which is concerned or which is pertaining the environmental education. in other topics I don't I have never incorporated it to be honest. An then the reason be that examiners also sometimes they are discouraging us from teaching more I mean depth in EE because they do not really ask more questions are not coming from that part of EE so. Yeah, you can teach your learners just to be aware but sometimes they are also discouraging us because they don't ask questions from that sections.</p> <p>b) How do you teach it? I normally just taught them theoretically.</p> <p>but I remember there was a time I took them to the there is a there is sewage treatment and just what we call Garmams sewage treatment I remember I took them once and then otherwise the rest I just taught theoretical. At Garmams I just took them there also to have fresh air Yes there was a discussion but I am not the one who explained I don't know those things I don't know how they are working there was a guy who was going around with them asking them here and there.</p> <p>Researcher: How interesting was it to learners? Respondent: Yeah, it was very interesting, it was very interesting it was very interesting you can really see that the learners like to see things rather than being just told theoretical.</p> <p>5. What are the internal obstacles that may hinder that implementation of environmental education. by internal I mean school related obstacles. Respondent: ok well I, <u>the school setup does not support the EE what I mean is that we do not have, we suppose to have facilities, we suppose to have</u></p>	<p>T/I-2 Only teach EE when dealing with ecosystem not in other topics.</p> <p>T/I-2 Teaching theory</p> <p>T/I-2 Used the trip to the sewage treatment place for enjoyment purpose.</p> <p>T/1-2 Lack of resources</p>
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<p><u>models of things just to show how to take care of the environment or part, the school itself does not really support us.</u></p> <p>Researcher: How are you not supported?</p> <p>Respondent: <u>Ok, number one, financial, financial because sometimes you want to take your kids to a certain places and then they will tell you that the budget is not, there is no enough money so that is one thing it really discouraging me already. Sometimes you also want facilities that should be in use in your lessons but then still the same answer that you will get money or they can just keep on postponing until you become discouraged.</u></p> <p><u>The support I get here is only from the other science teachers like when I took the kids to Gammams like the physical science teacher also went with me. Because they also have what you call the environmental club I will not talk about that much because I really do not know much about it, because I what I see what saw they normally do, just to pick the litters here and there, nothing else that they do but they call it environmental club please do not ask me anything much about that, I really don't know but sometimes we give them support, we let the kids to just to pick up the litters the waste in and around the school and that is all.</u></p> <p>(Researcher: Ok, I will not ask you much about it but it is very important information that you have given me.)</p> <p>6. What the external obstacles to the implementation of environmental education?</p> <p>Respondent: <u>Maybe I will start with NIED because they are the ones who setting up. The curriculum I think they did not really integrate much of the EE in the syllabus it's just a small portion of it. And then again to the examiners the examines they don't ask much about EE and then this will make us feel like it is less importance. Why should we focus more or why should we put more effort on those things while at the end of the year they don't ask much of it is although we are not just teaching the kids for the exams but I mean its once they ask much question</u></p>	<p>T/1-3 Teachers being discouraged by the postponements of allocation of money for trips</p> <p>T/I-3 Lack of support from other teachers other than science teachers</p> <p>T/I-4 Teachers are discouraged to give more effort to EE because it is less examined</p> <p>T/I-3....T/1-4 Lack of knowledge to teach EE</p>
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<p><u>about it will give us courage to work very hard on these topics.</u></p> <p><u>The main problem also I realized now I don't have enough knowledge, the training I got from the higher institution is not much that we did about the EE so I feel I don't have necessary skills about EE just know little about it.</u></p> <p>Researcher: Where do you expect to get the knowledge?</p> <p>Respondent: Well, they can do in-service training ministry we also have ministry of environment and tourism in Namibia. They can also do. What is this public? What is it? Training of teachers and then and then teachers can then teachers can then train the learners and then it goes on like that.</p> <p>7. Do you get support in terms of resources that enable you to implement EE?</p> <p>Respondent: <u>that one I can say no. as you are sitting in my lab now you can see those are just chemicals that I am using for other topics but there is nothing for EE to be honest with you.</u></p> <p>8. Do you get professional support to enable you to teach environmental education?</p> <p>Respondent: <u>Not at all. Even support for biology is not like offered anymore. You know what I mean. I think its seven years since I received a workshop in biology.</u></p> <p>Researcher: Can you remember anything they said about environmental education in the biology workshop?</p> <p>Respondent: Well, you cannot remember well, I cannot remember, I don't want to lie to you, but I remember the person who was conducting the workshop he actually gave us just some hints of those chapters at the beginning of the syllabus this is I think this is why we perceive as it is less important because they put it at the back. I mean you feel because that time when the kids are reaching there they are totally tired.</p> <p>9. How does the implementation of EE affect your</p>	<p>T/I-4 Receive no resources</p> <p>T/I-4 No development is received</p> <p>T/I-5 Affected negatively because of the lack of knowledge.</p>
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<p>teaching of biology? <u>It's really affecting me because some of the concepts I am just struggling, I really do not know what I am saying but I am trying my best because I have never gone through any training, I m just trying my level best. I don't know if I am following the right direction.</u></p> <p>10. How were you involved in developing the new curriculum? Respondent: <u>No I was not involved. I thought that is the job of NIED. But to be involved I think it's a good idea to us teachers who are actually experiencing the situation in the classroom. and then they should also incorporate the current issues in the country so that we can teach our learners to be aware of the current issues that are taking place in the country and as teachers we are experiencing this in our dairy life I mean in our classroom so it's best if they use us teachers to develop their curriculum.</u></p> <p>11. What do you think could be done to improve the implementation of EE? Respondent: <u>Ok I think what we have to, is like in our case in Namibia they must just come up with a subject and then it saying environmental I don't know what to call it. but something environmental not like it is incorporated in this subject and then in other subjects and then sometimes teachers are not well equipped with the knowledge about the subject about the subject. its better if they can just come up with a subject called environmental whatever and then it will discuss all the issues pertaining environment I think that will be better.</u> <u>I think to add that the ministry of education and the ministry of environment and tourism they have to sit and then see how they can train teachers so that they can incorporate EE in schools. because to me seriously it's a topic of less importance because number one it's at the end of the syllabus, number 2 most of the examiners they don't ask questions about the EE. Just very little portions that you find so this is what I will perceive it as less importance.</u> <u>They need to sit and see how to develop funds, support in terms of money because without money</u></p>	<p>T/I-5 Not involved, it's not teachers work.</p> <p>T/1-5 It's important to involved as for the knowledge of the reality of a classroom</p> <p>T/I-5 Separate subject is needed instead of incorporation because teachers are less knowledgeable.</p> <p>T/I-5 the two ministries should sit and plan the training of teacher on how to incorporate EE.</p> <p>T/I-5...T/I-6 The two ministries should allocate fund for EE.</p>
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<p><u>you cannot go ahead, excursion requires financial things and so on, so all I need is support from the ministry, ministry of tourism and ministry of environmental education. I mean ministry of environment and tourism and also fund. Then when money comes to school it should be allocated to EE and then I can see how I take it up, taking learners to excursions and so on.</u></p> <p>12. Did you receive training in EE in your teachers' education?</p> <p>Respondent: <u>No</u></p> <p>Researcher: Thank you very much for accepting to be a participant in my study and for the good information...</p>	<p>T/I-6 Did not receive training.</p>
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Appendix J

Transcripts for Advisory Teachers' Interviews

Interview transcripts Participant number 9	Points taken from the transcripts
<p>1. What are your duties and responsibilities as an advisory teacher?</p> <p><u>My main duties are to assist teachers in the content knowledge of the subject, in lesson preparation, lesson presentation and how to apply the knowledge that they have of a particular subject in their particular field.</u></p> <p>Researcher: How do you do that?</p> <p>Respondent: <u>In the beginning, when the new syllabus is introduced, we have workshops to introduce the subjects and then and after that we do monitoring, go to schools and visit classes and see how teachers are doing, how they are presenting lessons. But to implement the syllabus we have national workshops and we have regional workshops.</u></p>	<p>T/F-1 Assist teachers with content knowledge, Preparation and presentation</p> <p>T/F-1 They do workshops to introduce the new syllabus. And monitor at schools after that</p>
<p>2. How do you understand the concept environmental education?</p> <p>EE is a topic that have been brought up, have been a focus in the last few years because it is like the <u>issues of global warming</u> and I think the topic is included in different subjects, biology is one with environmental education and I think in the social science syllabi that is now geography , EE has also been included in different science curriculum, also included environmental. For me personally we real need to look at the environment and try to preserve our environment look after our environment for our future generation. I am very glad that I have somebody focusing on environmental on a PHD, she can come back and plough the information back into our community because I feel we need people who are specialized in this field.</p>	<p>T/F-1 It is issues of global warming</p>
<p>3. How do you understand the way environmental education is incorporated in the Biology curriculum</p> <p>Respondent: <u>for that one I really, you caught me unaware now because for that one I have to consult the biology syllabus and specifically mention the topics that are integrated in the Biology syllabus for you. That is really a difficult one I won't be able to</u></p>	<p>T/F-2 Do not know</p>

<p><u>answer that one straight away now. I have to consult the syllabus.</u></p> <p>Researcher: it is fine</p> <p>4. How do you think environmental education is important</p> <p>Respondent: I think it is very important and I am promoting the idea of a separate syllabus for environmental education where we only focus on environmental, where it is taught as a subject but not as part of a subject, that is how EE have to be because it is I mean you look at all this things that are happening in this world now tsunamis and I mean even here in Namibia, the rainy season has completely changed now I mean we had rains yesterday here even in the almost in the middle April, we are still having rains and we are still going to have rains, I have never experienced that before in Namibia. <u>I think we should real look at the environmental education and how it is affecting our daily lives and what we should do to improve on whatever we want to because we don't want to sit with natural disasters like Japan now whatever.</u></p> <p>5. How do you promote and support the implementation of environmental education in Biology?</p> <p>Respondent: What I do is that because we have workshops organized by the Nature Foundation as a Namibians. Mmmmh they have different mmmh they also have a ceremony where mmmh learners have to present topics, different topics and prizes will be awarded on conservation of the what is it now? And also when I go out to schools and look at the syllabus. You focus on those topics and you ask the teachers if they teach. mmmh <u>you can't really force a teacher but when a teacher is busy with environmental topics and I ask him or her to present a topic and I just see how it is done and how she or he will apply the knowledge in everyday's life.</u></p> <p>Researcher: how did the workshop you mentioned helped the teachers?</p> <p>Respondent: <u>No, no,</u> the learners were presenting from different regions, all the regions came here and</p>	<p>T/F-2 Important, we can rely on it to see how it changes natural disasters.</p> <p>T/F-2 See how teachers present the lessons on environment and how they apply it to everyday life.</p> <p>T/F-2 The workshop he mentioned did not help teachers.</p>
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<p>prizes were given out to the best-presented topics I attended all those different topics that were presented by learners. And the use of different plants for medicine and all those things. It was very interesting. In the north certain roots that they forgot...</p>	
<p>6. What are the barriers that hinder the implementation of environmental education?</p>	<p>T/F-3 The main barrier is content knowledge</p>
<p><u>To my knowledge, the main barrier is the information about the environmental education. since it is not taught as a separate subject it is not though as very important.</u> But if we can make that part of the curriculum were the subject is taught at school as part of the normal school curriculum, I think it will improve drastically. <u>I think the main barrier is just knowledge content knowledge about environmental education.</u></p>	<p>T/F-3 Have never invited an expert to help with content knowledge</p>
<p>Researcher: have you ever tried to invite an expert to come and reduce the knowledge barrier?</p>	
<p>Respondent: <u>unfortunately I have not because of the fact that I am mostly involved in mathematics and there is another colleagues whom we help one another in science. After that presentation I talked about, it is really become important for us to focus on EE especially all this things that are happening in the world now, it is really like a wakeup call for everybody but personally I have not invited a specialist.</u></p>	<p>T/F-3 Funding problems for the implementation</p>
<p><u>The other problem to get mmmh, I think this is also the main barrier, lack of funding, funding of mmmh implementing even a new subject such as an environmental education just as a subject because that is also need a lot of funding. We will definitely experience financial problems in doing that.</u></p>	<p>T/F-3 Internet can be used to get information. but there are schools with no internet</p>
<p><u>But what I can do now is that I can go into the internet and see if I can. Yeah, there is so much information on the internet really. there is no excuse not to have knowledge about environment but not everybody has internet connections.</u></p>	<p>T/F-3 Lack of resources like: textbooks, finance</p>
<p><u>You see we have schools where we have not even textbooks there is a lot of barriers in our education system still in implementing. It is now very important</u></p>	

to you so that it can be implemented but there are some other barriers like financial barriers we have textbook problems and a new minister is real trying very hard to eradicate the textbook problems.

7. What can be done differently to enable teachers to implement environmental education?

We should start with an awareness campaign amongst teachers and informs them about the importance of environmental education. and also start with preparing the syllabus for EE. You know I was involved in developing the mathematic syllabus and in compiling the new syllabus for EE just the whole syllabus that need to be implemented. If we can start with the basics like developing the syllabus , making teachers aware of the importance of EE through the media. We can even have reports in the, because I see mathematical problems in the Namibian that newspaper even some other problems, so we can inform teachers about EE, actually is not only teachers but learners, teachers, communities and everybody should be informed about this so we must make wide use of the media to inform teachers, learners and everybody the importance of EE.

Researcher: Thank you very much sir for the information

Respondent: Welcome, all the best with your studies.

Interview transcripts Participant 10	Points taken from the transcript
<p>1. What are your the duties and responsibilities of an advisory teacher?</p> <p>Respondent: Ok, it is a very good question, the duties and responsibilities of an advisory teacher as the term is already saying it is to advise teachers is to advise teachers on various area but first: <u>We have to advise teachers on the specific subjects like in my case I have advise teachers on life science and Biology on the teaching methodologies for biology. And that we have to also advise them on setting of examinations, moderation of examination but the most area is methodology what is the best method of delivering a lesson that's the main issue. And the subject content because there are this new teachers as I can say most of the new teachers who are joining the industry they are not really trained on the best methodology and they could not come across those difficult topics now we need to take them through this difficult topics and methodology so that we can simplify the content and best method of delivering this content to the learners.</u></p>	<p>T/NAM-1 Advise teachers on the methodology, content, setting exam</p>
<p>2. How do you understand the concept of environmental education?</p> <p>Respondent: It's a very nice question again. EE for me, this is the education which is <u>focusing on how we take care of our environment, how we take care of, we can start with the atmosphere, how you can take care of the land itself, how are you going to take care of water itself, how you are going to take care of the ocean, as an example, ocean water. it have to do with managing and taking care of places where we are living so that our places remain healthy so that they won't be creating health hazards to our self. Meaning we have to be aware of our places where we are living, let's be aware of them so that we prevent poisoning this area, so that they can't create problems to our own bodies as an example to our own health. That is how I understand it.</u></p>	<p>Education that focus on caring for E, like atmosphere, land, water, caring for places where people live</p> <p>Awareness to prevent poisoning of places where people live to prevent health hazards</p>
<p>3. <u>How do you understand the way environmental education is incorporated in the Biology curriculum</u></p> <p>Respondent: <u>Ok, so far we don't real have a specific part which we are saying is environmental education in biology. but now like in biology what we are having we are having topics like ecology as an example. Ecology the one that can be regarded a part the environmental</u></p>	<p>T/NAM-1...T/NAM-2 Nothing about EE only ecology</p>

<p><u>education that is how it is integrated in the biology high level and ordinary level. We are teaching even conservation in biology that is where now we pick up some of the concept of the environmental education but it is not really specified as such but though in this topic, in this two topic that is where now we are teaching environmental education.</u></p> <p>Researcher: have you also look at what other parts of the curriculum said about environmental education apart from the ecology?</p> <p>Respondent: <u>Ok, yeah, for the mean time I think we did not really go to that extend of really evaluating of what the current syllabus have say, what is that we need to synthesize, that teachers need to sensitize to learners about EE so far we are only focusing on the syllabus, the competencies on the syllabus say under this ecology teach the following and under this conservation teach the following we did not go to that extent really of evaluating what the syllabus said much about environmental education.</u></p> <p>4. How important do you think is environmental education</p> <p>Respondent: <u>Ok oh environmental education is very important is very very important as I have said before we need to understand the environment where we are living. Yeah, because if you understand the environment where we are living that is from there you can really try to make changes. you need to realize that there is something which is not good which you are doing, you need to realize, it from realize it, from realizing it you can make changes , I know in our country we are trying to create various industry is a developing country now we need to be aware what health hazards which it is going to create to our environment. it is very very important really. we need to understand this, so that we can like now we even, we are developing the country, we need to find out what problems are we likely to face in future, Yes. Learners need to know health hazards because this learners can also take this idea to the parents.</u></p> <p><u>Learners can also influence the whole community but for me even learners are ones that needs to know about this they are the future generation they need to know this they can also take information to the community, take information to the parents is the right channel of influencing everybody.</u></p> <p>5. How do you promote and support the implementation of EE in Biology?</p> <p>Respondent: In Biology?</p> <p>Researcher: Yes, in Biology</p>	<p>T/NAM-2 Did not evaluate the curriculum, only looked at competencies</p> <p>T/NAM-2 Important for learners to know health Hazards which they are likely to face.</p> <p>T/NAM-2 Important to because learners can influence the whole community.</p>
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<p>Respondent: <u>Ok, How are we doing this? Whenever we are holding workshop at least we pay attention now like in our case, we are having this chemicals the DDT, which are found in the pesticides we normally make reference to this like this time for flood fishing time we have to make now teachers aware that they have to sensitize their kids. Now like this mosquitoes nets they are using for fishing they are having this chemicals which we call now DDT. DDT is one of the chemicals now which is also creating problems to the environment, we sensitize our teachers during workshop about this issue so that they can integrate them during their lessons and make also learners aware, that is how we synthesize our teachers.</u></p>	<p>T/NAM-3 Cautioned teachers to sensitize learners about the effect of DDT which is mosquito nets which is used by people to catch fish during rainy seasons</p>
<p>6. What are the barriers to the implementation of environmental education in your own opinion? Respondent: <u>Ok, is a very nice question, one can say now like in our country, for you to do any implementation you need the national document, now, one can say we need a national document which is specifying that we must start the implementation coming from the ministry of education. It's hard for teachers to take up any instruction which are given if it's not put in black and white, so number one can be a document. We need a document a guiding document. We need a guiding document to be produced.</u> <u>and that it will help us and then it will also, we also need a bit of training. So that our teachers can be trained a bit not that much because we know we are aware. They can be trained a bit on how maybe on teaching methodology one can say, we do not say we know we need to be guided. Yeah, workshop can be organized, can also be organized</u> <u>and then we also need a bit of materials then you demonstrate something where people can see as an example you are having this gas is having this effect if you create if you buy the material and then you do demonstration where people can see because it will have an effect than it is also going to help the implementation of this subject, yes.</u></p>	<p>T/NAM-3 National document specifying the implementation of EE is missing</p> <p>T/NAM-3 Training is needed on methodology</p> <p>T/NAM-3 Resources needed</p>
<p>Researcher: You have indicated lack of knowledge as one of the main barriers. Have you tried to invite any expert in the field to help you in that regard? Respondent: <u>Ok, so far as I have indicated before like advisory teachers we focus on the syllabus. we are focusing on the syllabus if we did not, if our teachers did not indicate a need that they need to be helped under those topics are covered in ecology, covered in conservation, now teachers in most cases they don't experience problems in this topics therefore we don't even invite expert to come in and help us in this topic, we don't do that even in the most cases when we are holding workshops teachers they don't have problems with this topics they are having problems with other topics like genetic engineering either, either DNA those are the topics that are giving them problems but I hope I hope the reason why they</u></p>	<p>T/NAM-3...T/NAM-4 Development is only given according to request of the teachers. But never raised concern on EE</p>

<p>are not having there is no certain objectives which is really specifying that they must really teach this, what they have been teaching they understand it, they are only teaching explain for example what is DDT that one they do.</p> <p><u>If it is coming to inviting an expert, also we are all aware of budget, same apply to the region, we are having a portion which is allocated to a certain advisory teacher. Yeah, among that portion I have to see the number of workshop which I have to organize but the number of workshop which I have organize I have to do the analysis, I have to have something in black and white written by teachers that we need assistance in the following if I want I can Integrate it in no matter they could not raise it up.</u></p> <p><u>I can integrate it in but for me to integrate it in I cannot just think of something there must be evidence ,certain document maybe an examiners report when the kids were assesses indicate that teachers are having poor understanding in this topic but the teacher did not raise it or maybe the certain concept. Yeah, I need to have evidence so that I integrate it in the workshop. If I want it to be raised in, yeah.</u></p> <p><u>When it is coming to fund one can say we really don't have enough fund, we really don't have enough fund for the mean time because we do not cater for all workshop which we plan to do, Yeah, we are selecting those ones major ones which we think will help teachers because if we don't select you cut the time so that you can cover as many topics as you can within the short period of time, so we don't have enough fund.</u></p> <p>7. Ok. What should be done differently to enable the effective implementation of EE?</p> <p>Respondent: Ok let's look, let's start with Biology what I think in Biology we need to do the curriculum revision, we have to revise the curriculum and then we make it suitable to the Namibian situation. We have to revise that so that we can integrate the specific objectives which are fitting our country, we need to put them in there, we need to revise the that.</p> <p><u>Then we also need to maybe to have funds also available to train teachers if you are revising the syllabus you need to let teachers aware of that revision which you carries out. Let's make funds available to organize the workshop we can also make funds available as I said earlier to buy materials. I just got the experience now when I start working with teachers, teachers they like to see, seeing is and believing they want to see something if you are only telling them this is the way things are. Yeah, they will say Ok, but they want to see lets have material which really demonstrate that this is the problem. this is what we are telling me if you are telling me do not use this because this is the effect lets have those materials and start off demonstrate, demonstrate to the community as an example. Maybe in general also we can start sensitizing speaking, they can also start there. We can also influence the church elders, we can also influence headmen let's make everybody involved</u></p>	<p>T/NAM-5 Evidence is needed that teachers need developed in EE for it to be integrated in workshops.</p> <p>T/NAM-5 Lack of funds to conduct many workshops.</p> <p>T/NAM-5 Funds to be maybe available for workshops and materials.</p>
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if we really want this one to materialize we should not only integrate EE in Biology but let's influence everybody that is the way it can materialize.

Researcher: Thank you sir, I enjoyed the interview

Respondent: You are welcome.