Lydia A. Kimaryo

Integrating Environmental Education in Primary School Education in Tanzania

Teachers' Perceptions and Teaching Practices

Lydia A. Kimaryo
Teacher Educator

Worked with the Ministry of Education and Vocational Training
in Teachers Colleges in Tanzania
Attended Secondary Education at Weruweru secondary school
Bachelor of Education at Brock University Canada
Master of Arts, (Demography) at the University of Dar-es-Salaam
Advanced Certificate in Environmental Education,
Sweden and South Africa (Rhodes University)
Advanced Certificate in Education at Stockholm Institute of Education, Sweden

Cover: Tove Ahlbäck
Design idea: Enea Mhando

Åbo Akademi University Press
Biskopsgatan 13, FI-20500 ÅBO, Finland
Tel. int. +358-20-786-1468
E-mail: forlaget@abo.fi
http://www.abo.fi/stiftelsen/forlag/

Distribution: Oy Tibo-Trading Ab
P.O.Box 33, FI-21601 PARGAS, Finland
Tel. int. +358-2-454 9200
Fax int. +358-2-454 9220
E-mail: tibo@tibo.net
http://www.tibo.net

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ÅBO 2011

ÅBO AKADEMIS FÖRLAG – ÅBO AKADEMI UNIVERSITY PRESS

CIP Cataloguing in Publication

Kimaryo, Lydia A.
Integrating environmental education in primary school education in Tanzania : teachers' perceptions and teaching practices / Lydia A. Kimaryo. – Åbo : Åbo Akademi University Press, 2011.
Diss.: Åbo Akademi University.
ISBN 978-951-765-560-6

ISBN 978-951-765-560-6
ISBN 978-951-765-561-3 (digital)
UNIPRINT
Åbo 2011

Abstract

The study focuses on primary school teachers' perceptions of environmental education, its integration into primary school education and teachers' teaching practices in Tanzania. The thesis is based on empirical research. The theoretical underpinnings of the study are based on Palmer's (1998) model of environmental education. According to the model, meaningful environmental education should include education *about, in* or *through* and *for* the environment.

The study is supported by national and international literature from research done on environmental education and education for sustainable development and policy statements. The study is qualitative in nature, adopting phenomenography and phenomenology as points of departure. The empirical data was collected from four primary schools in Morogoro region in Tanzania. The study sample consisted of 31 primary school teachers. Data was collected through interviews and lesson observations.

According to the results of the study, primary school teachers expressed variations in their perceptions of environmental education and education for sustainable development. Most of the teachers focused on the aspect of knowledge acquisition. According to Tanzanian education and training policy, environmental education has to be integrated into all subjects. Although there is environmental education in the primary school curriculum, it is not integrated on an equal footing in all subjects. Some subjects like science, social studies and geography have more environmental content than other subjects. Teachers claim that the approach used to integrate environmental education into the school curriculum was not favoured because many claimed that what is to be taught as environmental education in the various subjects is not shown clearly. As a result, many teachers suggested that to ensure that it is taught properly it should be included in the curriculum as an independent subject or as specific topics.

The study revealed that teachers' teaching practices in integrating environmental education varied from one subject to another. Although most of the teachers said that they used participatory methods, lesson observations showed that they limited themselves to question and answer and group discussion. However, the teachers faced a number of barriers in the teaching of environmental education, some of which include lack of teaching and learning resources, time and large class size.

The role of teachers in the implementation of environmental education in developing an environmentally literate citizenry is of great significance. The responsibility of the government in developing a curriculum with clear goals and content, developing teachers' capacity in the teaching of environmental education and provision of teaching and learning materials needs to be taken seriously by the government in educational plans and programs.

Key Words: Environmental education, education for sustainable development, integration, primary school education, conceptions, perceptions, Tanzania, curriculum.

Acknowledgements

Writing a thesis is a challenging task, but I it has been made possible as a result of the support I received from a number of people in terms of time, expertise, encouragement and moral support. To these people I extend my sincere thanks.

First, I would like to thank my supervisors Prof. Irmeli Palmberg and Prof. Sven-Erik Hansen, without whose professional expertise and guidance, inspiration, encouragement and interest in my study, this work would not have been completed. I deeply thank them for their tireless guidance and support. I am also thankful to Prof. Ulla Lahtinen, Dr. Kristina Ström and Dr. Tom Wikman for their guidance and advice and also Terese Ahlström for ensuring that things went on smoothly during my studies. In the same way I would like to express my sincere thanks to Tarja Grahn-Björkqvist for her assistance in the technical parts and the manuscript layout, Professor Taina Kaivola and Professor Tuula Keinonen for reviewing the manuscript and providing constructive comments, and John Shepherd for language checking.

Second, I am very grateful to Åbo Akademi University for the financial support which they offered me, and to the Ministry of Education and Vocational Training in Tanzania for allowing me time to pursue my studies.

Third, I also owe many thanks to my fellow Tanzanian doctoral students who shared with me fruitful discussions in the process of creating and shaping the thesis.

Fourth, this study would not have been made possible without the participation of the 30 primary school teachers in the 4 schools where I conducted the study. To them I owe many thanks and may I say that I greatly value their contribution.

Last, but not least, I would like to express my profound gratitude to my family for supporting me during my studies. I particularly would like to thank my husband, Arseni Kimaryo and my son, Adam Kimaryo, for their understanding and encouragement during the time of my study. And to my daughter-in-law Mariana Bazil Kterua and my grandchildren Daniel Brian and Karin, I also would like to express my gratitude for their inspiration and love.

Lydia Arseni Kimaryo

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Abbreviations

CEE	Council for Environmental Education
EE	Environmental Education
EECI	Environmental Education Curriculum Initiative
ESD	Education for Sustainable Development
ESSPs	Earth System Science Projects
GLOBE	Global Learning and Observations to Benefit the Environment
ICT	Information and Communication Technology
MoEC	Ministry of Education and Culture
MoEVT	Ministry of Education and Vocational Training
KofC	Knowledge of Context
NASA	National Aeronautics and Space Administration
NASSP	The National Association of Secondary School Principals
NECTA	National Examinations Council of Tanzania
NEETF	National Environmental Education and Training Foundation
NFER	National Foundation for Educational Research
NGOs	Non-Governmental Organizations
NSF	National Science Foundation
PCK	Pedagogical Content Knowledge
PK	Pedagogical Knowledge
SD	Sustainable Development
SEER	State Education and Environment Roundtable
SMK	Subject Matter Knowledge
TEHAMA	Teknolojia ya Habari na Mawasiliano
TEP	Teacher Educators' Programme
TIE	Tanzania Institute of Education
UN	United Nations

UNCED	United Nations Conference on Environment and Development
UNESCO	United Nations Educational Scientific and Cultural Organization
UNEP	United Nations Environmental Programme
URT	United Republic of Tanzania
USA	United States of America
WCED	World Commission on Environment and Development
WCST	Conservation Society of Tanzania
WESSA	Wildlife and Environment Society of South Africa
WWF	World Wide Fund for Nature

1 Background to the study

This study attempts to examine primary school teachers' perceptions of the integration of environmental education into primary education in Tanzania and teachers' teaching practices. The global and local concern about growing environmental degradation has called for the need to help people to transform their attitudes and practices. Consequently, education has been recognized as one of the important tools for conserving the environment through the cultivation of knowledge, skills, values and positive attitudes towards the environment among the people. The need for and importance of environmental education has been emphasized through a series of intergovernmental forums and documents from the 1970s as a strategy for addressing the growing trend of environmental problems: The UN Conference on Human Environment in Stockholm (UN, 1972), The Belgrade Charter (UNESCO, 1976), The Tbilisi Declaration (UNESCO, 1978), The Brundtland Report (WCED, 1987), The Rio Earth Summit (UNCED 1992) and the Johannesburg Summit (UN, 2002). For example, the need for environmental education was realized and emphasized at the United Nations Conference on Human Environment held in Stockholm in 1972. In this conference it was recommended that:

> "the organizations of the UN system especially the United Nations Educational Scientific and Cultural Organization (UNESCO) and the other International agencies concerned should after consultation and agreement take the necessary steps to establish an international programme in environmental education, interdisciplinary in approach, in schools and out of school encompassing all levels of education (UNESCO, 1972 p. 19)"

Like many other countries, Tanzania as one of the member states in international conferences on the environment, has responded to global concern about the environment and international declarations by including environmental education (EE) in the school curriculum at all levels from the 1990s. The issue of environmental management and conservation has been spelt out clearly in the objectives of education in Tanzania (Ministry of Education and Culture (MoEC), 1995). The Education and Training Policy of 1995 shows the emphasis on environmental education by having as one of its major objectives, "to enable a rational use, management and conservation of the environment" (MoEC, 1995, p. 2).

The initiative by the Tanzanian government to integrate environmental education into the school curriculum is commendable. This is due to the fact that Tanzania's economy is largely dependent on the country's environment and natural resources (URT, 2004). But natural and human-made environmental issues and problems, like drought, floods, poor sanitation, lack of clean and safe water, land degradation due to poor agricultural practices, unsustainable ways of harvesting natural resources like mining, forests and fishing, environmental pollution, loss of biodiversity are threatening the life support system of the environment (MoEVT, 2005; MoEVT, 2007; URT, 2004). These problems are a result of various factors like population pressure, poor agricultural practices and high rate of urbanization (Johnson-Pynn & Johnson, 2005; Sheridan, 2004; URT, 1997). Therefore, education for awareness-raising and finding solutions for these issues and problems is considered necessary. To effect this, the

Environmental Management Act no. 20 (URT, 2004), spells out explicitly that environmental education is a statutory requirement for bringing about sound environmental and natural resources utilization in Tanzania. Also to attain quality life we need to live in a healthy and well conserved environment. In improving the quality of life and social well-being of its people, Tanzania has as one of the goals of the country's national strategy for growth and reduction of poverty to "Increase access to clean water, affordable and safe water, sanitation, decent shelter and a safe and sustainable environment." (URT, 2006, p. 20). Therefore, the overall aim of environmental education is to develop an informed citizenry that is environmentally conscious and motivated to actively participate in managing and sustainable use of its environment. This led to the integration of environmental education into the formal curriculum at all levels. The underlying aim is enable pupils in schools to develop knowledge about their environment, and an awareness of environmental issues and problems so that they can take an active part in seeking and implementing solutions to the problems facing them in their environment (URT, 2004).

Following the issuing of the Education and Training Policy in 1995, it was decided that environmental education should be taught in all subjects at all levels of schooling. With reference to primary education, in 1997and also 2005, the curriculum was reviewed to integrate environmental education into all subjects. It is envisaged that the teaching of environmental education will help learners develop knowledge, skills and positive attitudes towards the environment from a very early stage. As a result, education would develop environmentally responsible citizens, because through environmental education they would develop knowledge skills, concern and positive attitudes towards the environment.

However, environmental education is not a new phenomenon in the school curriculum. Even before it was stated in the Education and Training Policy, environmental education and management in schools in Tanzania was being taught. Environmental education was also emphasized by the Arusha Declaration in 1967, which strongly advocated learning by doing, creativity, development of critical thinking skills and problem solving skills (MoEVT, 2007). For example, there were components of environmental education in the primary school syllabus from the 1960s. These components were in the subjects of domestic science, agriculture and science and geography (O-saki, 1995). These subjects were considered to be environmentally oriented subjects and therefore it was believed that they could make a significant contribution to environmental education (Bolscho & Hauenschild, 2008; Chi-chung Ko & Chi-kin Lee, 2003). What seems to be new to the teachers is the integration of environmental education into all subjects.

Although environmental education has been included in the school curriculum in Tanzania from the 1960s and also emphasized in the Education and Training Policy of 1995, the condition of the environment has not improved. Recent studies have found that the implementation of environmental education has not been successful. Evidence of environmental degradation in the form of soil erosion, poor waste management, water pollution and many other problems can still be observed in many schools and also in the communities around the

schools. The school is part of the community surrounding the school, therefore it is expected that what the pupils learn in school should be reflected in society. Also it has been found that environmental education is not taught as intended in the schools. For example, in a study by Lindhe (1999) in primary and secondary schools on the greening of education in Tanzania, it was found that there was very little impact of environmental education in schools and in communities. Also a study done by Jambiya (2003) about environmental management around Lake Victoria revealed that people's awareness of environmental problems is low despite the fact that many people have attended school. Similarly, Mtaita (2007) found that although environmental education is integrated into all subjects in the school curriculum as directed by the education policy, the teaching of environmental education is not being implemented effectively.

This suggests that there is a problem as far as the teaching and learning of environmental education is concerned. This situation is described as the question of match and mis-match between rhetoric and reality in environmental education (Grace & Sharp, 2000; Palmer, 1998). In other words, it is an indication that there is gap between theory and practice or a gap between the ideal curriculum and what is actually taught in the schools. One of the reasons could be that although teachers have been asked to implement the teaching of environmental education in the subjects which they teach, they have not been offered support in the form of training in environmental education in terms of content and methods of teaching and learning and also the provision of teaching and learning materials (Cohen & Ball, 1990; Fullan, 1991). This support is essential because when training as teachers, primary school teachers are only trained in how to teach the traditional subjects and not environmental education. The notion of traditional subjects here refers to subjects like mathematics, science, languages, social studies and vocational skills.

In addition, research findings on the teaching of environmental education show that despite the fact that it is integrated in the content of different subjects, teachers do not teach it because they lack knowledge and skills in the teaching of environmental education (Bolstad, 2004) and few get the opportunity to see how environmental education is taught (Mtaita, 2005). Although Makundi (2000) supports this argument, she further attributes this situation to the approaches and methodologies used in teaching. She points out that the teaching and learning methods used emphasized knowledge and awareness-raising only. As such, people can be aware but do not take action. Similarly, Spiropoulou et al. (2007) argue that the implementation of environmental education has been less effective due to the traditional teaching approaches, inflexible curricula, a lot of content to be learnt and insufficient time for an in-depth approach to the study of environmental matters. It can be said that it is true that the traditional approach to teaching which is based on transmission of knowledge cannot help learners develop the skills and action competence necessary for taking action on the environment. Learners will be able to develop skills and action competencies if they are actively involved in hands on activities in the environment.

The problem of implementing the teaching of environmental education is not limited to Tanzania only, because similar situations have been found in other countries. Studies carried out in other countries also revealed that the aim of

environmental education has not been achieved, although it emerged more than 30 years ago (Barraza, Duque-Aristizabal & Rebolledo, 2003; Chen, 1997). Some of the reasons given are that teachers were facing problems in the teaching of environmental education like lack of time to teach (Summers, Corney & Childs, 2003), inadequate knowledge in environmental education and lack of skills in integrating environmental education into traditional subject content (Brown 2003; McLean 2003; Thomas, 2004; Van Petegem, Bliek & Van Ongevalle, 2007). For example, Van Petegen et al. (2007) found that teachers in Zimbabwe acknowledge the importance of environmental education, but spend very little time in teaching it, because they find it difficult to relate the content of their subjects to environmental education. Another contributing factor is that although environmental education was seen as urgent by some governments such as in Hong Kong and the United Kingdom, it was given low status by not making it compulsory and cross-curricula, and every school could teach environmental education at its own discretion (Chi-chung Ko & Chi-kin Lee, 2003).

The implementation of environmental education is a complex processe, hence a challenge to educators. Esland (1971), for example, reminds us that the introduction of environmental education into the school curriculum represents a fundamental challenge to the dominant conception, organization and transmission of knowledge, creating for most teachers a conflict with their approach to teaching and learning. Therefore, despite the integration of environmental education into school curricula, it has not been implemented effectively to improve the state of the environment as expected.

The integration of environmental education can be considered a new innovation in education. The introduction and application of new innovations in education require appropriate design and implementation of teacher training programs and in conceptual changes (Rauch & Steiner, 2005). Therefore, the training of teachers in environmental education is important, because research has revealed that for example science and geography teachers hold many misconceptions about atmospheric phenomena, despite the fact that they were taught how to teach these subjects when they were training as teachers. Consequently, Arons et al. (1994) question if these teachers have the ability to instruct their pupils appropriately, if they themselves do not have the right concept of the phenomena.

Given this prevailing situation in the implementation of environmental education, it is necessary to investigate how teachers perceive the integration of environmental education in the school curriculum and how they teach it within different subjects. The understanding of teachers' perceptions and teaching practices can help in finding ways in which the implementation of environmental education within formal education can be enhanced or improved. In the following section, the motives for the study are presented.

1.1 Motives for the study

As a teacher educator, there are a number of things which have motivated me to carry out this study, but the focus will be on three motives based on personal

experience of the teaching of environmental education, the need for research and teachers' knowledge base in environmental education.

The first motive is my personal experience as an environmental education educator. My experience as teacher educator and my involvement in environmental education training programmes for primary school teachers has motivated me to undertake this study. I have worked as an environmental education facilitator for the World Wide Fund for Nature (WWF) and the Ministry of Education and Culture, in environmental education programs for teachers and tutors in teachers colleges for ten years. As I worked with teachers in schools, I noted that they had difficulties in integrating environmental education content into the core subject content of different subjects taught in primary schools and also in the actual teaching of environmental education. From the time environmental education was integrated into the school curriculum, it was realized that teachers and even teacher educators lack the knowledge and skills of teaching environmental education as an integrated component in the subject content. Therefore, efforts were made by the Ministry of Education and Culture in collaboration with different Non-Governmental Organizations (NGOs) to expose teachers and teacher educators to environmental knowledge and teaching through short workshops and seminars. The training focused on teacher educators also because it was hoped that they would teach student teachers how to integrate environmental education into their teaching. However, due to the large number of teachers and teacher educators and lack of funds, only a small fraction of the teaching force was given the training. But still, as mentioned earlier, the status of the environment in schools and in the communities around them has not improved. In this sense, the findings of this study may possibly shed light on what teachers' perceptions on the integration of environmental education into primary education are, and how the teaching is done so that modalities for further training of teachers in the teaching of environmental education can be set.

The second motive is the need for research. This motive arises from the fact that environmental education as an integrated component in the school curriculum is a new approach to teaching and learning in the primary school. Therefore, it needs research input for its effective implementation. According to Creswell (2008), research is important because it gives suggestions and new ideas for improving practice both for teachers and policy makers. Armed with the findings from research investigations, teachers can translate the syllabus into learning experiences appropriately, hence teach more effectively. Additionally, research in a dynamic field like environmental education is important. Seen from the point of teaching a subject, the teachers' knowledge base on environmental education and their perception of the nature of the integrated curriculum are important in the teaching and learning process. Research will also expose the gap between what is intended to be taught and what is actually being done as far as the implementation of the curriculum is concerned.

Studies in teachers' perceptions of teaching environmental education have been done in various countries (Chi-chun Ko & Chi-kin Lee, 2003; Van Petegem & Blieck, (2007; Wheeler & Bijur, 2000**)**. In Tanzania, research on environmental education has mostly been done at the level of secondary school (Hogan, 2007;

Lindhe, 1999; Mtaita, 2007; Osaki, 1995). The researchers in these studies focused more on teaching and learning in complementary basic education, secondary schools and on the perception of stakeholders as to their participation in environmental education. Although these studies can be related to teaching and learning of environmental education in the primary school, there is still a need to specifically focus on primary education, because the context of the learners, age and even the content is different. In addition, there is still need to develop a strong environmental education base among the learners at an early age.

At the primary school level there is need for research into how environmental education has been incorporated into the curriculum, teachers' academic and professional qualifications, the methods used in the teaching of environmental education, and the possible challenges which teachers face in the teaching of environmental education. The findings from this research can help in rethinking the way in which environmental education can be integrated into the school curriculum and how teachers can be supported in its implementation.

The third motive arises from my concern about teachers' knowledge base and pedagogical skills in environmental education. In order to be able to teach something effectively, teachers need to have an adequate knowledge base in that area. The issue here is what kind of knowledge base do teachers need to facilitate the teaching of environmental education? On this issue, Shulman (1986) emphasizes that the teachers' knowledge base, which he refers to as pedagogical content knowledge (PCK), is influenced by subject matter knowledge, pedagogical knowledge and knowledge of context. However, it is worth knowing that the teachers' pedagogical content knowledge is complex because it involves many disciplines.

Primary school teachers in Tanzania have different academic backgrounds. Some teachers have been trained for two or four years after completing primary school education and were awarded grade C or B teaching certificates to teach in primary schools. In the 1990s this program was stopped because the government stated that the minimum academic qualification for a primary school teacher was ordinary secondary school level or form four. Primary education in Tanzania Secondary school education in Tanzania refers to formal education that an individual gets after completing primary education. Formal secondary education consists of four years of ordinary (form I to form IV) and two years of advanced level (form 5 and 6) (MoEC, 1995). As a result of the government's directive, grade C and B teachers were trained and upgraded to form four and grade IIIA levels. Students qualify for teacher grade IIIA certificate after completing ordinary level secondary education and two years of teacher training certificate programme. This makes them qualify to teach in primary schools (MoEC, 1995). As a result, majority of the teachers in primary schools have grade IIIA certificate. There are a few cases where you can find diploma level teachers teaching in some primary schools who have upgraded themselves through in-service training from grade IIIA to diploma level. Students qualify for diploma in education after completing advanced level secondary education and two years of teacher training diploma programme. This makes them qualify to teach in forms one and two in ordinary level secondary education (MoEC, 1995).

While training as teachers for certificate level, student teachers are required to choose four subjects which they have passed well at ordinary secondary education and are taught in the primary schools. The subjects which they choose from are: science (S*ayansi), m*athematics (*Hisabati), E*nglish language, *K*iswahili, social studies (*Maarifa ya Jamii),* and vocational skills (*Stadi za Kazi).* All these subjects have a component of subject teaching methods. In addition to these subjects, primary school teachers have to learn civic education (uraia), and early childhood education (*Elimu ya Awali*) together with educational studies which are compulsory for every student. It is assumed that the training would enable teachers to teach the whole primary school curriculum in all the classes, i.e. from standard one to standard seven, while integrating cross-curricular issues like environmental education. This is a big challenge for teachers because the primary school curriculum has seven subjects, each with its own syllabus. Therefore making them choose four subjects seems to be unrealistic because when they go to teach, in most cases circumstances might force them to teach any subject. Moreover, the teaching of environmental education involves a new approach to teaching and learning because the process of integrating environmental education with specific subject content is not familiar to teachers.

For effective implementation of the curriculum, teachers need to be trained (Fullan, 1991). This also applies to the teaching of environmental education. According to Fien (1993) and Fien and Corcoran (1996), in order to promote the teaching of environmental education in schools, teachers have to be trained. The training can be done while they are at college and also as in-service training.

The basic training which they get in teaching in Tanzania does not provide teachers with the necessary theoretical and practical issues in environmental education. The key problem in the implementation of environmental education is teachers' literacy (Champeau, Gross & Wilke, 1980). The curriculum for teacher training colleges does not offer environmental courses either in content or in methodology. As a result, teachers are not environmentally literate. Although there have been in-service environmental education programs for teachers and teacher educators, they do not provide adequate coverage of basic knowledge on environmental issues because the time is short and there is a lot of content to be covered. Experience from England (Grayford, 1991) and Hong Kong (Lee, 2000), where the integration of environmental education into the curriculum has been used, shows that the problem of teachers lacking appropriate training and expertise was among the problems which were faced in the implementation of environmental education.

Tanzania as a country is expected to play its part in addressing environmental issues and problems both at local and global level, using environmental education as a vehicle for addressing the growing trend of environmental issues and problems as resolved in the different international forums. My concern here is whether all teachers in primary schools in Tanzania have the necessary knowledge base and integration skills to teach environmental education. As a teacher educator I feel that there is a great need to ensure that teachers in schools help learners develop the necessary knowledge, skills and attitudes which will enable them to care for the environment and at the same time discourage

attitudes that are incompatible with sustainable ways of life. This is due to the fact that, in order for individuals to fulfill the role they have to play in a certain aspect, one has to understand the issue being addressed. Hart (2003) asserts that teaching and learning are strongly influenced by the individual's perception and action. Therefore, if environmental education is to be implemented by primary school teachers, by incorporating it into the content of the subjects they teach, there is need to seek their perceptions and understanding of teaching environmental education as an integrated component.

1.2 Aim of the study

Based on the background information of the study, the aim of this study is to explore primary school teachers' perceptions on the integration of environmental education into the primary school curriculum in Tanzania and teachers' teaching practices. I am interested in investigating teachers' perceptions and practices because it is assumed that the understanding of teachers' perceptions is important in the successful implementation of changes in the curriculum (Chi-kin Lee, 1996). Therefore, the way teachers perceive environmental education will influence their practices (Chi-chung Ko & Chi-kin Lee, 2003).

Although environmental education is integrated into the curricula for formal education at different levels of education and teacher education, I have specifically focused on the primary school level because primary education is basic and compulsory for every Tanzanian citizen (MoEC, 1995). In this sense, pupils at primary level need to develop the necessary knowledge, skills and attitudes at an early age to enable them live sustainably in their environment after completing school. Another reason for my focus on primary education is that since in environmental education we are concerned with helping learners develop knowledge, skills, values and attitudes concerning the environment, it is appropriate to be taught at this stage because it is easy to mould a young person. According to Fien & Corcoran (1996) and Cutter (2001), it is believed that the primary school years are an important level of education because the learners at this stage develop most of their physio-neurological capacity quite early in life. Therefore, learning especially of attitudes and values is important to be learnt at an early age so that they can take action in addressing environmental problems. Also, research evidence on the importance of the early years of education shows that they are an important avenue for social change (Spodek & Saracho, 2005).

1.3 Structure of the study

The study has been organized in five chapters. The first chapter of this thesis presents the background to the study. It aims at introducing the reader to the background of the study and at making him/her develop interest in the study. In addition, this chapter sets the foundation on which the study is built. In Chapter 2, I give an overview of literature on the concept of environmental education and related concepts, environmental education and the school curriculum and the teaching and learning of environmental education. A clarification of the key concepts and areas is important in helping the reader understand the study and what is being investigated. This chapter sets out the theoretical basis for the study. Chapter 3 presents the method of the study. The research questions and

the research approaches and methods adopted are presented and discussed. The study is positioned in the qualitative research paradigm, and I have adopted phenomenographic and phenomenological approaches. The choice of the research paradigm and traditions is based on the aim of the study, which is to investigate teachers' perceptions on the integration of environmental education in the school curriculum and how they implement it. Perceptions are best studied by using the phenomenographic, approach while practices are studied by using the phenomenological approaches. Both approaches will be discussed in detail in Chapter 3. The chapter also answers questions like how the study was done, who is involved in the study and how the data was analyzed. At the end of this chapter, the aspects of validity, reliability and ethical considerations are presented. This is followed by Chapter 4, which concerns analysis of the data collected for the study. In this chapter, different ways of teachers' perceptions of integrating environmental education into the school curriculum and how they actually teach environmental education in different subjects are analyzed, described and presented in the form of categories and aspects or sub-categories. Chapter 5 presents a discussion of the results based on the research problem and the research questions.

2 Theoretical framework of the study

This study aims to explore teachers' perceptions of the integration of environmental education in the primary school curriculum in Tanzania and how its teaching is carried. In this chapter, the author exams teachers' perceptions of environmental education and its related concepts like environment, sustainable development, and education for sustainable development based on literature. All these concepts have the aspect of environment not only as a component but also as a concern. Definition of the concepts will be followed by the discussion of the integration of environmental education into the school curriculum because, according to national policy guidelines, environmental education has been included into formal education as an integrated component in existing subjects. This will be followed by a discussion on how teachers implement environmental education in primary education in order to shed light on the teaching and learning process. Finally, teachers' knowledge of environmental education and the barriers facing teachers in the teaching of environmental education will be discussed.

2.1 Definition of concepts

Environmental education and its related concepts like environment and education for sustainable education are interrelated; therefore, it is hard to define one concept in isolation of the other. For example, in order to understand how teachers perceive environmental education, first of all you have to understand how teachers perceive environment because it will influence their understanding of the concept and also how they translate it into teaching and learning experiences. Shepardson et al. (2007) have argued that the way students conceive the environment shapes the ways in which they understand environmental issues and also shapes their behaviour. Therefore, to understand environmental issues students must first know what the environment is, and the phenomena and processes that interact to shape and make the environment what it is. Although these arguments are based on students, they also apply to teachers. As a result, teachers' understanding of environmental education shapes their teaching practices. Other concepts related to environmental education which will be defined are sustainable development and education for sustainable development. These concepts and the relationship between them will be discussed briefly in the following sections.

2.1.1 Environmental education

Environmental education as the key concept in this study is defined as education that helps individuals to become more knowledgeable about their environment and to develop responsible environmental behaviour and skills so that they can improve the quality of the environment (UNESCO, 1978; Nordström, 2008). In order to understand what environmental education is, one has first of all to make clear what is meant by environment. Although there have been many studies on the understanding of environmental education and its implementation, the aspect of how environment is conceptualized is often not included (Tani, 2006). But there is a dilemma in defining environment because it depends on how one

perceives it. Knowledge about people's perception about the environment and how they relate to it has been found to be of importance in the adoption of attitudes and environmental behaviour (Ballantyne & Packer, 1996) and also in the teaching and learning of environmental education.

In finding out how people perceive the environment, Tani (2006) analyzed research done between 1995 and 2004. In this analysis, she identified three different ways of how individuals view the environment, which include environment as an *entity,* as an *experienced phenomenon,* and as *a socially/culturally produced phenomenon* which will be briefly discussed in the following paragraphs.

The first way as to how environment is perceived is environment as an *entity.* When the environment is perceived as an entity, the environment is taken to be something which is not linked to man, but separate from man. One can compare this way of understanding environment with the way we see the moon, the stars or the sun. We usually see them as objects which are out there. This way of perceiving the environment can be referred to as the objective view of the environment. This implies that knowledge about the environment can be obtained through scientific research.

The second way of perceiving environment is where environment is viewed as an *experienced phenomenon*. In this view, environment is seen as a space which surrounds an individual, and the individual is at the center of that space. This means it is a setting for man's life. This is a subjective view of the environment because it gives the notion that man has control over the environment. This can be illustrated by results from studies carried out to find mans' connectedness to nature. In the study one respondent said, "When I think of my place on earth, I consider myself to be a top member of hierarchy that exist in nature" (Mayer & Frantz, 2004, p. 315).

The third view of environment according to Tani (2006) is that environment is *socially or culturally produced or constructed phenomenon*. According to this view, man is an integral part of the environment and he shapes it through his/her social and cultural behaviour. This implies that knowledge about the environment depends on the understanding of man and his/her social and cultural aspects and not from the environment itself only.

As can be seen from the previous discussion, the environment is perceived differently by different people as a result of individual and socio-cultural differences. This classification of environment reveals the three commonly used ways of describing the environment (Tani, 2006). As Smyth (2006) puts it, the perception of environment that one has is shaped by one's internal environment of needs, likings, memories and vision. Logically, it exists as the environment the moment one names it and gives it a meaning. In this regard, the environment is not something that has reality outside or separate from human beings and their social settings, but something that humans are an integral part of.

But in defining environment, it should be considered in its totality. The notion of totality here refers to the quality or state of being total, whole or complete to include all the aspects of a given phenomenon. Therefore, when environment is considered in its totality, it can be defined as the totality of the things that

surround man, which can be categorized into the biophysical, social, economic and political aspects as shown in Figure 1 and discussed briefly in the following paragraph.

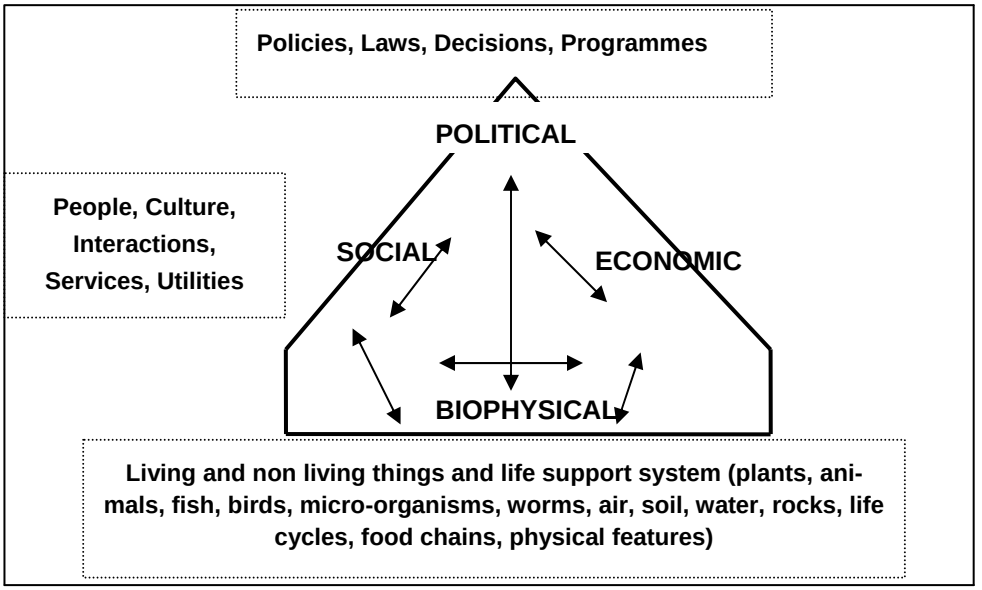

Figure 1. Interacting dimensions of the environment (modified from O'Donoghue & Russo, 2004, p. 337)

Figure 1 shows the interrelationship of the different dimensions of the environment. The biophysical dimension includes living and non-living things and the natural systems of the environment. It is the sustaining base of life support systems and also the base for the economic, social and political dimensions. The social dimension refers to people living together as part of the environment. People have a capital of established but changing cultural practices, social services and social systems that shape and sustain the way they live together. The economic dimension is the system within which there are different production sectors, and jobs exist to enable individuals to get money to pay for the resources and services which they need. Economic activities have an impact on the environment, and in turn the environment can affect economic activities. For example, economic growth may mean environmental degradation and resource depletion, which in turn can retard economic development. The political dimension refers to the condition that enables us to contribute to and influence the policies and decisions that shape access to resources, the economy and how people live together (O'Donoghue & Russo, 2004).

In order to sustain the environment, people have to develop knowledge, skills and positive attitudes on how to interact with the environment in a sustainable manner. It is important therefore for children to know the environment in its totality so that they can value it, because one cannot value something that one does not know. Knowledge about the environment and skills on how to live in the environment sustainably can be acquired through education which is referred to as environmental education. Through environmental education learners will

be able to know their environment just as the way they know reading, writing and arithmetic which are referred to as the 3Rs. A lot of effort is made to help learners know the 3 Rs, so in a similar manner we should help them to know their environment and how to relate to it.

Scholars of the environment like Fien (1993), Gough (1992), Tilbury (1995), Palmer (1998) and Palmer and Neal (1994) have suggested that, if environmental education is to be accepted as meaningful education, it needs to include three dimensions, which are education about, in/through and for the environment. This classification of environmental education was Lucas' (1979) attempt to categorize the different meanings which have been given to the term environmental education. This implies that environmental education has to assume the role of helping the individual develop knowledge about his/her environment, which he/she can get through interacting with the environment, and finally he/she can use the knowledge and skills to conserve or take care of the environment. These three dimensions of environmental education will be discussed briefly in the following sections.

*Environmental education as education **about** the environment*

The view of environmental education as education about the environment is a traditional view, which is sometimes referred to as the objective view. It considers the environment as a subject for investigation and includes the development of knowledge about the environment, environmental issues and problems, and the development of appropriate technical and intellectual skills to address environmental problems. This view was developed at the beginning of environmental education movements, when the main focus was on developing knowledge and understanding about the environment and creating environmental awareness among the people (Gough, 1997; Tilbury, 1995). It was assumed that if people developed an understanding of the environment, they would take action to solve environmental problems in their surroundings and also prevent further degradation of the environment (Gough, 1997; Palmer, 1998). Therefore, the teaching of environmental education involved mere transmission of knowledge about the environment and environmental problems. Based on this view, the topics included in the school curriculum were about the physical environment, different activities that caused environmental problems and the nature of different environmental problems.

In Tanzania, the view of environmental education as education about the environment prevailed in the teaching and learning of environmental education for a long time (Mtaita, 2007). Topics of the environment, mainly those of the biophysical dimension of the environment were included into the syllabus of few carrier subjects like social studies, vocational skills and science. These subjects were thought to be appropriate to teach environmental education because they focused more on the physical and biological entities of the environment and also on human activities than other subjects like languages, and mathematics. Also, the main objective of environmental education was to disseminate knowledge about the biophysical surroundings of man and the problems resulting from human activity. Even today the aspects being taught as environmental education involve the problems facing the biophysical environment. But in actual fact,

environmental education is more than dissemination of knowledge about the environment and the problems facing the environment.

*Environmental education as education **in** or **through** the environment*

The view of environmental education as education in or through the environment was developed after awareness grew that transmitting knowledge about the environment is not enough because people did not take action on environmental degradation as had been assumed. It was an indication that environmental education entails more than learning about the environment. It also entails a wider interpretation of the environmental crisis that needs to be learnt about (Palmer & Neal, 1994; Palmer, 1998). The interpretation of the environment is facilitated by the use of real life situations as a basis for developing knowledge through inquiry (Lee & Williams, 2001); hence, the focus on experiences in the environment. Therefore, it was seen that learning about environmental education involves hands-on activities like making observations of their surroundings and learning through field studies. The stage or context for learning about the environment is the environment itself. In this case, the environment is used as a learning resource, a medium for enquiry and discovery, which may enhance deep learning.

Learning in/through the environment helps learners learn how to learn, an aspect which is currently being emphasized in education. Also, learning through the environment can be a source of material for realistic activities in different subjects like language, mathematics, science, and many others (Palmer, 1998). This approach to learning assumes that if learners learn through the environment, they will develop environmental awareness and concern. This view has influenced the teaching of environmental education in many countries. For example, in South Africa active learning through hands-on activities in the environment is used in teaching and learning (O'Donoghue & Russo, 2004), and in England the national curriculum encourages active participation in problem solving and the acquisition of knowledge and skills which are needed to protect and improve the environment (Chatzfotiou, 2006). Although teachers in Tanzania are aware that learners learn better when they learn through the environment, or are involved in hands-on activities, they do not do so because they are caught in the traditional way of teaching, which is "talk and chalk" (Mahenge, 2004). They attribute this situation to the challenges resulting from large class size, inadequate learning materials and pressure from external examinations. These and many other challenges make them unable to teach environmental education as education in/through the environment.

*Environmental education as education **for** the environment*

Contemporary environmental education goes further than learning about the environment and in the environment. This dimension focuses on the aspect of ethics. It advocates the learning of environmental education which aims at the preservation and improvement of the environment by making individuals develop attitudes or concern for the environment so that they can take action to address various environmental problems or promote environmental quality (Lee & Williams, 2001). According to this view, pupils learn environmental

education through action taking like awareness raising, negotiation, persuasion campaigns and rehabilitation of degraded areas (Tilbury, 1995). Similarly, Jensen and Schnack (1997) point out that environmental education should aim at building a student's ability to act with reference to environmental concerns and assume responsibility for their actions. In other words, it should develop action competence in the learners. Action competence is defined as "pupil's abilities to act at the personal and societal level" (Jensen, 1995, p.6). The term "action competence" has mainly been used in Denmark and in other countries in Europe (Colquhoum, 2000). It has also been used in South Africa, but it is a new concept in the Tanzanian context, although the newly revised curriculum for schools at all levels now is a competency-based curriculum.

Although the three components of environmental education have been discussed separately, they complement each other because they are interlinked. They can be considered as levels of implementing environmental education. Learning about the environment is the initial level, where one has to get knowledge about a phenomenon which in this case is the environment. The second level involves interaction with the environment it to develop a deep understanding of it through experience. The third level after getting knowledge and understanding of the phenomena is to value it and to take deliberate action to sustain it. According to Chatzfotiou (2006), the three components facilitate a holistic approach towards environmental issues. They enable the pupils to examine and interpret the environment from different perspectives, actively participate in solving environmental problems and also help them develop the necessary knowledge, skills and attitudes towards the environment. The components also suggest the process of learning environmental education and therefore can be said to have implications for curriculum planning and the teaching and learning process.

On the basis of the different perspectives of environmental education discussed above, in this study I will adopt the notion of environmental education as education about, in and for the environment. I have adopted it because if environmental education is to be meaningful, one has to obtain knowledge and understanding, through experiences in the environment which will help to develop positive attitudes, commitment and motivation towards taking action on the environment.

Having discussed the different components of environmental education, the following section will examine the concept of education for sustainable development (ESD), which is closely linked to environmental education. The aspects which will be examined are sustainable development, education for sustainable development and how they relate to environmental education.

2.1.2 Education for sustainable development

Education for sustainable development is a concept which came into being when sustainable development (SD) became the agenda for development forums. Sustainable development was initiated as a result of conflicts between social development, economic growth and environmental conservation. At times, economic growth has been achieved through unfair deals without taking into consideration the environmental consequences and the communities whose

survival depends on the environment and the resources therein. Thus, sustainable development is defined as a course of action or development which focuses on environmental protection while using the available resources to meet the needs of the people at present without destroying or exhausting resources because they will be needed by future generations to sustain their lives (Breiting, 2000). It is therefore about bringing social, economic and environmental factors together (Gough, 2002) because none of them can be understood in isolation. It can be said that the essence of introducing sustainable development is to dissolve the artificial boundaries between the environment economy and the society. As people needed to be educated about the environment through environmental education, it was envisaged that some form of education needs to be put in place to address the issue of sustainable development. Therefore, this resulted into the emergence of education for sustainable development from 1992 (Barraza et al., 2003).

Education for sustainable development is defined by the Council for Environmental Education for National Curriculum for England and Wales as education that enables people to develop knowledge, values and skills to participate in decision-making about the way they do things individually and collectively, both at local and global levels, that will improve the quality of life now without damaging the planet for the future (CEE, 1998, p. 3). The origin of education for sustainable development can be traced back to agenda 21 chapter 36, where it was stated that states should be committed to the promotion of education, public awareness and training in order to achieve socio-economic and ecological sustainability. Therefore, it can be said to be education which aims at empowering people to take responsibility for working for a sustainable future (UNESCO, 2002).

The purpose of education for sustainable development, therefore, as its name suggests, is a sustainable future. Education for sustainable development, therefore, can be said to be the vision of education that seeks to balance human well-being and cultural traditions with respect for the earth's natural resources. The foundation of education for sustainable development is built in the way we think, the way we act, the values we hold and the decisions we make. However, people find it difficult to understand the relationship between environmental education and education for sustainable development.

The terms environmental education and education for sustainable development have given rise to debate concerning how they are defined and relate to each other. There are arguments that environmental education has evolved to become education for sustainable development (Fien, 2001; Tilbury & Cooke, 2005; Yang, Lam & Wong, 2010), and others claim that they are the same and are used interchangeably to describe the same thing. As a result, there are different perspectives about the relationship that exists between environmental education and education for sustainable development. Explaining these perspectives, Hesselink, van Kempen & Wals, (2000) and Wals and Jickling (2000) pointed out that there are four perspectives regarding the relationship between environmental education and education for sustainable development. The first perspective involves environmental education being perceived as part of education for sustainable development. The second perspective is the reverse of

the first one, where education for sustainable development is considered as part of environmental education. The third perspective is where environmental education overlaps with education for sustainable education, and the fourth perspective involves perceiving education for sustainable development as a stage in the evolution of environmental education. The critical aspects in the two terms are education and environment. But in environmental education, the kind of education specified is education that will contribute to the creation of a more democratic and environmentally just world, and in education for sustainable development it is to contribute to the creation of a more sustainable world where individuals live in the environment in a sustainable manner.

A closer look at the relationship between environmental education and sustainable development reveals that environmental education and education for sustainable development both have the same vision, which is creating a better world where there is a balance between economy, ecology and society. Therefore, they are tools for attaining sustainable development. Environmental education is thus inseparable from sustainable development because it is a component of sustainable development. Being a component of sustainable development, it has to deal with social, political, economic and ecological aspects of the human environment. It may be that for this reason there are thoughts that education for sustainable development is environmental education which has acquired another name (McKeown & Hopkins, 2009). Through environmental education, people will be made aware of appropriate management of the environment through sustainable management and use of natural resources, sustainable production and consumption patterns and appropriate science and technology development. Therefore, the concepts of environmental education and education for sustainable development have more things in common than differences.

After discussing the concept of environmental education and the related concepts of environment and education for sustainable development, I will continue to discuss the placement of environmental education into the school curriculum.

2.2 Environmental education and the school curriculum

In environmental education, the curriculum can be referred to as the sum total of all the experiences that learners undertake to help them develop environmental literacy, skills in solving problems, decision making, and active participation in taking action towards the environment while taking into consideration the ecological, political, economic aspects (Palmer, 1998). Reflection on the definition reveals that it entails the aspects of planning for instruction which shows what learners need to know in environmental education, how learners are to achieve the intended goals, what teachers need to do to help students develop the required knowledge, and the context in which teaching and learning occurs. The present study adopts this definition because it includes all activities/ experiences related to environmental education which are experienced or done in schools, including both academic and non-academic aspects.

The inclusion of environmental education into the school curriculum has been done as a result of the international communities realizing the impact of human activity on the environment and that education is the vehicle for reversing the growing trend of environmental degradation (UNCED, 1992). In a similar way, following the environmental problems facing the country and the government's response to international agreements, Tanzania has included environmental education into the formal curriculum at all levels (URT, 2004). It is envisaged that through environmental education pupils will develop knowledge and skills of living in harmony with their environment. It is therefore necessary that children in schools need to be environmentally literate, starting from the time they enter school. To achieve this end, it is important for the curriculum to develop the learner's understanding of the ecological processes, human impact on the ecological processes, and the sociopolitical systems that influence human beliefs and actions towards the environment (Meyers, 2006). In this section the focus will be on the components of environmental education in the curriculum and the inclusion of environmental education in the school curriculum.

2.2.1 Components of environmental education in the curriculum

The literature on environmental education provides several ways of understanding and designing curriculum for environmental education. Since the curriculum can in short be seen as a plan for learning, the main curriculum components according to Akker (2003) are the rationale, the aims and objectives to be achieved, the content, learning activities, the teachers' role, teaching and learning resources, time and assessment. This is just one way of looking at what constitutes the curriculum. In designing the curriculum for environmental education scholars suggest different approaches. For example, researchers and policy makers have suggested that one of the most effective approaches to environmental education is one which is holistic in nature, meaning that it should be integrated through the whole school curriculum (Palmer & Neal, 1994; Smyth, 2006; Tilbury, 1995; UNESCO, 1977; WCED, 1987). However, whatever approach is adopted, there will be need to consider the three interlinked dimensions of environmental education which comprise education about, in/from or through and for the environment, as pointed out by Palmer (1998). These components are interrelated and are essential components of environmental education planning at all levels. Figure 2 below shows a model of curriculum design showing how the interrelated components of environmental education can be used in designing the curriculum for environmental education.

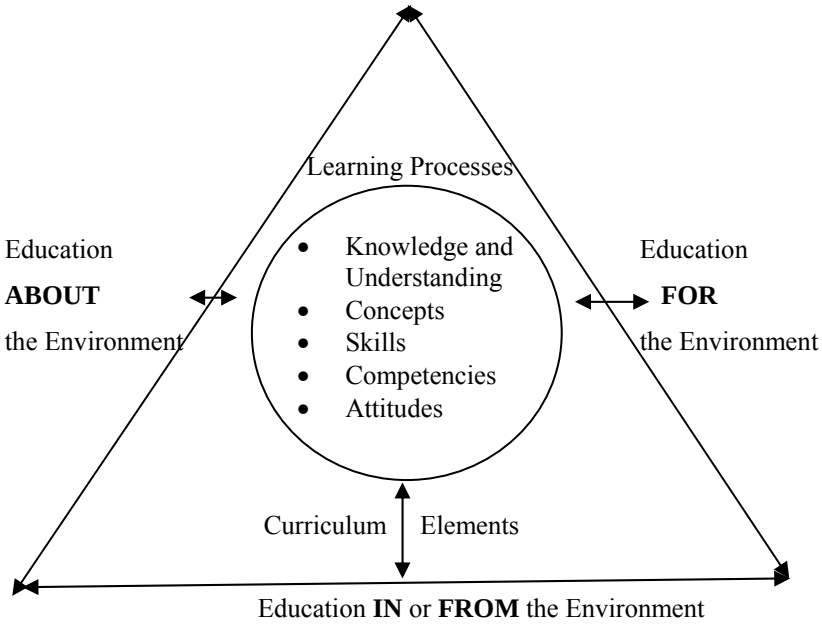

Figure 2. Interrelated components in the planning of environmental education (modified from Palmer, 1998 p. 144)

From Figure 2 above it can be seen that, at the heart of environmental education, the key aspects being addressed are knowledge and understanding, concepts, skills, competencies and attitudes. The model developed by Palmer (1998) has been modified to include the aspect of competence because it is one of the important things learners have to develop. This constitutes the component of curriculum which answers the question "what and why are they learning environmental education." Therefore, the curriculum has to focus on achieving these core elements. To achieve these, a range of learning processes, which include teaching and learning activities and the role of the teacher, should be planned to ensure coverage of the curriculum, while taking into consideration the three key components of environmental education namely, education about, in/from or through and for the environment.

The three components of environmental education can be linked to the technical, practical and critical curriculum models, as discussed by Carr and Kemis (1986) and Stevenson (1993). In the technical curriculum model, emphasis is on knowledge, skills and attitudes hence the tendency to support the aspect of education about the environment. The main curriculum concern in this model is subject content (Robottom & Hart, 1993; Tilbury, 1994). According to Lee and Williams (2001), an examination of curriculum from a number of countries showed that proposals for environmental education overemphasize the knowledge component.

The practical or interpretative curriculum model assumes that the learner is an active participant in constructing knowledge and meanings (Stevenson, 1993). Learners develop meanings from experiences in the environment, so the role of

the teacher is to organize experiences in the environment where learners can be involved. Therefore, when linking this to the different components of the environment, the emphasis in this curriculum model is education in or through the environment (Lee & Williams, 2001). In this model, the curriculum is viewed as something practical where learners actively interact with each other, the teacher, the teaching and learning materials and the real environment.

The critical curriculum model focuses on the component of education for the environment (Lee & Williams, 2001). Learners are encouraged to construct knowledge, think critically on their experiences and actions, while taking into consideration the political, economic and cultural aspects of society. The aim is individual and social empowerment. Although the different components of environmental education and the curriculum models have been discussed separately, they all have to be taken into consideration when designing environmental education curriculum. As Palmer (1998) and Fien (1993) suggest, if environmental education is to be meaningful, it should include education about, in and for the environment. After discussing the different components of environmental education curriculum, the next section will examine the different ways in which it can be included into the school curriculum.

2.2.2 Different ways of including environmental education in the curriculum

There is no one universal approach on how environmental education can be included in the school curriculum or educational programmes. There are various ways in which this can be implemented. Environmental education can be included into the school curriculum as an independent subject, or it can be treated as a cross-curricular issue permeating the whole curriculum hence integrated into existing subjects, or it can be taught as a theme organized around significant issues and problems. Although the three approaches are different, they can be appropriate for the teaching of environmental education in schools, but it depends on the contexts in which they are applied and also they both have their strengths and weaknesses. In the following sections, three of these approaches will be discussed.

Environmental education as an independent subject

One of the approaches of implementing environmental education in the school curriculum is to include it as a separate subject. The single subject pattern of organizing the curriculum treats each subject as a discrete component of the curriculum (Jackson, 1992). This has been the traditional way of organizing the curriculum in many countries, Tanzania included. When environmental education is accorded the status of a subject, it will have its own syllabus, time allocated on the timetable and it will be taught like other subjects e.g., English, science and geography.

There have been arguments against establishing environmental education as a separate subject. It has been acknowledged that environmental education is not a subject with a body of knowledge and skills like the other disciplines. Rather, it is considered as a situation in which learners may be involved to develop

knowledge, skills and attitudes towards the environment. It is therefore a curriculum orientation permeating the whole curriculum, as stated by UNESCO (1976, 1978). However, in practice it is not the case. There has been evidence that environmental education has been taught as environmental studies or environmental science as a new subject in the school syllabus (Gough, 1997). For example, in Nigeria, the government has designed curricula with strong elements for a brand new subject called citizenship education, both at the primary and secondary levels (Adedayo & Olawepo, 1997). Similarly in England, after treating it as a cross-curricular issue for a number of years, in 1995 the national curriculum was revised and environmental education became one of the main subjects in the revised curriculum (Chatzifotiou, 2006).

Although it is possible to include environmental education as an independent subject in the school curriculum, further arguments against considering it as an independent subject point out that the aim of environmental education which is to re-establish the man-environment relationship cannot be achieved through one subject (Gough, 1997; Powers, 2004). Therefore, by treating environmental education as a discipline of its own, one is continuing and reinforcing the separation of man from the environment. Also, in the Tbilisi declaration it was stated that:

> "environmental education should not be just one more subject to add to existing programs, but should be incorporated into programs intended for all learners, whatever their age….." UNESCO, (1977, p. 20).

Although it is argued that it is easier to teach, and will have its own identity when it is a separate subject (Sterling, 2004), it will have a narrow focus and not be related to the other subjects (Rusinko, 2010). In addition, not everybody may study it if learners have the mandate to choose the subjects they want to study.

The arguments discussed above can be considered to be valid because, first, the environment is a cross-curricular issue, hence all the various subjects are geared towards enabling the individual cope with his/her environment. Secondly, the curriculum of schools at different levels is already overcrowded (Powers, 2004), so adding another subject would worsen the situation. For example, in Tanzania in 1995, the problem of overcrowding of the primary school curriculum led the government to reduce the subjects taught from 13 to 7. However, this was not taken into consideration ten years later when the government decided to add more subjects to the primary school curriculum. The subjects which were added were Teknolojia ya Habari na Mawasiliano (TEHAMA), meaning, information and communication technology (ICT), French, Haiba na michezo (personality and sports) and social studies was broken down to the original subjects of geography, history and civics. The curriculum from 2005 to date has 13 subjects, which was previously considered to be too many.

Integration of environmental education into other subjects

Another approach to including environmental education into the school curriculum is to integrate environmental content into all the school subjects as a cross-curricular issue. The approach is referred to as correlated – subject design according to Jackson (1992), while Klein (1985) refers to it as multidisciplinary,

and in other cases it is referred to as a whole curriculum approach to environmental education. The notion of integration here refers to the making of connections across disciplines. With reference to environmental education, when it is integrated into the school curriculum it becomes the "thread" that runs through the whole curriculum. This is a popular way of integration in curriculum, where a theme or topic is addressed through the lenses of different subjects (Drake, 2004). In this sense, environmental education draws its content from the subject specific content of each subject. In doing this, environmental education therefore does not replace a particular subject, but is treated holistically through all the areas of understanding and experiences (Tilbury, 1995).

Successful integration of environmental education into the school curriculum will depend on the specific conditions, aims of education, and socio–economic structure of a particular country. It is argued that integrating environmental education into existing subjects will help learners develop understanding, skills and attitudes, which will enable them take an active and responsible role in the conservation of the environment. Arguing for the integration approach, Bolstad (2005), for example, found that schools are likely to find space for environmental education if it can be associated with existing subjects in the curricula rather than creating a new subject. Similarly, Capra (1997) argues that, in addressing environmental issues, there is need to shift from parts to wholes, and this is why the approach is referred to as the whole curriculum approach. Therefore, environmental issues and problems must be addressed in an interdisciplinary context in order to be more fully understood (Keiny, 1991).

The holistic approach to environmental education is supported by different researchers in environmental education, for example Bolstad et al. (2004) and McClaren and Hammond (2005). One of the arguments put forward as to why the emphasis is on curriculum integration is that it facilitates exchange and collaboration among different subjects (McClaren & Hammond, 2005), hence making learning meaningful. Also it is assumed that if the integration approach is adopted, that is integrating environmental education into all subjects, the rhetoric-reality gap will be closed (Palmer, 1998). The rhetoric–reality gap, as mentioned earlier, is the difference between environmental education which theoretically has been advocated and the environmental education that actually takes place in the schools (Grace & Sharp, 2000). Additionally, integrating environmental education into existing subjects in the curriculum will ensure that a large number of students, if not all, are exposed to environmental education. However, it is argued that although the approach is good and has a wide scope, it demands a lot of time and also resources (Rusinko, 2010), and also skills on the part of teachers.

According to the Education and Training Policy (MoEC, 1995), in Tanzania environmental education has been integrated as an element that should permeate all primary school subjects. Therefore, integration is the approach which has been used to include environmental education in the school curriculum in Tanzania, whereby environmental education is taught in all the subjects taught in primary school. This approach has been adopted because, as stated earlier, it will enable learners to relate environmental knowledge, skills and values from

different subject areas into their day-to-day activities. Examination of the syllabi for different subjects shows that there is some environmental content found in different topics or sub-topics as shown in Table 1 and in Appendix 2.

Table 1. Environmental education topics integrated into the primary school subjects (MoEC, 2005)

Subject	Environmental education issues
Social studies	The family, citizenship, cleanliness at home, school and the neighbourhood, conservation of the environment, economic activities and the environment, natural resources, the interdependence of things in the environment, ecosystem and ecology, environmental degradation, development issues, overpopulation, weather, water and waste disposal.
Science	Health issues, food and hygiene, health and sanitation, first aid, living things, energy, diseases, water, air, matter.
Mathematics	Using the environment to get teaching materials like counting. Using the environment as a teaching context like identifying different shapes, measurement, drawing. Setting mathematic problems related to the environment.
Vocational skills	Handcrafts like making baskets, pottery, laundry, cookery, agriculture.
Personality and sports	Health issues, personal hygiene, care of resources and life skills.
Information communication and technology	Using Information technology to access environmental knowledge in different disciplines.
Language (English & Kiswahili)	Structure, reading for comprehension, vocabulary and composition writing

From Table 1 it can be seen that the mode and extent to which environmental education has been integrated into the subject differs from one subject to another. In some subjects environmental content has been included as content to be learnt, while in others it has been included as a teaching and learning resource and learning tasks. For example in the languages (Kiswahili and English), environmental education appears as reading passages, vocabulary and structure exercises enriched by environmental notions. In mathematics, environmental education is found in the form of mathematical problems and teaching and learning resources. However, the intensity of environmental education content varies from one subject to another. In Tanzania, the subjects which have the most environmental education content are social studies (MoEC, 2005 (MoEC, 2005), science (MoEC, 2005) and vocational skills (MoEC, 2005) for primary schools. Analysis of the environmental education content included in these subjects show that emphasis is on teaching *about* the environment and to a lesser extent environmental education as education in the environment. Focus on the third dimension of education *for* the environment is minimal. It is anticipated that when learners learn about the environment, it is also education for the environment.

Apart from including environmental education in the different subjects, it is also integrated into extra-curricular activities. Learners are involved in various environmental management activities in the school grounds. Examples of such activities are cleaning the school compound, gardening, farming, tree growing and waste management. Although these activities seem to be routine work, the learners' involvement in these activities broadens their conceptions about the environment and its management (Ferguson, 2008).

The integration approach is also used in Uganda (Ofwono-Orecho, 1998) in Nigeria (Adedayo & Olawepo, 1997)**,** New Zealand (Flaws & Meredith 2007), China (Hua 2004) and in Jamaica (Ferguson, 2008). Also in Finland, the integrative approach has also been adopted in the National Core Curriculum for Basic Education 2004, where the theme of "Responsibility for the environment, well-being and a sustainable future" (Finnish National Board of Education 2004, p. 39) as a cross-curricular theme can clearly be seen. It aims at raising environmental awareness and commitment to a sustainable way of life among pupils. In addition, environmental education elements are also taught in environmental and natural studies, biology and geography in basic education (Jeronen & Jeronen, 2008; Finnish National Board of Education 2004).

Experience has shown that the integration of environmental education into different subjects creates a number of challenges to education systems (Mappin & Johnson, 2005; Palmer, 1998). It is argued that when environmental education is integrated into the content of other subjects, learners fail to develop a clear understanding of what different disciplines or forms of knowledge contribute to the understanding of an environmental topic (McClaren & Hammond, 2005). In addition, teachers find it difficult to link environmental education content with subject content because there seems to be no clear formula for implementation. As a result, many teachers are not comfortable with teaching through integration (Drake, 2004).

Another observation is that the integration of environmental education into the subjects will not only make it be regarded lightly by both teachers and learners but will also dilute it, particularly in an exam-oriented curriculum (Adedayo & Olawepo, 1997). This observation seems to be true because experience shows that many teachers focus on children passing exams. If there is content or subject which is not examined, they will not teach it effectively. It is also argued that the integration of environmental education into existing subjects may not be accorded adequate weight in all subjects. An example can be drawn from the primary school curriculum in Tanzania. The primary school curriculum is divided into thirteen subjects, which together form the primary school curriculum. Although the integration approach has been adopted in including environmental education into the primary school curriculum, it has not been done on an equal footing. The so-called host subjects like social studies, vocational skills and science have received more content than others. This could have resulted from the fact that these subjects have a lot of content which is related to the environment more than other subjects. Another possibility is that this may have resulted from curriculum developers not being knowledgeable on how to integrate environmental aspects into other subjects like languages and mathematics without affecting the subject content.

Furthermore, although integration is considered to facilitate holistic learning, it is assumed that it has resulted in subject content overload, which in turn has contributed to a superficial treatment of environmental education components. Also, the environmental education components which are to be taught in different topics are not shown clearly in the subject syllabi. For example, in vocational studies, in the topic of basketry, the syllabus and even the teacher's guide does not suggest to the teacher the environmental aspects which can be included. As a result, teachers do not know what to include. This is because the teachers are not used to include things which are not explicitly mentioned in the syllabus. This could be partly due to a lack of knowledge and skills in environmental education.

Another factor which can be a limitation to the teaching of environmental education as an integrated component in the curriculum is the teachers themselves. In the integrated approach, teachers have different disciplinary backgrounds with different motivations, different conceptions of environmental education and also quite different priorities. Therefore, it is likely that as they teach, more emphasis will be put on their respective disciplines. Sometimes, teachers lack expertise (Grace & Sharp, 2000) in the teaching of environmental education in terms of content and teaching skills.

Despite the challenges which the integrated curriculum poses, it has been considered to be the path that makes sense in education in this century (Drake, 2004). Integration connects what is learnt to real life situations and other subjects (National Council of Teachers of Mathematics, 2000). Therefore, if environmental education is to be meaningful, it should be integrated into different subjects so that all that is learnt in every subject will be related to real life situations which involve the environment in which the learners live.

Organization of the curriculum around significant issues and problems

This approach is considered to be a powerful one in the integration of environmental education into the school curriculum (Flaws & Meredith, 2007). In this approach, teachers and learners identify significant issues and problems without taking into consideration the boundaries between subject areas. The core of the unit is based on issues of concern rather than on topics (Fraser, 2000). The role of the teacher is to provide the students with guidance and learning resources. The learners in groups follow a problem-solving process and reach consensus on the issues to be investigated and the steps to be followed. This integrative approach shows the close relationship of the metacurriculum with curriculum or subject content. "Metacurriculum" is a term encompassing the skills to think, and learn independently and to solve problems in contrast to top-down teaching (Flaws & Meredith, 2007).

Reflecting on this approach, when the curriculum is organized around significant issues and problems, it facilitates relevant and holistic learning. Learning is relevant if it involves learners in real life situations which may be of concern. Since learners will be involved in identifying, analyzing and solving different issues and problems, they will develop the critical thinking skills which are important in environmental education. Also, learning will be holistic because it

will involve knowledge from different disciplines and also it will expose the learners to the ways people interact with their environment.

Looking at the three different approaches used in including environmental education in the school curriculum, the preferred approach is the independent subject approach because most teachers are used to it. However, it is argued that when it is integrated into the curriculum as an independent study, it has a narrow focus (Rusinko, 2010). But when learners want to be autonomous, the models of curriculum integration that most people support are those where content and curricular areas are shared or connected in some way, hence forming a broader focus (Flaws & Meredith, 2007; Rusinko, 2010).

After the discussion on how environmental education is included in the school curriculum, there is need for a closer look at how it is translated into teaching or how it is communicated to learners. This aspect is addressed in the following section.

2.3 Teaching and learning of environmental education

In this section I will first discuss the teaching of environmental education as an integrated component into the subject content. This will be followed by an overview of the pedagogical thinking underlying the teaching of environmental education, environmental literacy, concern for the environment and learning for action competence with a short discussion on the teaching methods. Then the aspect of critical teaching in environmental education will be discussed and related to Nyerere's education for self reliance. Since the teachers' knowledgebase is at the core of teaching and learning, their knowledge base in environmental education will also be discussed. Finally, the barriers facing teachers in the teaching of environmental education will be examined.

2.3.1 Teaching environmental education as an integrated component in subject content

In Tanzania, the approach which has been adopted to include environmental education into the primary school curriculum is integrating it into other subjects because it is not offered as a discrete subject (Lindhe, 1999; Mtaita, 2007; URT, 2004). This approach of integration has been adopted following the deliberations of the international forums on how environmental education is to be included into the school curriculum. The approach also enabled schools to cope with an overcrowded curriculum and also to solve the problem of knowledge fragmentation. Since environmental education content is not stated clearly in the syllabi for different subjects, when it comes to the actual teaching in the classroom, teachers have to search for environmental content from different sources like books, magazines, newspapers, and other sources, and find relevant environmental education content to be included in the different topics and individual lessons. Then the teacher has to identify areas and stages in which specific content can be integrated with the subject content. For example, in the syllabus for science in the primary school (MoEVT, 2005), on the topic about air, there is nothing mentioned about air pollution. But the teacher is expected to integrate environmental education by linking the subject content with different

causes of air pollution, and the environmental impact of air pollution on the environment. Then, together with the pupils they can discuss different activities in their environment that can cause air pollution and what measures they can take to minimize it, both at local and global levels. This process requires the teacher to have a wide knowledge base of environmental education and also the skills of linking the subject content with the environmental education content without diluting the subject content.

Sometimes when we talk about integration, it only refers to the teaching of content in the classroom. Integration can also be achieved by just taking the learners outside, even if the content of the topic is not directly related to the environment. This approach to integration enhances the learners' appreciation of the environment. In addition, environmental education should go beyond the classroom into society, into our daily activities and into nature (Hua, 2004). For example, if in the classroom the pupils learn about waste management, to integrate what they learn with society, they can discuss the impact of poor waste management on the environment then decide to carry out a clean-up activity of their school, the area around the school and at home.

The primary education curriculum emphasizes teaching and learning methods which make students active participants in the learning process (MoEC, 1995). It has been found that children learn better through the use of teaching methods that are active and participatory and are related to real life situations. Such methods engage learners in higher order thinking skills, critical thinking and stimulate learning, which are important in the learning of environmental education (Moon, 2008).

Environmental education seeks to develop the necessary knowledge, understanding, values, skills, attitudes and commitment among the people. These qualities would allow people to be proactive in securing a healthy and properly functioning sustainable environment (SADC-ELMS, 1999). To attain this objective, there is need to examine the kind of thinking that guides the teaching and learning of environmental education.

2.3.2 Pedagogical thinking guiding the teaching of environmental education

The traditional approach to the teaching and learning of environmental education focused on learning about the environment and environmental problems. As a result teaching was mainly based on the transmission of factual knowledge. It was assumed that when people got such knowledge, they would be able to take action in solving the various problems in their environment and therefore change their behaviour. Currently, there has been a shift from the provision of knowledge about the environment and environmental issues to carrying out investigations and taking action in the environment (O'Donoghue & Russo, 2004). Various models have been developed as tools for environmental learning. Some of the models include one developed by Hungerford and Volk (1990), which is based on traditional thinking which assumes that the behaviour of individuals can be changed if they are made more knowledgeable about the environment and its associated issues. It is assumed that the more knowledge

one gets, the more aware of the environment one becomes, hence more motivated to act towards the environment more responsibly (Hungerford & Volk, 1990). O'Donoghue (2001) also developed another model of environmental learning framework as a tool for planning environmental learning. The model suggests that learners focus on an issue or a problem, then engage in enquiry encounters, seek information, report ideas that they find and then take action to solve the problem. The model developed by O'Donoghue seems to focus more on solving environmental problems and issues. It is argued that it is not enough to teach learners about the environment and related problems. The result can be to make them feel desperate about their future (Hicks & Bord, 2001). Another model was developed by Palmer (1998) on the teaching and learning of environmental education basing on the thinking that meaningful environmental education includes education about, in or through, and for the environment. Although all the models focus on action on the environment, in this study I have adopted Palmer's model. Figure 3 is a model of how the teaching of environmental education can be done based on Palmer's (1998) interpretation of what the teaching of environmental education should take into consideration.

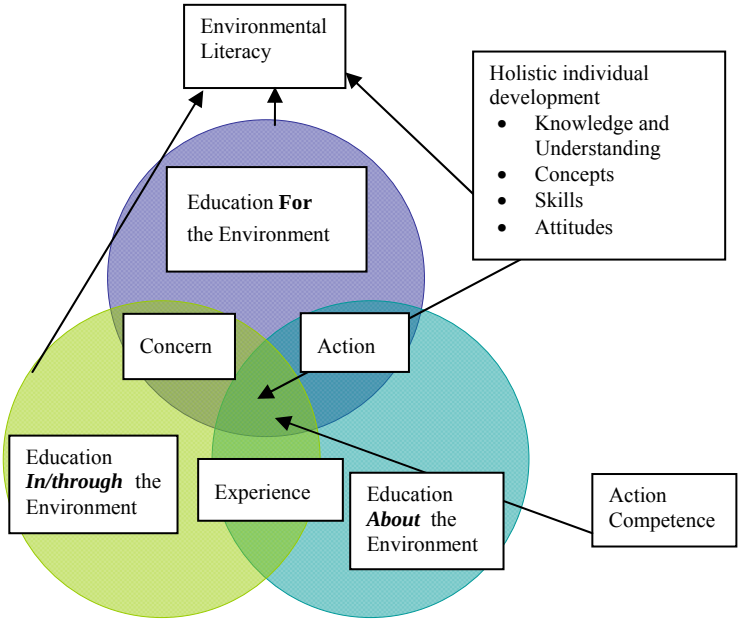

Figure 3. A model for teaching and learning environmental education (Modified from Palmer, 1998, p. 145)

The model as shown in Figure 3 includes the different components which have to be taken into consideration when planning for teaching and learning. Based on

the model for curriculum planning (Fig. 2), the learning tasks should address the components of education about, in, and for the environment (Palmer, 1998; Palmer & Neal, 1994). The elements of experience in the environment, concern for the environment and action-taking on the environment are crucial in the teaching of environmental education. Learners should be given the opportunity to get different experiences in their environment so that they can develop concern and various skills for taking action in their environment. Therefore, meaningful environmental education has to take into consideration finding information about the environment to develop the knowledge base needed, exploring through encounter experiences in the real environment, and taking action based on what one knows for a better world, all of which contribute to a better environment and sustainable environmental management O'Donoghue (2001). Emphasizing the central role played by experience in the teaching and learning of environmental education, Palmer and Neal (1994) stress that "first hand experiences of the environment are at the forefront of teaching and learning" (p. 37). The model for teaching environmental education (Fig. 3) suggests that if the three components of environmental education are taken into consideration, then the learners will become environmentally literate, develop concern for the environment and will develop action competence, which will be discussed in the following sections. I have focused on these aspects because they are the critical qualities which teachers have to develop among learners in the teaching of environmental education.

2.3.3 Environmental literacy

Environmental literacy refers to a person's capacity to perceive and interpret the state of the environmental systems and the appropriate action to manage, restore or improve those systems (Roth, 1992). Similarly, Orr (1992) defines environmental literacy which he refers to as ecological literacy, as the individual's capacity of knowing and caring about and the ability to take action on the environment. He further says that environmental literacy involves an understanding of how individuals and societies relate to each other and also to natural systems. This understanding will enable an individual to identify problems emerging from the environment, and their causes, which require changes in the ways human beings relate to each other and to the natural environment. From the definitions, it can be seen that environmental literacy is defined in terms of knowledge, understanding, attitudes and action-taking. Therefore, in order for an individual to be environmentally literate, he/she has to have knowledge and understanding of the environment, develop positive attitudes towards the environment and take action to address issues and problems that may arise in the environment.

Environmental literacy is considered as one of the fundamental goals of environmental education because its ultimate goal is to develop environmentally literate individuals (Dissinger et al., 1992; UNESCO-UNEP, 1989). Usually, when we talk about literacy, we link it with texts, meaning the individual's ability to develop reading, comprehension, writing and numeracy skills. But the concept of literacy has also come to refer to other disciplines and fields of study. With reference to the environment, it has been argued that we can talk about

environmental literacy because the biophysical environment can be treated as a text (Stables & Bishop, 2001). In so far as the features of the biophysical world reveal themselves through the signs we attribute to them, it can be said that we read the environment just like we read a text (Dissinger et al., 1992). Therefore, as one becomes literate in reading texts, one can also become environmentally literate. It is therefore taken that environmental literacy has content, skills and processes that learners ought to know in order to be able to demonstrate environmental literacy (Cutter-Mackenzie & Smith, 2003). Environmental literacy can therefore be acquired from direct personal interaction with the environment as well as from various other sources such as relatives and friends or through education and media. Based on the works of Fien (1992), Orr (1992, 1994), Roth (1992) and Simmons (1995), environmental literacy is categorized into four levels, namely environmental illiteracy, nominal environmental literacy, functional/operational environmental literacy and highly evolved environmental literacy.

On the first level of environmental literacy (environmental illiteracy), refers to a person who has little understanding of environmental concepts, processes, issues and problems. On the second level (nominal environmental literacy), a person has knowledge about the basic terms, facts and meanings used in communicating about the environment (Roth, 1992). However, such people still have misconceptions about the environment and environmental systems. On the third level (functional/operational environmental literacy), a person can correctly define environmental concepts, understand how environmental systems are organized and function and how the different systems relate to man. He/she also possesses knowledge and skills to take action to solve environmental problems arising in his/her immediate environment. Such a person has a broader knowledge and understanding of how human and natural systems interact. On the fourth level of environmental literacy (highly evolved literacy), a person has an adequate knowledgebase about the environment and understands how socio-economic and political processes influence the environment. In addition, he/she has the ability to synthesize environmental information and use it to act in ways that will lead to environmental sustainability. From the analysis, it can therefore be said that a person who is environmentally literate is one who has a rich knowledgebase, skills and multifaceted beliefs about the environment, and has also attained the higher levels of environmental literacy. I would suggest that for teachers to be able to teach environmental education effectively, they have to have the third and fourth levels of environmental literacy.

Roth's (1992) categorization of environmental literacy as nominal, functional or operational and highly evolved environmental literacy cannot be related to Marcinkowinski's (1991) view of environmental literacy, which he says comprises knowledge, skills, understanding and active involvement in the environment. Neither can it be related to the Scottish Office's (1993) definition, which is in terms of knowledge and understanding of the components of the environment and its systems. Although the above definitions have common areas of concern, they lack grounding in debates about literacy.

However, these views about environmental literacy touch on six main areas of environmental education, which are environmental sensitivity, knowledge, skills,

attitudes and values, personal investment and responsibility and involvement (Dissinger et al., 1992). Some of these areas can still be categorized into two main areas of environmental literacy, which are affect and behaviour (Roth, 1992). The affect category includes environmental sensitivity, values and attitudes, while the behaviour category involves personal investment, responsibility and active involvement. This categorization therefore makes four areas of environmental literacy, which are knowledge, skills, affect and behaviour. It can be said that the different ways of looking at environmental literacy are an indication that there are weak conceptions of environmental literacy, hence inconsistent applications of literacy in environmental education (Stables & Bishop, 2001). But still the fact is that the biophysical environment is laden with meanings, as everything operates as a sign. Therefore, everything can be treated as a text and it is on this basis that the concept of literacy is based.

It seems that no one is completely illiterate of his or her surroundings, but people's ability to process and analyze information varies from one individual to another. Although scientific knowledge is used as a reference point for environmental literacy, other types of knowledge like traditional or indigenous knowledge are also included. As a result, it is assumed that environmental literacy is something that everybody has. The reason for this assumption is that every individual lives and interacts with his/her environment always. Therefore, much of the environmental literacy develops in daily life activities as people interact with their environment (Barton, 2002). According to Smyth (2006), this kind of environmental literacy is built from awareness by the acquisition of greater knowledge and understanding of the components of the system, the links between them and the dynamics of the system. This is evidenced by the fact that many local or indigenous people live in harmony with nature and manage their resources wisely (McCay, 2001; Murdoch & Clark, 1994). For example, before the development of science and technology, many traditional communities had a lot of environmental knowledge, which helped them to live sustainably and within the carrying capacity of the life support system of the planet earth. They had knowledge about their environment and its dynamics, the available resources and how to use them in a sustainable manner. In Tanzania, for example, some communities had different ways of conserving their resources. Taking the case of the North Pare community in Tanzania, people conserved the catchment areas by declaring the forests around them to be sacred places. So nobody was allowed to go into these forests for whatever reason. Also, nobody was allowed to collect water with a soot covered cooking pot, or bathe and wash clothes in the water sources (Sheridan, 2004). This enabled them to get enough clean water throughout the year. Also, before the introduction of piped water, most people got their water from rivers, lakes and furrows. To keep the people from polluting the water sources, the Nguni people in Tanzania, for example, told children that if they urinate in the river or lake their sex would change to become female if they were male or male if they were female (From traditional tales). As a result, since nobody wanted their sex to change, they did not urinate in the water sources. Such conservation practices differed from one society to another because different societies had different ways of understanding their environments and the environmental issues and problems.

As can be seen from the examples above, although most of the people in the traditional societies were not literate in terms of knowing how to read and write, they were environmentally literate. They had the power to understand the different factors that contribute to environmental change and how the change can be addressed. This could be referred to as functional and critical literacy (Dissinger & Roth, 1992; Stables 1998). However, the situation has changed with the emergence of science and technology. People have become environmentally illiterate. A survey done by the National Environmental Education and Training Foundation (NEETF) in the United States in 2000 found out that there is widespread environmental illiteracy. For example, a majority of people do not know the causes of water and air pollution and poor solid waste management (NEETF, 2001). This is not the case with the USA only, but it is now a common phenomenon in many countries. Many of the environmentally friendly traditional practices have been abandoned by many communities. What could have caused this environmental illiteracy, which has led to a number of environmental problems like the greenhouse effect, acid rain, depletion of ozone layer, desertification, poor waste management, and land degradation? Although developments in science and technology have contributed a lot to an improved understanding of phenomena and quality of life, they have also contributed to the scale and rate of environmental degradation (Bowers, 2001). The role of indigenous knowledge in developing environmental literacy among learners should not be underestimated. As seen previously, different communities have vast a wealth of knowledge about the environment (in most cases, not documented), which advocates sustainable living. This knowledge is based on day-to-day hands-on activities in the environment and it sometimes surpasses that of professionals in different fields.

Environmental literacy is context-specific, and like environmental behaviour is affected by other factors like power relations and social and cultural factors (Hares et al., 2006; Schwartz & Thompson, 1990). Environmental literacy is not only conceptions in people's minds but also something manifested in people's environmental behaviour. It is assumed that unsound actions leading to unsustainable situations may take place due to insufficient knowledge, difficulty to interpret, or distorted perception of the environment. Therefore, if a person is to be considered environmentally literate, he/she should be able to demonstrate observable behaviours concerning knowledge of the key environmental concepts, skills in managing the environment, identification of environmental issues and problems and strategies to address these problems (Hares et al., 2006).

Environmental literacy is essential for sustainable living. Therefore, it can be enhanced through formal and informal learning. As said earlier, much of environmental literacy develops in daily life activities as one interacts with one's environment (Barton, 2002). This suggests that, teaching and learning in school should not be compartmentalized into different unrelated subjects where abstract facts are transmitted to the learners. Instead, learners should be involved in learning through different activities which enable them to interact with their environment. This is referred to as learning through or in the environment (Palmer, 1998; Palmer & Neal, 1994).

How people behave towards the environment is also affected by other factors along with environmental literacy. These other influencing factors can be political, cultural, economic or social. These factors can make people find themselves facing or causing environmental problems despite their environmental literacy. But people do not always behave in a way regarded as optimal or expedient towards the environment. For example, on the one hand people may feel obliged to harm their environment in order to secure their immediate livelihood or survival, even if they are knowledgeable about the negative long-term consequences of their actions. On the other hand, people may end up with sustainable solutions, even though they lack knowledge considered scientifically correct. These conclusions may be based on their previous experiences, beliefs or traditional practices. It may also be that people are aware of environmental problems, but they lack the knowledge of, or commitment to collective action. This may be the case of common property in some societies. In common property, for example land, collective action may pose a challenge because the stakeholders may have conflicting views on how the common resources should be used (Adams et al., 2003). When a person is environmentally literate, it does not necessarily mean that he/she will develop concern for the environment, which is also an important aspect of environmental education.

2.3.4 Concern for the environment

Concern for the environment can be described as a feeling of care and responsibility for the environment. There are two sides of environmental education, namely the search for scientific and technical knowledge on how to manage and solving environmental problems and helping individuals develop a sense of care and responsibility for the earth (Chawla, 2006). The development of a sense of care refers to environmental concern. For a long time, environmental education research has focused more on the search for knowledge and skills on how to manage and solve environmental problems, but very little has been done in terms of feelings and understanding which transform knowledge into action or not taking action. One of the main reasons for such focus is that it is assumed that once a person is knowledgeable about a problem, he/she will automatically take action. Another reason could be that concern goes with interest in order for one to take action. However, although concern and interest may lead to taking action on behalf of the environment, sometimes it may not be the case because it is assumed that action is guided by the intention to act (Chawla, 1999, 2006). This can be supported by findings from research carried out by Dunlap et al. (1993), where people showed very high levels of public concern about environmental protection, but when it came to taking action in the environment very few people were willing to give their time. Also, concern for the environment can either be concern for the welfare of humans (anthropocentric concern) or concern for all living things (ecocentric concern) (Thompson & Barton, 1994).

One of the aims of teaching environmental education in schools is to make learners develop concern for the environment. Therefore, the teaching of environmental education has to influence care for the environment and concern

for the environment among learners. These qualities can be demonstrated by the individual's involvement in conservation activities like proper waste management, practicing green farming, and reading literature about the environment from different sources. But if in schools the focus is on learning about environmental problems and their consequences, one might end up producing worried thinkers rather than environmentally concerned individuals.

Apart from making learners develop concern for the environment so that they can take action to care for or improve the environment, it is also expected that they would act as change agents in the home and in the community (Uzzell et al., 1994). It is evident that children influence their parents' environmental performance after they have learnt about the environment in school (Evans et al., 1996; Palmberg, 1996). More parents admitted to recycling waste after their children have done a course on the environment at school. But in some cases, the learners may fail to influence the environmental attitudes and behaviours of their parents and the community. Although they may have concern for the environment, they may feel powerless when it comes to the taking of action, because in some societies no one would listen to their ideas about environmental change (Freeman, 1999). For example, in some African households, a child cannot be taught about tree planting and then go to plant trees at home because he/she is still a child and therefore does not have a right to the land. The land belongs to the father, so planting anything permanent like a tree will make him feel that the child is taking the land from him (personal experience).

A person's environmental concern can be developed by a number of factors. Some of these are significant life experiences, and courses of study in school. Significant life experiences are those experiences that an individual regards as significant in their lives. They may cover life – span perspectives because they seek to understand how past experiences continue to influence an individual's feeling, behaviour and actions.

Significant life experiences help the individual to become reflective and develop meanings of the past, current and future situations. In this case, we can refer to this process as a means for sustainable living because an individual interprets and uses past experiences to meet the challenges of the present and make anticipations for the future. For example, it was found that some people have developed environmental concern as a result of significant life experiences (Chawla, 2006; Palmer & Neal, 1994). Significant life experience research was begun by Thomas Tanner in the 1980s when he asked environmentalists what made them work for the environment. He found that most of them said that their involvement developed from past experiences in the environment. Also, it was found that some of the experiences of nature the children had in childhood made them develop a special feeling about the environment (Hungerford, 2006).

It is therefore evident that if we want to develop environmental awareness, concern and interest in our learners, we need to know the kind of experiences and influences that would make them develop an inner feeling about the environment. According to Tanner (1980), children must know and love the natural world before they become involved in taking care of it. This is due to the fact that affective development towards the environment in early childhood may be the basis for building more complex ideas (Van Matre, 1979). For example, it

has been found that children at kindergarten level can develop affective concepts concerning the environment (Bryant & Hungerford, 1977). As a result, it is argued that attitudes towards environmental conservation and environmental pollution have been found to develop when children are at the elementary or primary school level (Palmberg, 1996). It can therefore be argued that children's meanings of the environment, which are related to their mental structures resulting from personal experiences and their life-worlds, develop at an early stage in life (Palmberg & Kuru, 2000). Therefore, it is important that teachers provide their learners with opportunities which will make them develop inner feelings that nurture appropriate action taking towards the environment, hence care and concern for the world are important in the early years of their lives.

Courses and learning activities in schools are yet another factor which helps individuals develop concern for the environment (Chawla, 1999). Studies show that some people admitted that the courses which they studied in school like ecology, biology, and geography made them develop environmental concern (Palmer & Neal, 1994; Palmer et al., 1999). However, development of concern for the environment will depend on the kinds of experiences the individual is exposed to during the teaching and learning process. For example, after 12 pupils in grades 3-6 of primary school level were exposed to the use of environmentally friendly products, the pupils decided to take action by making a survey in their locality to find out the kind of products they use in their homes (Palmberg, 1996). This indicates that the knowledge they learnt in school made the learners develop concern for the environment.

Apart from using significant life experiences and formal courses in school to develop concern for the environment among individuals, it is also important to engage young people with their families in doing various activities in the natural environment, such as hiking, fishing, gardening, identifying things in the environment and protecting local natural resources (Chawla, 1999). Therefore, community based programs where children see adults and peers being involved in taking care of the environment should be created. In addition, experiences of environmental destruction should be used as teachable moments to engage young people in understanding what has happened and why and how constructive action can prevent it from happening again. To facilitate this kind of learning, the Natural Learning Organization in the United States has sought to turn schoolyards into natural areas to serve the communities around, and also to be used as classrooms where learners can learn from the natural settings (Chawla, 2001).

Becoming environmentally literate and developing environmental concern are not enough for developing responsible citizenship among the learners. They also have to develop action competence to enable them take action in their environment as will be discussed in the following section.

2.3.5 Learning for action competence in environmental education

Since environmental issues and problems are rooted in society, which has diverse characteristics, they should be viewed from an individual, social and structural perspective. In order to be able to do this, learners should be helped to

develop the ability to recognize problems and find solutions for them in different situations or contexts. When people develop such ability, they are usually considered as competent in that particular area. The notion of action competence refers to an individual's ability to act at personal and societal levels in identifying and addressing environmental issues and problems (Jensen, 1995; Schnack, 1994). In other words, action competence refers to students' ability to act with reference to environmental concerns. It includes the ability to identify problems, make decisions about solutions and take action to solve those problems. In a similar way, Keen (1992) refers to competence as the ability to deal with non-routine and abstract work processes, handle decisions and assume responsibility of those decisions, operate in ill-defined and ever changing environments, work in groups, work within expanding geographical and time horizons, and understand dynamic systems. These are characteristics of competencies and not competencies themselves because they are not bound to a specific profession or domain. We therefore can say that competencies are a mixture of complex cognitive skills, interpersonal skills and attitudes, which allow someone to show competent behaviour in a certain field. Therefore, due to varying nature of contexts, it is difficult to have a single definition of what competence is which can cut across all contexts. What is considered a competence in one setting may not be a competence in another one. This is because competencies in different contexts require different combinations of skills and knowledge. Therefore, the central aim of educating people is to help them develop various competencies to be able to take action in different contexts.

Sometimes it is believed that if we get knowledge about a given problem, then we automatically become competent in solving and handling that problem (Schnack, 2000). The fact is that we can possess knowledge that does not affect our behaviour or the way we act. Action competence, according to Schnack (2000), is an educational curriculum ideal within the recent school of critical education linked to democracy. Therefore, action competence is both political and democratic education. Therefore, any educational theory that is based on action competence as an education ideal must be critical pedagogy theory (Mogensen & Schnack, 2010) involving reflection and critical thinking because one does not take what is given for granted. Critical thinking is a basic condition for developing action competence, because in developing action competence an individual has to think critically (Breiting & Wickenberg, 2010). This means that one has to expose the basis of his/her ideas or assumptions so that they can be critically analyzed through arguments and critique (Robottom & Hart, 1993).

However, action competence is not a new thing in education, and environmental education in particular. The concept of action competency has been adopted in many countries, such as Denmark, Australia, Macedonia (Simovska, 2000) and in South Africa (EECI, 2000). Competence based learning should therefore help learners develop the capacity of being able to act, now and in the future, and to assume responsibility for their actions. Such competency is referred to as *Applied Competence*, which is a combination of *Practical Competence*, *Foundational Competence* and *Reflexive Competence* (EECI, 2000). These can be referred to as the different levels of competence, as illustrated in Figure 4.

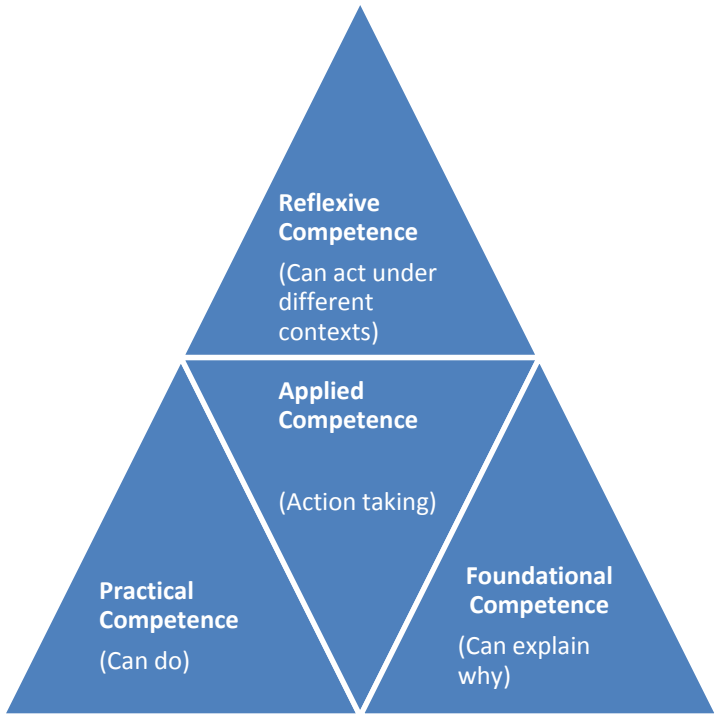

Figure 4. Developing competencies in environmental education. (Modified from Environmental Education Curriculum Initiative, 2000, p.31)

As can be seen from Figure 4 above, the initial level of competence is practical competence. This refers to the situation when learners can demonstrate that they can do something or know how to perform a certain thing. But knowing how to do something is not enough, so the learners have to demonstrate why they are doing what they are doing, and not otherwise. This is referred to as foundational competence. This is followed by the level of reflexive competence, whereby learners show that they can reflect on and in their actions, and are able to apply their practice and knowledge to new situations or contexts. The combination of these different levels of competencies possessed by an individual help him or her to carry out different tasks in his/her environment (Jones, Voorhees & Paulson, 2002). In the teaching and learning of environmental education, learners should be helped to develop action competence so that they can become involved, investigate issues, reflect critically, make informed decisions and act accordingly, individually and collectively, in a responsible manner.

The question is, what methods can teachers employ to facilitate environmental education in primary schools to help learners develop the competencies which have been discussed? The following section attempts to discuss in general the

methods that can be used in the teaching and learning of environmental education.

2.3.6 Methods for teaching environmental education

It is argued that there are no standardized methods for the teaching of environmental education (Lee & Williamson, 2001). But for effective implementation of environmental education, appropriate teaching and learning methods need to be used to address all the three components of environmental education (education about, in and for the environment). The interdisciplinary nature of environmental education emphasizes holistic and interdisciplinary teaching and learning. This can be done by engaging pupils in critical inquiries into real issues of the environment, and development and in actions addressing those issues (Stevenson, 2007). Elaborating on holistic education, learning styles and methodologies which are participatory in nature are suggested (Sterling, 1992). Sometimes participatory learning is referred to as active learning (Kane, 2004; O'Donoghue, 2001) which encourages critical thinking among learners and encourages learners to take responsibility for their own learning. Pedagogical activities which engage learners help them develop higher order or critical thinking skills, which are needed in analyzing environmental issues (Ballantyne & Packer, 2009; Stevenson, 2007).

The teacher, therefore, has the task of planning and organizing appropriate learning tasks which will enable learners obtain actual experiences from the environment, such as making investigations in the environment and reflecting on the interrelations that exist between man and his biophysical surroundings. It is widely held that individuals learn better when they learn through experience. As a result, environmental education is equated with outdoor education and experiential learning. These terms are usually used interchangeably. Although each of these areas have their own objectives and purpose, they share related purposes and focus (Adkins & Simmons, 2002). This situation is expected because whether it is outdoor learning or experiential learning, they are all done in the environment. So the environment cannot be separated from them.

When emphasizing the use of experiences and outdoor activities in the teaching of environmental education, teachers are obliged to teach their learners about the environment and how to conserve it for future use by using different activities which will give learners different experiences in the environment (Schatz, 1996). These experiences will help pupils interact with the natural environment, understand the ecological processes and the human impact on the environment (Meyer, 2006). Also, learners will develop skills for searching for knowledge about the environment, different relationships between the phenomena around them and environmental issues/problems. As a result, they will develop environmental sensitivity, action skills, taking responsible action in nature, social relationships and self-confidence (Palmberg & Kuru, 2000). These will enable them to learn how to analyze for themselves different situations, to propose viable solutions and take appropriate actions in their environment.

Learners possess a wealth of prior knowledge and understanding concerning different things which they learn in school. Prior knowledge refers to the kind of

knowledge an individual develops as a result of experience and interactions with the environment and with other people (Wood, 1998). Research in cognitive and development psychology and science education has shown that individuals construct personal knowledge structures on the basis of everyday experiences (Stanistreet & Boyes, 1997). But some of the prior knowledge which individuals hold may have misconceptions, and as a result the structures they have are different from scientific concepts (Duit, 1994). Therefore, through cooperative learning methods learners get the opportunity to share their prior knowledge with the teacher and also with other learners because education involves the sharing of different knowledge and understanding of the learners and the teacher (Kane, 2004). Through cooperative learning some of the misconceptions that they have will be clarified.

Cooperative learning is based on learning theory which emphasizes learning through social interactions (Vygotsky, 1978). The theory states that apart from individuals constructing their own meanings, as advocated by Piaget and Bruner, they also learn from other individuals (Wood, 1998). Therefore, it is argued that social interaction is important because personal views need to be set against the views of others and generally accepted (Littledyke, 2008). In cooperative learning, different methods are used by the teacher to organize and conduct classroom instruction. Some of the methods that can be used in cooperative learning are group discussion, project work, group investigation role play, amongst.

The use of investigative, experiential and cooperative teaching learning methods in environmental education addresses the issues of knowledge acquisition, skills and attitude development. Through these methods learners are provided with the opportunity to carry out guided inquiry into environmental issues (Meyers, 2006). When learners are provided with the opportunity to carry out guided investigations into the environment and environmental issues, they generate knowledge and also develop observation, recording and interpretation skills, which are important in understanding the environment. This approach to learning is referred to as "place-based education" (Stevenson, 2008; Van Kannel-Ray, 2006). Place-based education focuses on the use of the local environment as the place to investigate nature. It is argued that hands-on activities provided for learners in their local area help them develop action competence and critical thinking skills (Van Petagem et al., 2007). Although it involves the local context of the learner, it needs to be connected to national and global situations, hence the slogan, "think and act locally and globally" (Stevenson, 2008). It is envisaged that place-based education has various benefits, including attitude and behavioural benefits. It facilitates the development of ecoliteracy and ecological identity, which in turn will lead to local ecological and cultural sustainability or the social and ecological well-being of the places where people stay (Gruenewald, 2003; Sobel, 2004; Woodhouse & Knapp, 2000). The notion of ecoliteracy refers to an individual's capacity to understand how the natural world works (Orr, 1992). Therefore, an ecologically literate person is one who has the knowledge to understand the interrelationships that exist in nature and has the competence and attitude to take care of nature. Another benefit of place-based education is that it contributes to critical teaching (Smith, 2007).

While the use of investigative, experiential and cooperative learning is considered to enhance deep learning among learners, the view of teaching as transfer of knowledge dominates among teachers in Tanzania, where the learners listen to the teacher and answer his/her questions individually or in chorus (Barrett, 2007; Mahenge, 2004; O-Saki & Agu, 2001). The use of participatory and cooperative teaching methods has been introduced into the school system in Tanzania, with the aim of shifting from teacher-centered methods to learner-centered ones which are referred to as "good practices" (Barrett, 2007). Despite all these efforts, it is questionable whether teachers will be able to employ them, given the classroom context and conditions under which they operate, where the class size is big, teaching and learning resources are scarce, and there is pressure to cover the syllabus. Given these challenges, I am of the opinion that the teachers' adoption of these teaching methods will depend on their knowledge of the subject matter, and pedagogical skills and knowledge of the context, which they can develop through professional development programs.

2.3.7 Critical teaching in environmental education

Research evidence has shown that environmental education, and education for sustainable development, needs to adopt critical teaching based on critical theory developed by Dewey (1859–1952) and Kant (1724–1804) because they are both concerned with individuals and the society (Wolff, 2006). Critical teaching in this context refers to the kind of teaching where teachers help learners to find alternative ways of solving problems and to look at issues from different perspectives. Teachers therefore have to expose learners to contradictions, encourage them to ask questions that would stimulate and extend learners' thinking, and also to deconstruct and reconstruct knowledge (Carr & Kemmis, 1986; Fisher, 2001; Freire, 1997; Leonardo, 2004). For example, Freire stressed the importance of respecting learners' experiences, and that in learning one should therefore begin with the learners' experiences and link the knowledge to be learnt with the learners' real life situations (Freire, 1997). In a similar way, Carr and Kemmis (1986) claim that education should address societal problems. Going beyond school, Gooch et al. (2008) and Robottom and Hart (1993) suggest that the critical approach to environmental education should involve learners, teachers and society in carrying out investigations about real environmental issues so that they can identify the underlying socio-cultural norms to issues and problems.

Critical teaching creates an environment for critical thinking. It facilitates the development of higher order thinking skills, which include interpretation, analysis, synthesis, evaluation, making conclusions and self-regulation (Fisher, 2001; Gooch et al., 2008). Critical teaching therefore helps to develop well-informed individuals who have the ability to think deductively about issues and problems around them and make decisions to take action. Therefore, in teaching, teachers have to plan for learning experiences which revolve around real and relevant issues which are interdisciplinary in nature and use learner-centered approaches to facilitate learning (Ernst & Monroe, 2006) in order to promote reflective thinking among learners (Hungerford, 2010). Learners who can think critically have the ability to act in environmentally and socially responsible

ways, or they can be said to have developed action competence (Jensen & Schnack, 1997).

A person will be able to act as a responsible citizen if he/she has the knowledge, skills and attitudes and can think critically. Therefore, it is with the same thinking that Mwalimu Nyerere, the first president of Tanzania, when initiating education for self reliance in 1967, pointed out that education should liberate individual learners in terms of knowledge, skills and attitudes so as to make them able to think for themselves and to make decisions concerning different issues in their lives (Nyerere, 1967a). Linking education for self-reliance with the lives of the people, he said that since agriculture is the basis for our development, each school should have a farm as an integral part of the school (Nyerere, 1967c). This could be considered as environmental education because pupils learnt good agricultural practices.

As a result, in implementing education for self-reliance, agriculture and tree planting for conservation purposes became common activities in schools. Many primary schools had tree nurseries, where they grew tree seedlings to plant around the school and some were given to the school children to go and plant at home (Bakobi, 1994). In one of the forums with heads of schools Nyerere made it clear that self-reliance does not imply reducing the emphasis on academic subjects, but aims at making them more relevant to real life situations. As an example, he said that when teaching mathematics, teachers should use mathematical exercises related to real life problems (Nyerere, 1967b). From looking at Mwalimu Nyerere's philosophy of education for self-reliance, one can clearly see that it is no different to what environmental education is aiming at with regard to critical teaching and how it can help learners develop critical thinking skills. There is need for a critical approach to teaching in environmental education, because it will help individuals develop skills to reflect on what they do as individuals and also to play an active role in working with others to address issues in their environment. In addition, critical teaching will help in developing responsible citizens who are environmentally literate, have concern for the environment and have action competence, as discussed in the previous sections.

How researchers and environmentalists see critical pedagogy in environmental education is worth considering. For example, there are criticisms that critical pedagogy in environmental education is just a theoretical orientation because it lacks practical guidance for teachers and also it does not take environmental concern into consideration (Stevenson, 2008). Despite criticisms, previous experiences show that, countries like Australia, Canada and the United Kingdom have successfully adopted critical pedagogy in the teaching of environmental education with emphasis on environmental consciousness, environmental ethics, critical thinking and problem-solving skills by studying real world environmental and social issues and problems (Gruenewald, 2003). However, being a new approach to pedagogy, it is argued that teachers need to be oriented in how to implement critical teaching.

2.4 Teachers' knowledge base in environmental education

The importance of teachers' knowledge base in teaching cannot be underestimated. When emphasizing the importance of teachers in the effective implementation of environmental education, it is suggested that teachers have to be committed (Robottom et al., 2000). But apart from commitment, they also need a good knowledge base in environmental education.

In order for teachers to be able to implement environmental education in schools they need to have a good knowledge base in environmental education as will be discussed in the next section. Good teachers should possess a good knowledge base, which consists of knowledge, skills, understanding and disposition of collective responsibility. A good teacher should also possess means for representing and communicating the knowledge and skills to the learners (Palonsky, 1993). In other words, teachers must not only know the subject matter that they teach, but also the appropriate methods to transform it for the purpose of instruction (Thornton, 2001a). Shulman (1987) referred to the knowledge that the teacher needs to have as pedagogical content knowledge (PCK). In general, it is defined as the knowledge which is developed by teachers to enable learners to learn.

According to Shulman's model, pedagogical content knowledge is influenced by three other knowledge bases, which are subject matter knowledge (SMK), pedagogical knowledge (PK) and knowledge of context (KofC) (Abell, 2007; Shulman, 1987) as shown in Figure 5.

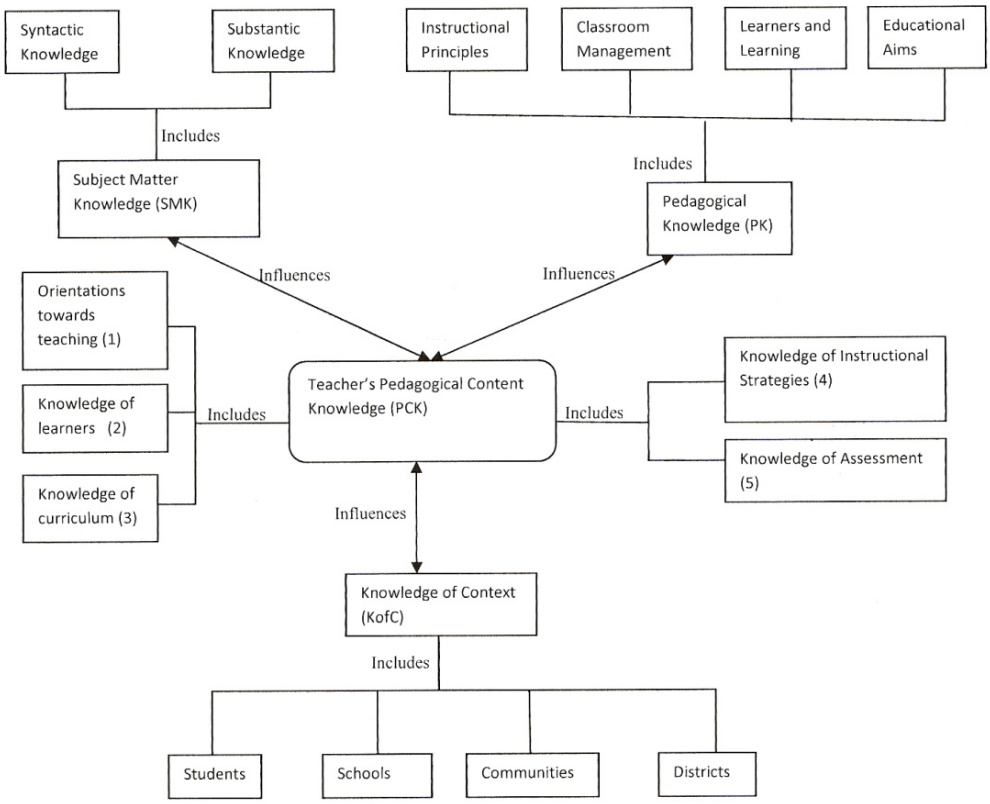

Figure 5. Teacher's knowledge base (Modified from Abell, 2007, p. 1107)

2.4.1 Pedagogical content knowledge

The teaching of different subjects requires different pedagogical content knowledge because different subjects have subject specific ways of teaching them (Tambyah, 2008). It involves the transformation of knowledge from different fields of knowledge. Knowledge that is connected to the teaching of a particular subject matter is referred to as pedagogical content knowledge (PCK) (Grossman, 1990; Shulman, 1987; Wilson & Shulman, 1987). Therefore, pedagogical content knowledge refers to teachers' understanding of how they can help learners understand the subject matter. This kind of knowledge is what distinguishes teachers from subject matter specialists, because knowing the subject matter is not a sufficient condition for teaching it (Abell, Rogers, Hanuscin, Lee & Gagnon, 2009). As shown in Figure 5, teachers' pedagogical content knowledge has five components. These include orientation towards the teaching of a particular subject, knowledge of learners and their understanding, knowledge of the curriculum, knowledge of instructional strategies, and knowledge of what and how to assess (Abell, 2007; Magnusson, Krajcik & Borko, 1999).

Building on Shulman's (1987) and Grossman's (1990) model of pedagogical content knowledge, the model applies to environmental education as a field of study. First, the teacher's orientation or general understanding of the teaching of environmental education, which involves the teacher's knowledge, beliefs about the purpose and goals for teaching environmental education, is important. These are what characterize the way which he/she will teach. A teacher's orientation guides him/her in making decisions about instructional strategies, learning tasks, use of instructional materials like textbooks and other teaching resources, and how to assess and evaluate learning (Magnusson et al., 1999).

Regarding knowledge of learners and their understanding, teachers need to know their learners and their understanding of environmental education. So environmental education teachers need to know what their learners need to know, and the areas which they find difficult or have misconceptions of so that he/she can help them. For example, studies have found that learners have misconceptions about environmental phenomena like the greenhouse effect, acid rain and the ozone layer (Khalid, 2001). The environmental education teacher therefore has to identify these misconceptions and help the learners clarify them. Although some teachers may have knowledge about areas that learners may find difficult in understanding, sometimes they may not have the knowledge to help them and sometimes they may have the same misconceptions (Berg & Brouwer, 1991; Magnusson et al., 1999). It can be suggested that such a condition can be addressed by in-service experiences and training.

Knowledge of the curriculum is yet another component of teachers' pedagogical content. It can be said that teachers should have knowledge about the goals and objectives of teaching a particular discipline and also should be knowledgeable about the program and the curriculum materials. Teachers' curriculum knowledge here refers to teachers' understanding of the whole curriculum as developed by the mandated body. In Tanzania, the mandated body for curriculum development is the Tanzania Institute of Education (TIE) (Meena, 2009). This knowledge base includes knowledge of the syllabus which states clearly the national and subject-specific aims and objectives of teaching a particular subject, subject content, teachers' guides, students' texts and teaching and learning materials which are suggested in the teaching of the subject.

Teachers have to be knowledgeable about the curriculum because they have to interpret the syllabus in classroom practice by preparing schemes of work and lesson plans which are used for teaching (Meena, 2009). As a result, in a curriculum where environmental education is integrated, the teacher has to know how the environmental knowledge can be integrated with the subject content and identify entry points for integration according to the teaching plan. Although it has been stated that environmental education should be integrated into the curriculum of all the subjects taught in schools, studies in Tanzania have shown that teachers do not know what and where to integrate environmental education into their teaching (Lindhe, 1999; Mtaita, 2007). As a result, they face problems in integrating environmental education into their teaching.

Teacher's knowledge of instructional strategies is another important component of teachers' pedagogical content knowledge. The teacher has to have knowledge of strategies for the specific subject and also appropriate strategies for the

different topics in the subject. Each subject has specific teaching strategies and even different topics in a subject can have specific teaching strategies (Magnusson et al., 1999). In environmental education, some of the strategies include outdoor experiences, investigation, exploration, problem-solving, simulations, inquiry, field excursions, and many others. Despite the fact that teachers may be aware and sometimes knowledgeable of the different teaching possibilities in environmental education, they may not use them due to various reasons such as not being adequately prepared, lack of time, pressure from external examinations and large classes.

All learning has to be assessed. Therefore, another component of teacher's pedagogical content knowledge is knowledge of assessment. In this domain the teacher has to have knowledge of the dimensions of environmental education that have to be assessed and the methods to be used in assessment. The traditional way of assessing learning is the use of tests and examinations which focus on knowledge only. But in environmental education, the dimensions to be measured are knowledge, skills, attitudes and action competence. These cannot all be assessed by written or oral tests and examinations.

Currently, the goal of assessment is integration, whereby assessment becomes part of the learners' everyday learning, so the teacher has to use a variety of assessment instruments like the use of portfolios, writing reports or writing reflections of what they learn, and seeing if pupils have developed the will and ability to be involved in environmental issues in a democratic way. This goal is especially important in environmental education because it focuses on a wide range of knowledge, skills, attitudes and action competence which cannot be assessed by tests and examinations.

Apart from the constituent parts of PCK discussed in the previous paragraphs, teachers' pedagogical content knowledge involves the transformation of other kinds of knowledge, which are teachers' subject matter knowledge (SMK), pedagogical knowledge (PK) and knowledge of context (KofC) in developing instruction, as illustrated in Figure 5.

2.4.2 Subject matter knowledge

Subject matter knowledge (SMK) is the teacher's knowledge base which influences pedagogical content knowledge. SMK can be defined as the knowledge that the teacher needs to have to be able to organize the concepts, facts principles and theories of a given discipline, and also the knowledge of the rules of evidence and proof which are used to generate and to justify knowledge claims in the discipline (Abell, 2007). Teachers' subject matter knowledge is necessary for the teacher to be able to teach a particular discipline. For example, in order for a teacher to teach a given subject effectively, he/she has to have the key facts, concepts, theories and principles about the subject, which is referred to as substantive knowledge, and also syntactic knowledge which refers to the rules of evidence and proof used to generate and justify knowledge in a discipline (Abell, 2007). Sometimes, subject matter knowledge is determined by the number of courses covered and grades obtained in the courses for a certain

discipline. But it can also be measured by the teachers' conceptions of the subject content.

Teacher's subject matter knowledge is important because it relates to teachers' practice of teaching. Studies done among teachers have found that there is a positive correlation between science training and teaching effectiveness **(**Dobey & Schafer, 1984; Druva & Anderson, 1983). It can be argued that teachers need to have good background in the subjects they teach to be able to teach effectively, or else it would be very difficult for them to structure the knowledge to be taught as expected by subject specialists. However, it is argued that the possession of subject matter knowledge is not enough for a teacher to teach effectively. There is a critical amount of subject matter knowledge that the teacher needs to have to develop pedagogical content knowledge (Magnusson et al., 1999). This principle is evident in Tanzania, where primary school teachers must have a minimum qualification of secondary school education (MoEC, 1995). This is because they need to have more knowledge than that of the level they teach.

For example, studies performed in Queensland, Australia found that primary school teachers' knowledge of facts, principles and concepts about environmental education was weak, and that they were likely to be teaching at a knowledge level of ecological illiteracy and/or nominal ecological literacy (Cutter-Mackenzie & Tilbury, 2001; Cutter-Mackenzie & Smith, 2003). Ecological illiteracy here refers to little understanding of environmental issues and/or the idea of environmental crisis. It also involves misconceptions about environmental issues. Nominal environmental literacy refers to an individual's ability to recognize and use some basic concepts of environmental education, but sometimes he/she may have misconceptions and provide naïve explanations of environmental systems, issues or problems (Cutter-Mackenzie & Smith, 2001).

2.4.3 Pedagogical knowledge

Teachers' pedagogical knowledge (PK) is another teacher's knowledge base which influences teachers' pedagogical content knowledge. Teacher pedagogical knowledge involves knowledge of instructional principles, classroom organization and management, knowledge of the learners and how they learn, and educational aims (Abell, 2007). In order to be able to communicate content to learners, teachers need to have an understanding of the principles that guide instruction, how to organize and manage the class to enhance learning, knowledge of the learners and the learning process and the general educational aims for teaching (Bransford, Darling-Hammond & Le Page, 2005).

It can be argued that the application and use of knowledge in the classroom is the most important aspect of the work of the teacher. Therefore, pedagogical knowledge is of great importance because it blends content and pedagogy, hence distinguishes between teachers and content specialists (Tambyah, 2008). It can be said that teachers' pedagogical knowledge lies at the heart of teaching because it represents the ways in which teachers merge the academic content with teaching methods, organize instruction and bring all these elements together with the learners' interests and abilities (Shulman, 1987) to facilitate learning.

But this does not mean that subject content is not of importance. The pedagogical knowledge and subject matter content have an interdependence relationship because teachers' knowledge content affects both what teachers teach and how they teach it (Grossman, 1995). Most of the pedagogical knowledge is developed through teacher education, teacher practices and from colleagues (Ernest, 1998 a).

2.4.4 Knowledge of context

In teaching, teachers have to work in a variety of ways to suit various situations, and also they have to adjust to the situations which they find in their classrooms. Therefore, knowledge of context (KofC) is another teacher knowledge base which influences teachers in translating pedagogical content knowledge into instruction. Knowledge of context includes knowledge about the community, school, the learners' backgrounds, the larger context like the district (Grossman, 1990) and also of the physical environment. Sometimes this knowledge is not found readymade for the teacher, so he/she has to obtain this knowledge from the learners, parents, other teachers, and the individual teacher himself or herself (Barnett & Hodson, 2000). Knowledge of context by teachers helps them in contextualizing the content being taught in order to make learning meaningful and related to real life situations.

Education about, in, and for the environment are the three approaches in meaningful teaching and learning of environmental education (Palmer, 1998). Therefore, the teachers' knowledge of the context is critically important in the teaching of environmental education. The teacher will only be successful in teaching if he/she has knowledge of the context, because the learners' environment will form the core of his/her teaching. Many teachers fail to teach due to lack of knowledge of context. For example, in Tanzania teachers teaching social studies for standard three (years 8-9) fail to teach the topic on "Our Ward", which requires them to teach the learners about the ward where the school is. Because there are no books about the ward, the teachers claim that they cannot teach the topic because they do not know what to teach. Instead, they teach the ward which is given as an example in the textbook.

2.5 Barriers perceived by teachers in the teaching of environmental education

Environmental education in many countries, for example in Germany, is integrated into different subjects across the curriculum (Böhn, 1997). But in practice, teachers integrate it mostly into biology and geography (Pulkkinen, 2006), because these subjects have content which is mostly related to the environment. The differences between what theorists refer to as environmental education and what actually takes place in schools is a situation which is referred to as the "rhetoric-reality gap" and has been widely discussed (Grace & Sharp, 2000; Lee, 1993; Palmer, 1998; Walker, 1997; Wolff, 2006).

While integration increases the opportunity for action, studies on the teaching of environmental education have shown that the implementation of environmental education in schools makes teachers encounter various barriers. The notion of

barriers here refers to the things which create problems for teachers, making them unable to teach environmental education as planned in the curriculum. For example, in a study carried out on Finnish teachers in a primary school in North Carelia, it was found that the barriers which teachers face in the teaching of environmental education are lack of time, funds, teaching and learning materials and knowledge (Pulkkinen, 2006). In another study done in Hong Kong, the kind of barriers perceived by teachers in primary schools in teaching environmental education are lack of knowledge, lack of lesson time, lack of teaching and learning materials and the issue of the safety of learners when the teacher wants to take them out to provide them with field experience, especially when there are many children in the class (Chi-chung Ko & Chi-kin Lee, 2003). Although only a few studies have been referred to here, these barriers seem to be common among teachers in different parts of the world. Various studies have identified barriers in the implementation of environmental education in schools as a result of lack of time, lack of resources, lack of school support and lack of knowledge and motivation among teachers (Ballantyne, 1999; Lee, 2000; Tomlin & Froud, 1994). Similar barriers were reported in Tanzania in a study by Lindhe (1999), where teachers revealed that in teaching environmental education they face barriers like large class size, which is an obstacle in using active teaching methods. Other barriers included lack of teaching and learning materials, and lack of environmental knowledge on the part of the teacher.

All these barriers can be said to be based on the teachers' own practical theories of education which are believed to shape their pedagogical decision-making. These theories include what the teachers believe about schooling, knowledge, teaching, students and learning (Stevenson, 2007). Also, the low levels of implementation are accounted for by lack of adequate pre-service and in-service teacher training in environmental education (Cutter-Mackenzie & Smith, 2001; Fien & Cocoran, 1996; Tilbury, 1992; UNESCO/UNEP, 1990). This results in lack of competence on the part of the teacher. As a result, environmental education has not been practiced widely in schools (Dillon & Teamey, 2002; Gough, 1997; Hart, 1993) because it is complex and demanding, intellectually and emotionally. This is due to the fact that the goals of environmental education according to international policies and the existing purposes and structures and practices of schooling do not meet the needs of the teachers. The role of the school is social reproduction, where the dominant curriculum and teaching practices are those of transmitting compartmentalized knowledge. Therefore the conditions needed to support environmental education are rarely found in schools (Stevenson, 2007).

Another barrier in the implementation of environmental education is globalization (Stevenson, 2007). With the coming of globalization, many governments have reoriented education to focus on the preparation of workers to compete in the new global knowledge-based economy. This has resulted in curriculum centralization, with more emphasis on subjects like mathematics, science and technology, and also reliance on examinations to measure student performance. As a consequence, subjects which are outside the emphasized subjects are marginalized. Also with globalization, the purpose of schooling and processes of teaching and learning are changed to fit the new focus. Therefore,

the aim of environmental education as stipulated in policy statements will not be realized under such conditions of schooling.

2.6 Conclusions

The focus of this chapter was on the theoretical considerations underlying the present study. Three major areas were identified and discussed. These areas included the definition of the concepts of environmental education and education for sustainable development, environmental education in the school curriculum and the teaching and learning of environmental education. These areas were considered as vital in the provision of knowledge on teachers' perceptions on the integration of environmental education in the primary school curriculum and teaching practices.

The concepts were defined and analyzed with reference to different literature and it could be seen that there are similarities and differences. Although the concepts have common features, such as both being concerned with the environment, they differ in the fact that education for sustainable development has a broader perspective in that it addresses not only the ecological dimension of development but also the social and economic dimensions.

The discussion on environmental education in the school curriculum showed that different approaches can be used to include environmental education in the school curriculum. It was seen that environmental education can be integrated into the curriculum as a separate subject or it can be integrated into existing subjects. The advantages and limitations of the different approaches were discussed. Although both approaches can be used, the integration of environmental education into existing subjects is the most advocated in terms of approach because it facilitates a holistic approach to learning.

Different teaching and learning methods were discussed, together with methods of teaching environmental education, teachers' knowledge base in environmental education and constraints facing teachers in the teaching of environmental education. Although there are no standardized methods for teaching environmental education, active learning or participatory teaching methods are advocated to help learners develop critical thinking skills and action competence. However, the teachers' knowledge base in environmental education was considered to be of importance in effective teaching of environmental education. It was seen that the teacher has to have subject matter knowledge, pedagogical knowledge and knowledge of context.

Finally, the barriers perceived by teachers in teaching environmental education were discussed, some of which included lack of knowledge, lack of time, lack of teaching and learning materials and large class size. Smooth implementation of environmental education in schools depends on the teachers' ability to overcome these barriers.

3 Methodology of the study

In this study I have set out to investigate primary school teachers' perceptions on the integration of environmental education into the primary school curriculum in Tanzania and their teaching practices. The purpose of this chapter is to discuss the methodological aspects which aim at discussing how the study was carried out. The discussion of the methods will help the reader understand how the researcher arrived at the findings of the study. The chapter begins with the research questions followed by the methodological framework which provides the orientation of the research. The description and discussion of the research design includes the context of the study, participants, sampling techniques, and data collection methods and data analysis. The issues of validity and reliability are also discussed in this chapter.

3.1 Research questions

The overarching question of this study is what perceptions do primary school teachers in Tanzania have on the integration of environmental education into primary school education and their teaching practices in various subjects. Based on the background of the study, the research is guided by the following three research questions:

> What are teachers' perceptions of environmental education and education for sustainable development?
>
> What are teachers' perceptions on the integration of environmental education into primary education?
>
> What are teachers' teaching practices in integrating environmental education into their teaching?

These research questions form the core of my study of teachers' perceptions and teaching practices. In the first research question, the focus is on teachers' understanding of environment, environmental education, sustainable development and education for sustainable development. These concepts are the key concepts around which the study revolves, so it is very important to understand how teachers conceive them. Also the concepts of environmental education and education for sustainable development are widely debated today and sometimes they are used interchangeably.

The second research question is concerned with how environmental education is included or integrated into the primary school curriculum as a cross-curricular issue, as it cuts across all subjects. Understanding teachers' perceptions on the integration of environmental education into primary school education is important because it determines how teachers convey and communicate their knowledge to pupils.

The third research question focuses on teachers' practices in the teaching of environmental education. Specifically, the focus is on how they integrate the environmental education components into the subject content and the methods which they employ in actual classroom practice. The integration of environmental education into primary school education is an experience which

demands that teachers change their practices in order to accommodate its teaching in the different subjects. This demand poses challenges to teachers because they have to link environmental education components with the specified subject content in the subject syllabi. It is assumed therefore that the answers to these questions will shed light on how environmental education is implemented as an integrated component in primary school education.

3.2 Selection of the research approach

In this study the researcher's main task is trying to identify the kinds of perceptions that teachers attribute to their understanding of environmental education, how environmental education has been integrated into the curriculum and how they translate it into teaching practices. Various methodological approaches could have been adopted. Since the study seeks to find the perceptions, experiences and practices of individual teachers, the study has adopted the qualitative approach.

Current research trends have adopted the use of the qualitative approach to research in investigating experiences (Cohen, Manion & Morrison, 2000; Fraenkel & Wallen, 2000) in order to make an in-depth description of a particular situation or practice. This is based on the fact that the way people experience a phenomenon differs from one individual to another. For that matter, the qualitative paradigm is considered to be appropriate approach to this study compared to the quantitative paradigm, because it seeks teachers' understanding, practices and experiences (Palmer, 1998). In a similar way Gillham (2001) adds that qualitative methods focus primarily on the kind of evidence given by the respondents. For example, what teachers tell about environmental education is evidence of how they perceive environmental education which will help to understand the rationale for their practices.

As mentioned previously, this study will adopt a qualitative approach using phenomenography and phenomenology as research methods. The choice of the methods has been based on what the research is seeking to find out, namely the teachers' perceptions and experiences. In the first research question the interest is in teachers' perceptions of environmental education and education for sustainable development, therefore the appropriate method is phenomenography. The second and third questions seek to explore teachers' perceptions of the integration of environmental education into the school curriculum and their teaching practices; hence, I chose the phenomenological approach because the focus is on the teachers' experiences and practices. The term practice here will be used to refer to how actions are situated in their contexts. Therefore, in this study, the teachers teaching practices refer to their actions at work, which is teaching in the classroom. Both the phenomenographic and phenomenological approaches will be discussed in detail in the following section

3.2.1 The phenomenographic approach

In this study, the phenomenographic approach has been adopted to seek teachers' perceptions of environmental education and education for sustainable development. Phenomenography is a research method which is used to find

different ways in which individuals conceive or think and understand different aspects of various phenomena around them (Marton, 1986; Ornek, 2008). According to Marton (1981), in phenomenography the interest lies in the description, analysis and understanding of phenomena in the world as other individuals conceive them. Therefore, the focus of phenomenographic research is on the qualitatively different ways in which people understand or experience a particular situation, aspect or phenomena around them (Marton, 1981; Marton & Booth, 1997; Marton & Pong, 2005). The notion qualitatively different ways of experiencing phenomena refers to the different ways of looking or perceiving something. With reference to this study, it is the range of different ways in which teachers conceive environmental education. I say a range of different ways because, as Ornek (2008) argues, individuals differ in the ways in which they experience or perceive phenomena because ways of understanding are not constant among individuals. This is due to the fact that an individual's understanding is influenced by time, beliefs, culture context and the prior knowledge he/she has of the phenomena in question (Marton, 1981). As a result, ways of experiencing phenomena are constantly changing according to their context and the ways individuals interact with them.

The object of research in phenomenography is the different ways in which people conceptualize experience, perceive, apprehend and understand various phenomena in the world around them (Marton & Booth, 1997). In this study therefore, the focus in the first research question is on the variation in the ways primary school teachers conceive environmental education. The importance of finding the different ways in which individuals perceive things has also been emphasized by Branford and Schwartz (1999), Garner (1974), Gibson and Gibson (1955). They all have emphasized the role of contrast in perception, because people perceive phenomena differently. It is assumed that the way one experiences a particular situation or an object is a result of how they relate it to other phenomena. It is believed that in order to understand how people deal or handle situations or even solve problems, one has to understand their lived perceptions (Marton & Booth, 1997). This is because in phenomenography, individuals are seen as bearers of different ways of experiencing phenomena and also bearers of fragments of different ways of experiencing phenomena. Therefore in phenomenographic research, it is considered that the way in which a phenomenon is experienced is a result of an internal and external relationship which exists between the experiencing individual and the phenomenon being experienced. (Marton and Booth, 1997).

The phenomenographic approach is based on the theory of variation, because variation is at the heart of phenomenography (Marton & Pong, 2005). The theory of variation explains how individuals gain knowledge of the world around them. According to this theory, an individual's experiences and learning are understood in terms of three aspects, which are discernment, simultaneity and variation. Although these factors are considered independently, they are interrelated, hence forming the base of the variation theory. When we discern something, we expose it to variation. Things can be differentiated by different qualities, like shape, colour, size or any characteristic that makes it appear different from other things. Taking an example of a tree, if we knew only one type of a tree, we would not be able to distinguish a mango tree from a palm tree

or mahogany. We would call all of them trees, regardless of their differences. But because we know that there are different kinds of trees, we recognize them as different and give them different names for the purpose of identification. Even if we do not know the name of a tree, we still know that it is different from the other trees that we know. When we discern something, the different parts and forms of that thing will appear to enable us recognize that thing and therefore make meaning from it (Marton & Booth, 1997). If we discern different characteristics of a phenomena, like if we say something is round and smooth, we are aware of its shape and texture, which are two different dimensions. A person's experience can be understood as an internal relationship between the person experiencing and the phenomena being experienced, and that is why we have variations in the way individuals perceive phenomena (Marton & Booth, 1997). According to Bowden and Marton (1998), when we talk about qualitatively different ways of experiencing phenomena, they are concerned with structural differences and differences in meaning.

Experiences of phenomena or situations are usually described by statements. The initial statements made by individuals describing the experiences are referred to as first order perspectives (Marton & Booth, 1997). But when the researcher goes further to search for the reasons why they perceive or conceive the way they do, or even make conclusions about something, the responses they give are referred to as second order perspective. While first order statements are considered as starting points for expanding the individual's understanding of the phenomena under investigation, the second order seeks to make more clarification of what has been said. In order to get an in-depth understanding of the phenomena being studied, both first and second order perspectives of the individuals need to be adopted. Taking the example of this study, of teachers' perceptions on the integration of environmental education into the primary curriculum, the initial statements made by the teachers will be first order perspective on how they experience the situation. The statements which will be obtained from the interview will reflect individual teachers' ways of experiencing the situation. But in order to get an in-depth understanding of the teachers' experiences, the researcher has to go further and ask the teachers why they think in that particular way by using prompts such as "What do you mean by…… or Why do you think like that? or Can you tell me more about….." The statements given in response to these questions are second order perspective statements because they clarify the initial or first order statements. It is these second order statements which are used to make judgments about understanding.

From the second order perspective, categories of description are developed to describe how the phenomena being studied are understood or experienced. Each of the categories indicates a particular way of understanding or experiencing the phenomena in question. The qualitatively similar and different ways in which individuals perceive phenomena form a category system. Both the categories of description and the category systems form the results of the qualitative analysis (Marton, 1988).

The advantage of using phenomenography in research is that it probes into how individuals experience understanding and construct knowledge. This is important in education because the role of the teacher is to help learners in

developing concepts which are consistent with the concepts in the various subjects which they study (Marton & Pong, 2005). Also the different conceptions which learners have can form the basis for helping teachers find ways of helping learners change from one way of thinking to another (Marton, 1986). Furthermore, phenomenographic research can help learners be aware of contradictions in their own reasoning as they are exposed to new ideas.

3.2.2 The phenomenological approach

The second and third research questions seek to find out teachers' perceptions of integrating environmental education into primary school education and their teaching practices in the teaching of environmental education as an integrated component in the school curriculum. Based on the study aims, which seek teachers' perceptions and practices, I have chosen the phenomenological approach to the study. Phenomenology is a philosophical interpretative qualitative research approach which explores personal experiences as perceived by the participants (Smith & Flowers, 2009). It attempts to give us a full understanding of the individual's experience (Keen, 1975). Giorgi (1970) argues that phenomenology provides a deeper understanding of human behaviour than other models. This is because when conducting this type of research, the researchers immerse themselves in the material to better understand and appreciate the experience of the respondents (van Manen, 1984): the researcher gets into the "life world" of the respondents. Life world here refers to the concretely experienced everyday world which is taken for granted. The approach is based on the philosophical assumption that individuals get to know only what they experience through the sensory organs.

According to Patton (1990), phenomenology is the study of how individuals describe things and experience them through their senses. In a similar way, Creswell (1998) describes phenomenology seeking to describe the lived experiences of an individual or a group of individuals about a particular phenomenon. In addition, Cohen, Manion & Morrison (2007) define phenomenology as the study of experience as seen by an individual.

Phenomenology as a research method focuses on the structure and essence of experience. It is concerned with how we put together the phenomena we experience to make sense of the world around us, and hence develop a world view.

In this method, semi-structured interviews are used as an instrument for collecting data from the participants. Through the interviews I as the researcher get the opportunity to talk and listen to the teachers as they talk about their practices in teaching environmental education by integrating it into the content of the subjects they teach. In doing this, I am not looking for specific answers, but am attempting to gain a deeper understanding of the phenomena being studied. And this deep understanding of the phenomena can be developed by the researcher getting close to the participant and the situation. The goal is to capture everything that is taking place and all that is actually said. The data therefore consists of direct quotations from the participants and lesson observation. Since its focus is on understanding the nature of reality through

people's experiences in subjectively constructed processes and meanings, the aim of phenomenology is to determine what an experience means for those who have had the experience and are able to provide a comprehensive description of it. It is argued that the phenomenological method is interested in the ways in which phenomena are experienced, rather than the nature of the phenomena themselves (Cohen et al., 2000). The investigation of teachers practices' with their perceptions and understanding of how they experience teaching environmental education in their day-to-day lives are essential to uncovering how environmental education is implemented in schools.

In conducting phenomenological research, there are two phases (Creswell, 1998). In the first phase, the epoch, the researcher records on paper his or her biases and assumptions as completely as possible and then tears up the paper to get rid of his/her biases symbolically. The notion of epoch here refers to when the researcher sets aside all the preconceived experiences to best understand the experience of the participants in the study (Moustakas, 1994). This facilitates openness towards the phenomena under investigation. The second phase involves recording, clustering and synthesizing categories to discover the main characteristics of the categories, which are referred to as aspects or sub-categories.

3.2.3 Relation of phenomenography to phenomenology

Sometimes phenomenography is equated to phenomenology. Although the two are qualitative methods of research and they belong to the same field of knowledge which is defined by experience, they are not the same because they differ in terms of their object or purpose of research. Marton and Booth (1997) argue that the two methods are not the same because the object of phenomenological research is human experience, while the object of phenomenography is the structure and nature of human experience. In addition, Ornek (2008) points out that other differences in phenomenology include the aim and research results. Therefore, while phenomenology aims at describing experiences to capture the richness of the individual's actual experience, phenomenography aims at describing variations in understanding phenomena (Marton & Booth, 1997). Regarding the research results, analysis of phenomenological data leads to the identification of meaning units (Flood, 2010) while in phenomenography analysis leads to the identification of conceptions and outcome space.

Another distinction between the two approaches is the way researchers view the phenomena being studied. While phenomenology views phenomena from the first order perspective, phenomenography describes the phenomena from the second order perspective. In the first order perspective, the researcher describes the phenomena as it is through the eyes of the respondent. In the second order perspective the researcher describes how individuals conceive the world around them. So in the second order perspective, the phenomena being investigated are seen through the participants' eyes or are described according to how they appear to other people. This exposes the different ways of how people conceive reality.

Lastly, phenomenology aims at understanding the nature or the qualities of a phenomenon, but phenomenography aims at finding the variation and the structure of this variation in terms of the different aspects which define the phenomenon (Marton, 1996).

3.3 The study area

The study was conducted in four primary schools in Tanzania in Morogoro region. My motive for choosing Morogoro is based on the importance of the environment of that area and also on practical reasons. Regarding the importance of the area, the Uluguru Mountains, which are one of the physical features of the region, are part of the Eastern Arc Mountains. They are globally recognized for their rich biodiversity. Biodiversity refers to the number and variety of plant and animal species found in a given area. The mountains are also of hydrological importance because they are the catchment area for many of the important rivers of eastern Tanzania. However, these mountains are being degraded by human activities in unsustainable agricultural practices like shifting cultivation and wild fires (Wilfred, Madoffe & Luoga, 2007). Therefore, I assume that if environmental education is taught effectively in the primary schools it can contribute to the conservation of these mountains. In practical terms, I chose to carry out the study in Morogoro because I live in Morogoro and am familiar with the area.

The four schools were randomly selected from urban and rural localities. Therefore, two schools (schools C and D) are located in Morogoro municipality and the other two (A and B) are in Morogoro rural district. To avoid choosing schools which were too close to each other, the schools were randomly selected from different wards, both in the urban and rural areas. In the urban area, the schools were selected from Mwembesongo and Kilakala wards. In the rural area they were selected from Kiroka and Mikese wards. The simple random selection method was used to select the schools. The names of all the schools in each ward were written on a piece of paper, and were put in four different boxes. After mixing them thoroughly, one school was picked from each box. This procedure assured that each school in the wards had an equal chance of being chosen (Trochim & Donelly, 2006).

The schools were chosen from different localities because it was assumed that the location of the school would influence the teachers' perceptions and practices of environmental education. Although the schools were in different localities, they are similar in some aspects like class size, availability of teaching and learning resources, and they follow a centralized curriculum. The main difference between the schools is that they serve different communities. The urban schools serve communities which are engaged in commercial and employed activities, while the rural schools serve communities which are involved in subsistence activities, mostly farming.

3.4 Selection of the participants

The participants of this study were 31 primary school teachers. Their selection was influenced by the aim of the study and also on the aspect of trying to get

variations in experiences as far as possible. In this study, the phenomenon of my interest is to explore primary school teachers' perceptions of the integration of environmental education into the primary education curriculum and how they implement it in their normal teaching. However, there are different ways in which participants in research can be selected. According to Maykut and Morehouse (1994), in qualitative research the participants are carefully selected for inclusion in order to match the purpose of the research. So the researcher needs to consider the extent to which the sample will generate rich data for the study (Cohen, et. al., 2007).

In this study, the choice of participants was based on theoretical sampling (Creswell, 2008) where the participants to the interviews and lesson observations were theoretically selected. In theoretical sampling the researcher chooses the kind of participants on their potential in providing data that it would give useful information relating to the phenomena being studied (Patton, 2001). Although theoretical sampling is mainly used in grounded theory studies, it was used in this study because the goal is to develop a rich understanding the real situation concerning teaching environmental education in primary schools in Tanzania. Therefore, in the case of this study the choice of the teachers was intentional (Creswell, 2008), based on different qualities like teaching subjects, class level, working experience and gender. Teachers were selected from all the subjects because they represented different experiences of the integration of environmental education into the primary school curriculum. The aim was not was not to get many variations but to get a deep understanding of what was being investigated. The class level the teacher taught was also taken into consideration, although in most cases the same teacher would teach the same subject and even more than two different subjects at different class levels. The aspect of gender and avoiding gender bias was also a criterion for selecting the study respondents as it was assumed that male and female teachers would to think about their work differently. However, gender balance in teachers in urban schools was not possible because most urban schools are staffed mostly by female teachers. This situation results from married female teachers following their husbands who work in other sectors in town. Working experience was also considered because life experience plays a significant role in the development of perceptions and practices. Limit of teaching experience was not set because the researcher wanted to get experiences of both short and long servicing teachers. The professional qualifications of the teachers were not considered as a criterion for selection because almost all the participants had the same qualifications (Grade IIIA Certificate), except two teachers who had upgraded from teacher grade IIIA to diploma in education level. Grade IIIA teachers are those who have undergone two years of teacher training after completing ordinary secondary education level. Teachers with a diploma in education are those who have undergone teacher training for two years after completing advanced secondary education level or who have upgraded themselves from teacher Grade IIIA. However, all the teachers who participated in the study had initially been trained as primary school teachers and had teaching experience ranging from one and a half years to 31 years. A summary of the background characteristics of the participants in the study is as shown in Table 2 and particular characteristics for each participant are shown in Appendix 1.

Table 2. Summary of the background characteristics of the participants in the study

Characteristic	Profile	Number of Participants
Gender	Male	13
	Female	18
Teaching Qualification	Diploma	02
	Certificate (Grade III A)	29
Teaching Experience	1 – 10 years	16
	11 – 20 years	09
	21 – 30 years	05
	Above 30 years	01

3.5 Data collection methods

Data for this study was collected using the mixed approach methods (Creswell, 2008) and it included interviews and lesson observations. The mixed method design was used with the aim of one form of data supporting the other. In this case, the observation data supported the interview data. Also the mixed method approach was used in order to access both teachers' perceptions, experiences and practices. Through interviews the researcher was able to obtain the teachers' opinions, points of view, values, feelings, attitudes, perceptions and practices regarding the integration of environmental education into the primary school curriculum. Through observation, the researcher could see what teachers actually do (Maykut & Morehouse, 1994), hence enabling the researcher to obtain a deep understanding of what they say and do about the issue being investigated (Cohen, et al., 2000). This enabled the researcher to compare what teachers say about how they teach environmental education with how they actually practice what they say in the classroom. According to Flick (1998), the combination of different data collection methods within one study is believed to result in an in-depth inquiry of the phenomena being studied. The data collection methods which were used to collect data for the study are discussed briefly in the following sections.

3.5.1 Interviews

In phenomenographic and phenomenological studies, interview is the main method of data collection (Flood, 2010) because researchers have found that it is one of the most common and effective modes of gathering data in any inquiry, particularly in trying to understand other people (Fontana & Frey, 2002). Similarly, Drever (1995) points out that the method is considered to be common because when one wants to get information, overall opinion, or exchange ideas, one way is to talk to people. An interview has been defined as a two-person conversation initiated by the interviewer for the purpose of obtaining research-relevant information (Cohen & Manion, 1994; Cohen et al., 2007). It is different from ordinary or everyday conversation in that it has a specific purpose where

the interviewer asks leading questions to arrive at the specified goal. However, when the interview is not structured, it bears resemblance to an informal conversation.

The researcher can use different kinds of interviews to collect data from the respondents. According to Drever (1995), interviews can either be classified as formal, non-formal or informal; structured, semi-structured or unstructured, amongst others. The intention here, however is not to discuss the different kinds of interviews but to discuss the type of interview which has been adopted for this study, which is the semi-structured interview. According to McKernan (1991), in this type of interview the interviewer has certain questions he/she asks to all the interviewees but also allows the respondents to bring up issues and questions as they progress. In doing so, the interviewer can obtain the respondents' clarifications and elaborations.

I have chosen to use interview as a data collection method for my study because the method has advantages over the other methods. First, through interview, an exchange of views between two or more people on a given topic is made possible. Both the interviewer and interviewee discuss their interpretations of the world they live in and explain how they perceive or regard situations from their points of view. From these interactions, they both learn from each other. This therefore makes interview not only concerned with data collection about life experiences, but can also be considered as part of life (Cohen at al., 2007). Secondly, the interview is a multi-sensory tool for data collection. Data can be collected through verbal, non-verbal, and audio channels. These different sources of data can generate rich information about the phenomena being studied.

Thirdly, through interviews, one is able to measure what a person knows (knowledge or information), what he/she likes or dislikes (values and preferences), and thinks or feels (attitudes and beliefs) (Cohen & Manion, 1994). In addition, interviewing serves as a tool to discover the perceptions and experiences the informants have had of a particular situation or topic (Lofland, 1995). It can be said that the interview method is quite suitable in investigating individuals' knowledge, feelings and attitudes as they experience real life situations. In addition, Kvale (1997) points out that, interviews obtain descriptions of the world of life of the respondents in order to be able to interpret the meaning of the desired phenomena.

Fourthly, the advantage of using interviews as a data collection method is that they have been found to give high quality data, because through interviews the participants' descriptions can be explored illuminated and probed (Kvale, 1996). The researcher does this by asking the interviewee to clarify issues which were not clear by asking follow-up questions, requesting examples and reflecting of what they say (Patton, 1990). Therefore, the researcher has control over the kind of information he/she wants to get from the respondent by asking probing questions to elicit more information.

Sometimes a researcher cannot observe or see for him or herself the phenomena being studied. Therefore, the fifth advantage is that interviews provide the

researcher with useful information such as personal information when he/she cannot observe what is being done or going on.

Therefore, taking into consideration all these advantages, when designing this study, teacher interviews were considered to be the most appropriate method for data collection, and to enable an in-depth understanding of what the perceptions of teachers are on the integration of environmental education into the primary school curriculum.

Although the interview as a data collection method has advantages, it also has some disadvantages. According to Creswell (2008), some of these disadvantages are that data from interviews is filtered information through the views of the interviewers because researchers summarize the participants' information when they write the report. In addition, it is a challenge to the researcher to capture the real meanings of the respondents. This may be due to the fact that people may not necessarily be conscious of the thinking underlying their actions. Also, as in observation, the data obtained through interviews can be deceptive because the respondents decide what to say and what not to say. So it can be a problem for the researcher to get exactly what she/he wants. In addition, the equipment used in recording interviews can be a problem when conducting or transcribing the data. To overcome this shortcoming, interviews can be complemented with unstructured observations.

3.5.2 Observations

Apart from using interviews, to investigate the teachers' experiences, lesson observations were also used to develop an understanding of how teachers actually teach while integrating environmental education into the subjects they teach. The concept of observation is defined differently by different authors. For example, Gorman and Clayton (2005) define observation as the systematic recording of observable behaviour or phenomena in a natural setting. Observation as an instrument for collecting first hand information is considered to be one of the core research methods for data collection (Adler & Adler, 1994). However, there is debate as to whether observation should be considered a research method or a data collection method (Powell & Connaway, 2004; Williamson, 2000). Researchers like Williamson (2000) consider observation to be a data collection method because it can be used in some of the different research methods like phenomenography, phenomenology and ethnography.

In this study, observation has been used as a data collection method. The choice of observation as a tool for collecting data was to get the opportunity to collect live data from naturally occurring settings. This enables the researcher see for himself/herself what is being done in the classroom instead of relying on spoken or written accounts (Cohen et al., 2007). It has been observed that what people do may differ from what they say they do (Robson, 2002). In addition, through observations, the researcher can access information that may have been missed by the interviewee, or discover things that participants may not want to talk about in the interview. Therefore, through observation the researcher is able to compare what teachers say with what they actually do in the classroom.

Lesson observation as a data collection method is a very useful method because it can help the researcher generate quality data. O'Sullivan (2006) suggests that it illuminates the teaching and learning process, exposes the conditions under which teachers work and possibly provides some indication of bringing about improvement in the teaching and learning process. For example, in a teacher training project in Namibia, lesson observations highlighted the realities within which teachers worked and therefore indicated the potential for specific teaching and learning approaches that could be used **(**O'Sullivan, 2004). Furthermore, O'Sullivan (2006) points out that lesson observations in research can answer the what, how and why questions. For example, in studying the teaching and learning process in schools, through lesson observation one can obtain knowledge of what the current situation is, why the situation is as it is, and how it can be modified or improved given the prevailing conditions and available resources.

In this study, the researcher conducted lesson observation as teachers taught different subjects in their normal settings. By doing this, the researcher was able to find out how teachers teach the different subjects in primary school while at the same time integrating environmental education into the subject content.

In doing observation, the researcher can be a non-participant observer, a complete observer, or a participant observer. According to Thompson (2003), in the non-participant method observer the observation can be said to be conducted by remote control. The researcher may not be on the scene but can observe the participant from another place, like using a screen viewer to watch from another room. On the other hand, in the complete observer method, the researcher is present at the scene, but does not participate in what is being done. The researcher is completely detached from the group being observed and his/her role is to observe, listen and record what is happening. With the participant observer method, the researcher takes part in what is taking place, but the extent of observation is greater than that of participation. For example, while carrying out the observation, he/she may ask a few questions.

In this study, the complete observer role was adopted because the researcher was quite new to the observed situations. According to Baker (2006), if the researcher is going into a new environment it may require him/her to adopt the role of complete observer. Furthermore, the complete observer approach was adopted for the study to avoid the researcher's influence on the teachers' practices.

The observations which were carried out for this study were unstructured observations. The researcher observed the lessons and developed a written account of how the lesson was conducted and all that happened in the class. The observations were followed by a short post-observation interview to help the teacher and the researcher reflect on the lesson in relation to the inclusion of environmental education in the subject content. The observed lessons were purposefully selected to ensure that the lessons observed were different in order to expose different experiences. The teachers who were observed were aware that I was going to observe them teach because I had to seek their consent before going into the classroom.

3.6 Data collection process

The process of obtaining the schools and participants (teachers) for the research involved three stages. The first stage involved writing to the education officers to seek permission to do research in the identified schools. This is a vital stage because nobody is allowed to go into schools and carry out any activity without written permission from the district education officer under whose control the school is.

The second stage involved a visit to the school to introduce myself and explain the intention of my study. This also was very important because I had to make it clear that I was not coming to inspect the teachers, but to seek their perceptions, thinking, opinions and practices on the teaching of environmental education. I also asked them if they would allow me to tape record the interviews so that I could capture all the information they gave during the interview. The head teachers of the four schools assisted me in getting teachers for the interviews and lesson observations. All the teachers who were approached agreed to participate in the study.

Stage one of data collection involved carrying out the study by interviewing the individual teachers and observing them teach. The interviews were conducted in the schools and the teachers were free to choose where they would like to be: in the office or outside under a shady tree. This shows that the interviews were conducted in a natural setting and there was a positive interview climate between the interviewer and the respondents. Alternatively, I could have collected the data by convening a meeting of all the teachers who were involved in the study. But according to Creswell (1998), removing the study participants from their natural settings leads to contrived findings, which are out of context. Therefore, the findings can be valid and reliable because the participants were not taken out of their context (Maykut & Morehouse, 1994).

Most of the teachers were interviewed between April 2008 and August 2008, while some were conducted in January 2009. Every respondent had to respond to the sixteen questions developed from the three research questions (See Appendix 2). The language used in conducting the interviews was Kiswahili, which is the medium of instruction in the primary schools. Kiswahili was chosen because most teachers can freely express themselves in Kiswahili but not in English although they might be fluent in English. The time used to interview one respondent ranged from thirty to forty minutes. In order to capture the verbal interactions of the teachers and record them accurately, the interviews were tape-recorded. Tape recording can illuminate one's knowledge and understanding of the phenomena being studied. The taped conversations were then transcribed and translated. The data collection and analysis process for the study is as summarized in Figure 6 below.

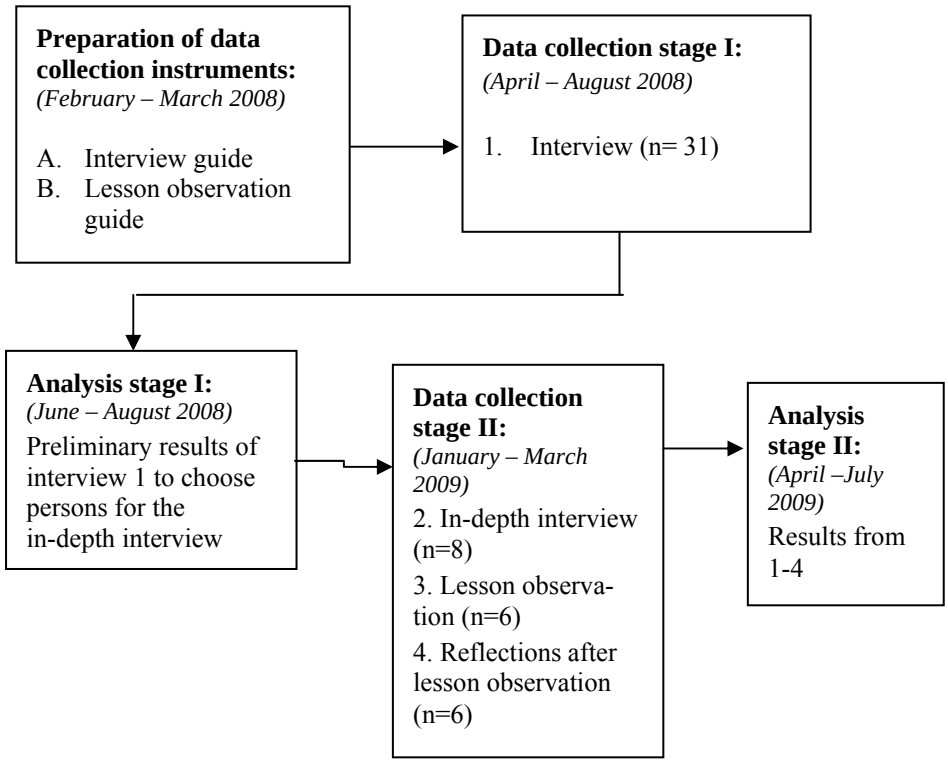

Figure 6. Data collection and analysis process

The data collection process started with preparation of the data collection instruments, which were the interview guides and lesson observation guides. The data collection process followed the emerging design approach, whereby the researcher collected the initial data then analyzed it to enable him or her make decisions about the next stage and what type of data to collect (Creswell, 2008; Creswell & Plano, 2007). By using the emerging design approach, in this study the data was collected in two stages or phases. Data for stage I was collected through interviews between April and August 2008. In this stage, interviews with 31 teachers in four primary schools were conducted and tape-recorded. The tape-recorded interviews from data collection stage I were transcribed, and then read to identify preliminary categories emerging from the data in relation to the research questions (Analysis stage I) from June to August 2008. From the analysis, the researcher looked for clues about what needed to be clarified more or any additional information. These results were used to choose persons for in-depth interview and lesson observation in stage II of the data collection.

Strategic sampling was used to choose the 8 teachers from those interviewed in data collection stage I who would participate in stage II of the data collection. At least two teachers were selected from each school involved in the study. Stage II data collection was conducted between January and March 2009. In this stage the aim was to deepen the responses obtained from data collection stage I

interviews and also to gather any information that was not collected during the previous interviews. This was done to bring new insights to the research as the approach facilitated cross-examination of the participants so that their further perceptions, experiences could be elicited.

The criteria for choosing the teachers who participated in the stage II interview was based on their indication of good understanding of environmental education from the stage I interview. I wanted to make sure that they had a good enough understanding of the subject so that they could discuss more ideas during the stage two interview regarding integration of environmental education into the curriculum and how it is actually taught. Another criterion for the choice was that it was important that the selected teachers were comfortable with being interviewed for a second time. However, this does not mean that their ideas were not representative of the other teachers.

In the in-depth interviews, I used the teachers' responses from data collection stage I as the basis for probing further into what the teachers had said (Smith & Flowers, 2009). For example I would ask, "In your first response you said…….. When you say …….. what exactly did you mean? Or, can you cite an example to explain this? Or can you tell me more about…." The rationale for adopting this approach to data collection is that the data collected in data collection stage I provide a general picture of the research problem. Therefore, in the data collection II stage the data is refined to extend, elaborate on or explain the general picture of the problem which was developed in the first stage. This approach to data collection is referred to as the two phase model (Creswell, 2008; Creswell & Plano, 2007). This approach is assumed to provide a better and deeper understanding of the research problem and questions (Creswell, 2008).

In addition to the in-depth interviews, 6 lesson observations from the four schools were carried out. Each observed lesson was followed by a post-observation interview to reflect on the lesson. This stage was followed by data analysis stage II to get results for data collected in stages I and II.

3.7 Data analysis

Data for this study was collected through interviews and lesson observations. In performing data analysis, the researcher looks at the data he/she has collected very closely, and then tries to organize it so that he/she can develop meaning from it. Therefore, meanings have to be interpreted from what is said in the interview. From interpretation of the data, the researcher develops concepts, themes, categories and aspects from the data. The guiding principle for the analysis is based on the research questions. In this case, the data analysis will be guided by both phenomenographic and phenomenological research approaches.

3.7.1 The phenomenographic data analysis

The data for research question one was analyzed using phenomenographic data analysis methods. The process of analyzing the data followed several steps. In the first step, the interviews were transcribed to yield data for analysis. Transcribing involves transforming oral speech to written text (Kvale, 1996).

The transcription of the interviews was done manually by the researcher so that she can capture all that was said by the respondents and also become familiar with the respondents' way of thinking. Since the interviews were conducted in Kiswahili, after transcribing, the researcher had to translate them into English.

In the second stage, the researcher started by reading and re-reading all the transcribed interviews in order to identify the overall meanings of what the respondents said. I first did open coding to allow me to identify the key words that characterized the ideas. Open coding refers to the initial coding of the respondents to identify key concepts in the statements. Coding is a process of sorting the data from the participants' responses and grouping them according to the things that they have in common. From this initial coding I developed preliminary categories which are based on the informants' descriptions.

The open coding was followed by axial coding. This kind of coding involves making connections between the preliminary categories and developing new, more abstract categories with structural variations. In axial coding the ideas and the key words are then compared to find similarities and differences. The concepts and perceptions with similar properties are grouped together into qualitatively different categories of description (Marton & Booth, 1997). Eklund–Myrskog (1996) refers to these categories as *qualitatively different* because they are based on different ways of perceiving the phenomena, i.e. focus is on their structural meanings and not the amount of detail provided. According to Marton (1981), categories of description denote forms of thought which are brought together in order to characterize the world, or part of it. Therefore, each category represents a unique way of understanding the phenomena under study. This stage was then followed by looking for similarities and differences between categories dealing with the same content. The structural characteristics of each category, referred to as aspects in each category, were identified. Following these principles of data analysis, the data for research question one, which seeks teachers' perceptions of environmental education and education for sustainable development, was analyzed.

3.7.2 The phenomenological data analysis

In analyzing the data for research questions two and three, the phenomenological procedures for analyzing data were followed. Since the study seeks to find out the teachers lived experiences in the teaching of environmental education, the approach used in analyzing the data is descriptive, in the sense that what the teachers said was described. Therefore, the participants' utterances are taken to be what they actually do in the classroom.

In the first step, as with the phenomenography research analysis, the researcher listened repeatedly to the tape recorded-interviews. Then these were transcribed and translated. The researcher then read and re-read them (Maykut & Morehouse, 1994) in order to develop a deep understanding of what the respondents said. The first step was followed by step two, where the researcher started interpretation of the data to identify significant statements which seemed to illuminate the research problem (Creswell, 1998; Hycner, 1999). These significant statements are referred to as units of meaning which are developed as

a result of careful reading through the transcripts of interviews, observation notes and field notes.

In step three, the researcher analyzed the statements or units of meanings that he/she had identified and elicited the qualities that determined their characteristics in relation to the research problem (Groenewald, 2004). The units of meaning were clustered to form different categories (Creswell, 1998). The process of clustering units of meaning that seem to be describing the same phenomena is referred to as coding or categorization. This process aims at finding out what is common, different, and the linkages between them (Sedel & Kelle, 1995). From the themes or categories, the researcher identifies the characterizing features in each category which will be used in describing and analyzing them.

As can be seen from the accounts on how the data was analyzed following the two research approaches, (phenomenography and phenomenology) the basic procedures are similar. The difference is that the result of the phenomenographic analysis shows different ways of understanding the phenomena being studied, while the results for the phenomenological analysis show the essence or the nature of the phenomena under study (Larsson & Holmström, 2007)

3.8 Validity, reliability and ethical considerations

The findings of scientific research are valuable when the researcher is able to prove the validity and reliability of the results. If there is no confidence in the data, there can be no faith in the results obtained and also the conclusions made. As a result, the research will not serve the purpose it sought to address and also it will not be replicable. Therefore, validity and reliability are the criteria used to judge the trustworthiness and credibility of research findings (Ary, Jacobs & Razavieh, 2002; Gay & Airasian, 2003). In addition to validity and reliability, the issue of ethical consideration is also important in establishing the trustworthiness and credibility of the research findings, as it may affect the quality of the data collected. The issues of validity, reliability and ethical considerations are presented in the following sections.

3.8.1 Validity and reliability

The key to effective research findings is validity and reliability (Cohen et al., 2000**).** While in qualitative research reliability is concerned with the consistency of the scientific findings, validity in quantitative research is concerned with the accuracy and trustworthiness of the scientific findings (Best & Kahn, 1993). According to Bell (1999) and Best & Kahn (1993), accuracy determines whether the instrument used has measured what it was intended to measure. Validity also refers to the relationship between the data collected and the theoretical framework of the study (Burns, 1994). Although in qualitative research, measurement of phenomena is not taken into consideration, accuracy is considered. But to make a distinction between the way it is used in quantitative research and qualitative research, Guba and Lincoln (1989) suggest that the notion should be replaced with authenticity. However, it is argued that since we are researching in the same world, validity is attached to accounts and not data

or methods (Hammersley & Atkinson, 1983). Therefore, the distinction between its application in quantitative and qualitative research does not apply much because the notion is concerned with accuracy, which applies to both research traditions. The basic thing is that, whether the findings are quantitative or qualitative, they must describe the phenomena being studied accurately.

Validity in qualitative studies can be measured through external and internal validity (Cohen et al., 2000; Eklund-Myrskog, 1996), which Trochim et al. (2006) refer to as credibility and transferability, respectively. *External validity* refers to the extent to which scientific observations and measurements can be compared and applied legitimately across groups (Eisenhart & Howe, 1992; Lincoln & Guba, 1985). *Internal validity* addresses the degree to which the scientific observations and measurements are authentic representation of the reality. Internal validity is concerned with the researchers' interpretation of the extent to which the data represents the reality of the situation being studied (Cohen et al., 2000).

The drawbacks of internal validity can be the inconsistencies of the participants' responses. This is because the participants may tell the researcher what they think he/she wants to hear, or they can even lie, or omit data or information. These drawbacks can be reduced through the use of other data collection methods like observation, or according to Cohen et al. (2000), by the use a multiple respondent approach, or by approaching the respondents and asking them to read what they have said and confirm if it reflects what they meant.

While internal validity focuses on ensuring that the data which has been provided by the research is valid, external validity focuses on the extent to which the results can be generalized to a wider context. Although in qualitative research the aim is not to generalize the findings, external validity can refer to how the empirical findings can be used to make suggestions as to how other people understand a given phenomenon. In this study, validity is measured by internal validity. It involves the extent to which the categories developed represent primary school teachers' perceptions of the integration of environmental education into the primary school curriculum and their teaching practices.

Another means of ensuring validity of the findings is triangulation. Triangulation involves studying the same phenomena using different methods. If the findings are similar, then the validity of the study is high. In this study, triangulation has been taken care of by the use of different methods of data collection, which are interviews and observation. In addition, response validation was done by the researcher asking specific questions with the aim of checking her understanding of what the interviewee meant.

External validity refers to the transferability of the study results from one context to another. In qualitative research, external validity can be determined by the degree of honesty, depth of the inquiry, scope of the data collected, and triangulation (Cohen et. al., 2000). In this study, the researcher has tried to ensure the external validity of the study by choosing a representative sample for the study, collecting sufficient data in relation to the research questions and

using a combination of data collection methods (interviews and lesson observation).

Within the qualitative tradition, the concept of reliability refers to the consistency, reliability, dependability, credibility, applicability or trustworthiness of the research findings (Anfara et al., 2002; Cohen et al., 2000; Golafshani, 2003; Lincoln & Guba, 1985). Also, in qualitative research, reliability is regarded as a comparison between what the researcher has recorded and what actually takes place in the actual setting which is being studied. This also implies the degree of accuracy and comprehensive coverage of the study (Burns, 2000; Cohen et al., 2000). It is argued that reliability is applicable to quantitative research, which assumes that for the findings to be reliable they should be replicable, meaning that if the same methods are used with the same sample, they should yield the same results (Cohen et al., 2000; LeCompte & Preissle, 1993). Similarly, in qualitative research, a degree of reliability is ensured. It is suggested that the aspect of reliability in qualitative research can be taken care of by ensuring the stability of things like observations and interviews. This can be done by doing the same observation and interpretation of the observation at different times or in a different place, or another observer doing the same observation or carrying out the same interview. It may involve member checks, triangulation and audit trails (Cohen et al., 2000). In audit trails, the researcher confirms the results. This can be done by the researcher taking back the transcribed data to the respondents to get their comments on how the data was analyzed.

In this study, validity and reliability were ensured first by reading the responses to the respondents to ensure what was written is what they meant. Secondly, a co-judging procedure was used to ensure the validity and reliability of the study. The co-judging method involves the use of an independent co-judge independently classifying all statements in accordance with the categories of description set up by the researcher (Eklund-Myrskog, 1996). The co judge, who is conversant with qualitative research, was given statements to categorize, which were already categorized according to the researchers' categories. If the co judge's categorization is the same as the researcher's categories, then it can be said that the study is valid. Also validity in this research was ensured through the honesty and keenness of the researcher. Although discussed separately, the aspects of validity and reliability cut across the research process.

3.8.2 Ethical considerations

When research involves people, the issue of ethics has to be considered. Ethical issues must be considered because they protect both the researcher and the participants of the research from potential harm that may be caused as a result of the research (Cohen, 2000; Lester, 1996). Kvale (1996) points out that there are three ethical considerations which have to be taken into consideration in conducting research. These include the informed consent of the participants to participate in the study, confidentiality and consequences. Also acknowledgement of all the people who have participated in the research for their contribution and support (Cohen et al., 2000; Kvale, 1996; Lester, 1996) has to be made.

On the aspect of consent, before the researcher conducted her study in the schools, the researcher explained the aim and objectives of the research to the Morogoro urban and rural district government authorities and sought permission to carry out the study in their schools. The district officials issued letters of permission to go into the schools and conduct the research. At each school, the informed consent of the heads of the schools and teachers was obtained before the data collection began. Although the researcher may have targeted particular respondents because they were purposefully selected, the researcher also informed them of their right to withdraw when they felt like doing so. Luckily, all the teachers who were approached to participate in the study agreed.

To ensure confidentiality, the interviews were conducted in a place that the teachers preferred. Before conducting the interview, the researcher assured the participants that all data collected during the interviews would be kept securely and treated as confidential. To maintain confidentiality, the schools and all the participants were given anonymous names in the data analysis and interpretation. Therefore, private data identifying the teacher and their schools is not included in the report. Instead, names and other identifying features are assigned to them. When the teachers in this study were assured of anonymity, they relaxed because they may have been afraid of giving information that would imply that the teaching of environmental education was not being implemented as expected.

In research, potential harm can be associated with the participants' involvement in giving their views, perceptions, concerns, and feelings (Cohen et al., 2000). As for the consequences of the study, the researcher assured all the schools and individual teachers that she would take full responsibility for the consequences arising from the study. This is in line with Kvale (1996), who pointed out that consideration of the consequences or benefits to the larger group which the sample for the study is representing should be done. Following the guidelines discussed in this chapter, the results of my study will be presented in the next chapter.

4 Presentation of the results

The aim of this study is to investigate primary school teachers' perceptions on the integration of environmental education in primary school education and the teachers teaching practices. In this chapter, the findings of the study are presented according to the three research questions as they are stated in Chapter 3. For the first research question, I used the phenomenographic data analysis method, while the second and third research questions had the phenomenological data analysis approach.

In research question one, the concepts of environment, environmental education, sustainable development and education for sustainable development were analyzed, coded and organized into different **categories** based on their similarities and differences in the teachers' statements. Each category is an indicator of the teachers' qualitatively various ways of perceiving a given phenomenon. The categories of description are characterized by different **aspects** which form the internal structure of the category. The results are presented in table form as shown in Table 3, showing concept, category name and aspects.

Table 3. Overview of the model used to present results from research question one

Concept	**Category name**	**Aspects**
Concept	C-A	C-A1
		C-A2
	C-B	C-B1
		C-B2

The different categories are indicated by C (meaning category), followed by capital alphabetical letters like C-A, C-B, C-C (where C-A means the first category, C-B the second category, C-C the third category). The different aspects are marked by the name of the category followed by a number, like C-A1 (which means first category and the first aspect).

In research questions two and three the phenomena being experienced are teachers' perceptions of integrating environmental education into primary school education and the teachers' teaching practices in environmental education. The results are divided into **themes**, and each theme has different **categories**. The different categories are further analyzed to find **sub-categories** which describe them. The sub-categories are the properties of the categories to which they belong. The results are presented diagrammatically using a tree diagram, as shown in Figure 7, to illustrate teachers' perceptions of the integration of environmental education into primary school education and the teachers teaching practices. As for research question one, the different categories are indicated by C followed by capital alphabetical letters like (C-E), and the sub-categories are marked by the category name followed by a number like (C-E1). The alphabet

letters and roman numbers are only used to differentiate the categories, aspects and sub-categories. They do not imply some form of hierarchy.

Although the process seems to be the same in both processes of analysis, they are different in the sense that the first research question focuses on teachers' perceptions of concepts, while the second and third questions focus on teachers' experiences of integration and teaching of environmental education. Therefore, concepts and aspects were used in research question one, while themes, categories and sub-categories were used in research question two and three.

In presenting the results, each category is further described and illustrated with examples from the teachers' responses, which are indicated by inverted commas. At the end of each quote, the name and sex of the respondent are shown as (Mary, F). Description of some lesson observations is also presented.

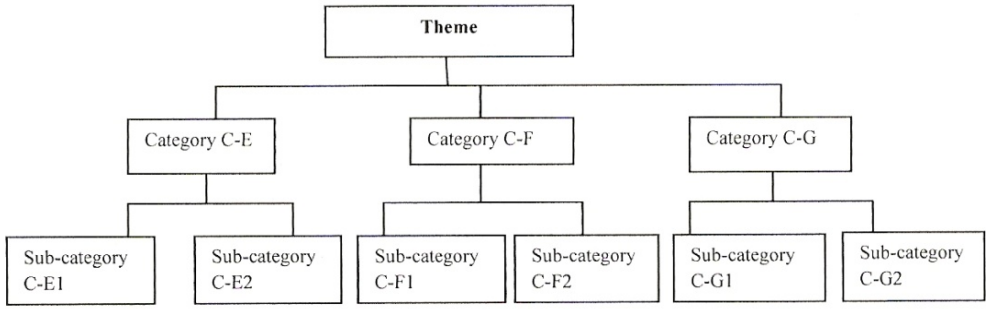

Figure 7. Overview of the model used to present results from research questions two and three

4.1 Teachers' perceptions of the environment and environmental education

My first research question focuses on teacher's perceptions of environmental education and education for sustainable development. The question aimed at finding out how teachers perceive and understand these concepts. I started by finding out how teachers perceive the concepts of environment and environmental education. I set out to seek teachers' perceptions of these concepts because if teachers are to teach these concepts in schools they need to have a clear understanding of the key concepts. Also it is assumed that there is a relationship between a teacher's understanding of the content and student learning (Loughland, Reid & Petocz, 2002). Therefore, understanding the teachers' perceptions of environmental education and education for sustainable development is essential because as they teach, they transmit their perceptions to the pupils. In doing this, some possible misconceptions of these concepts may be identified and therefore ways of making them develop the concepts accurately found.

Therefore, the results from the first research question are presented in two parts. The first part focuses on what environment means to teachers and their perception of environmental education. The second part focuses on what

sustainable development means to teachers and their perception of education for sustainable development.

4.1.1 What the environment means to teachers

Before the teachers could explain what they perceive as environmental education, they were asked to explain what environment means to them. Analysis of the data revealed that there were variations in the ways in which the teachers perceived the environment. Some teachers described it as a physical setting and others as a socially constructed setting.

Environment in the first category, where teachers consider it as a physical setting, was focused on two aspects by teachers namely environment as the different objects seen around man, and as living space. Space here is referred to as location or place. The teachers who described environment as different objects around man said:

> "Environment is the total of all the physical things that surround human beings." (Muso, M)

> "Environment is all the things that surround a human being like animals, insects, plants - the things on the ground." (Shani, M)

The way teachers described environment in this aspect in the objective way of thinking about the environment. As is clear from the teachers' utterances, they described environment as the surroundings of human beings and cited examples of the different observable things found in the environment, but none of the teachers mentioned man as part of the environment. Studies done in Europe have revealed that in defining environment, people tend to leave out humans (Leal Filho, 1996). In phase 2 of the interview, I therefore asked the teachers if man was part of the environment. The teachers said man was part of the environment and gave reasons why they think so. This was evident from the next quotation:

> "I can say that man or people are part of the environment because he is one of the living things." (Muso, M)

Sina, a teacher teaching science to pupils aged 12-13 years, explained man as part of the environment from a science point of view, based on the scientific processes though which living things in the environment undergo, with man not being an exception. He says:

> "Yes, man is part of the environment. I think so because man uses the environment and he is one of the living things, and the living things are part of the environment. He also is the one who improves it or destroys it through various activities. Also when he/she dies, the remains decay and become part of the environment- soil. Some of the things which make up the environment are land which is made of non-living things and the remains of living things, trees and all the living things including man." (Sina, M)

Some of the teachers described environment as the space where man lives. In this aspect teachers refer to the environment as a setting for man's everyday life. This is a subjective view of the environment which depends on the individual's understanding.

> "Environment is the part that surrounds a person [. ……] By part, I mean the area or place or space where an individual lives." (Wamo, F)

> "Environment is the space and all the things in it which surround a human being where he/she is at a particular time. For example, in school it is the buildings, flower gardens and many other things." (Kaji, M)

In the second category, teachers perceived environment as a socially influenced setting. The social influences which the teachers referred to were political and cultural systems. Regarding political influence on the environment, teachers believe that political systems shape the environment through policies, laws, and regulations regarding the environment. The following interview extracts illustrate this kind of thinking:

> "Uh! I must admit that I do not know how the political system influences the environment. But I can say that the influence is through policy formulation, laws and regulations. For example, we have the environmental policy defining what environment is and the government makes laws and regulations regarding the environment. So, I think the environment is as it is because of the policy and regulations." (Sina, M)

On cultural influence, the teachers talked about environment as a socially produced setting in terms of being shaped by culture. Culture is said to be a human adaption to the environment (Nordström, 2006), because human cultures have risen in response to the demands and opportunities of a particular environment. Culture which involves beliefs, religion, stories and language is linked to place. Therefore, people from a certain place may have a particular kind of culture towards the environment and that has influence on the environment. In talking about the cultural systems and how they shape the environment, one of the teachers said:

> "Even […….] beliefs can be part of the environment [… eeeee…] but I don't know. For example, there are beliefs in some societies that if you set fire to an area and it burns a big area, then you have a powerful hand. So people try to show how powerful they are by setting fire to the forest, which is an environmentally destructive practice." (Retha, F)

From the teachers' perceptions of environment, it can be seen that there are variations. The teachers' perceive environment both objectively and subjectively. The teachers who perceive environment from an objective view focused on the things which are physical and can be seen and touched. To them things which cannot be seen is not part of the environment. For example, they did not mention things which are invisible, such as air although it is an important component of the environment. This way of perceiving the environment highlights an often used way of defining the concept of environment as something physical and in most cases referring to the biophysical component of the environment only. It is for this reason that environment is sometimes referred to as nature. Teachers who have a subjective view of the environment consider the physical environment as influenced by social, cultural and political factors. These teachers have a broader view of the environment because the physical aspect of the environment is also in focus, but its condition of being influenced by the social systems is taken into consideration. The underlying idea here is that environment is perceived as human surroundings which are shaped by social,

cultural, technological and political systems created by human beings. These ways of perceiving the environment have implications in the way teachers perceive environmental education and how it is taught.

4.1.2 How teachers perceive environmental education

The teachers described environmental education by referring to knowledge and skills acquisition. Based on the teachers' responses from the interviews, two different ways of perceiving environmental education were identified, hence forming two categories. These categories were knowledge focused education (C-A) and skills focused education (C-B). The two categories of description were further analyzed and five aspects were identified, as shown in Table 4.

Table 4. Teachers' perceptions of environmental education

Concept	Categories	Aspects
Environmental education	C-A. Environmental education as knowledge focused education	C-A1. Education about the environment C-A2. Care of the environment
	C-B. Environmental education as skills focused education	C-B1. Problem-solving skills C-B2. Adaptation to the environment C-B3. Resource utilization

C-A. Environmental education as knowledge focused education

Most of the teachers based their conception of environmental education on knowledge acquisition. Knowledge in this context refers to the rational and logical part of human thinking that leads to the knowing of facts, ideas, concepts or information about something. Knowledge widens the scope of individuals understanding of phenomena. The respondents were concerned with two aspects in this category: education about the environment and education about care for the environment.

C-A1. Education about the environment

The majority of the respondents described environmental education as education about the environment. In this case the respondents were only concerned with the cognitive and awareness perspectives of environmental education. One of the teachers was concerned with sustaining lives, because she said that we need knowledge about the environment to sustain our lives. Also they referred to environmental education as education that directs a person on how to live in their environment so that they can lead a comfortable life, depending on the prevailing weather conditions of a particular place. Another teacher talked about knowledge about the environment in terms of security. He argued that some of the objects in the environment are dangerous. So he says that if we understand

our environment, we will be in a position to know which things are safe and which ones are dangerous. To make their points, this is what Muso, Aziz and Retha said:

> "It is education about the environment. For example, knowing about all the things in one/s environment, their functions and how they are used, because some of the things in the environment are dangerous" (Muso, M)

> "Environmental education is education that is about the environment, meaning how you can understand it [...]" (Aziz, M)

> "Environmental education is education which is offered to a person so that he/she can live in his/her environment based on the weather of that place. I mean to be able to cope with the environment of that particular place". (Retha, F)

Some of the teachers when interviewed in phase two of the interview said that environmental education is education that makes an individual aware of the environment. Environmental awareness here refers to an individual's ability to perceive, feel or be conscious of events, patterns and even objects in his/her surroundings. Increase in environmental awareness enables man to broaden his/her knowledge and also to consider the environment in a holistic way and as a result be able to identify any changes that may occur in their environment. Teachers argue that because the environment is something which is always there, people may not be aware of it, so environmental education is a means of developing awareness of the environment among the people. This kind of thinking can be illustrated in the following extracts from the interviews:

> "Environmental education is education that enables an individual to be aware of his/her environment. Although the environment is always there, we might not be aware of it. We take it for granted!" (Pazi, M)

> "As I understand, environmental education is education that enables us as human beings to know our environment and develop an awareness of the different things which are in our environment. Developing awareness is important because it helps an individual know the state of the environment." (Sinta, F)

C-A2. Care of the environment

In this aspect, the teachers referred to environmental education as education which provides individuals with knowledge about how to take care of the environment. Care of the environment refers to the things that we can do for the environment, like keeping the environment clean and taking care of natural habitats. The following statements from teachers support this kind of perception. For example, some of the teachers said:

> "Environmental education makes us know how we can take care of our environment." (Mangowi, F)

> "It is education which is concerned with the taking care of the environment" (Meya, M)

The teachers were asked to explain what they meant by taking care of the environment. The teachers mentioned different things that can be done to indicate care of the environment. For most of them, tree planting is at the centre of care for the environment. However, one of the teachers who had earlier

training in environmental education raised the issue of controlling water pollution, proper waste management and controlling wild fires as ways of taking care of the environment. This is clear from the two following quotations:

> "Examples of what we can do to take care of the environment are planting trees, taking care of forests and many other things. As you can see, we have taken care of our school environment by planting trees." (Kasi, F)

> "It is education which is concerned with the taking care of the environment. By taking care of the environment I mean planting trees, not washing in rivers, not setting fire to the forest, which is a serious problem here, and also managing wastes well. There are a lot of things which we can do to take care of the environment." (Meya, M)

While Meya and Kasi focused on the how aspects about care for the environment, Ksheru and Sina when interviewed for the second time went further to explain why man has to take care of the environment. They said that man takes care of the environment so that he/she can live in a better environment and also for economic purposes. This can be seen from their statements below:

> "It is skills or strategies which are given to a person so that he/she can take care of his or her environment so that he or she can live in a better environment which is clean, with fresh air and enough food." (Ksheru, F)

> "Environmental education is education which gives us skills on how to take care of the environment. And I think it is important that individuals understand how to take care of their environment because they will get fresh air, enough rain and enough food. Also, if the environment is taken care of it will be beautiful, hence attract tourists to come to our country. This will boost the economy of the country." (Sina, M)

Despite the fact that teachers were concerned with care for the environment, in explaining how this can be done, their scope was limited to tree planting and taking care of the forests. This reflects the crucial problems of deforestation and wild fires which are rampant in the area. The teachers who focused on the why aspects were concerned with aesthetic factors like making the environment beautiful and good to live in and also one of the teachers was concerned with the economic aspect of the environment, namely tourism.

Generally, teachers thought that environmental education is education that mainly provides individuals with knowledge about the environment and how to take care of it. This view can be a result of thinking that the aim of education is to provide knowledge so that individuals can take action. The teachers go further in suggesting that when people get knowledge they develop awareness which may lead to care for the environment and the ability to act.

C-B. Environmental education as skills-focused education

Another way of teachers' perception of environmental education is characterized by the development of skills. The notion of skills refers to the ability to do something or know how to do something as a result of training and practice. In this category, the skills which the teachers referred to were divided into three aspects, namely problem-solving skills, adaptation skills and resource utilization skills.

C-B1. Problem-solving skills

Some of the teachers considered environmental education as a tool for helping learners develop problem-solving skills which will enable them solve problems arising in their environment. This is a widely-held conception of environmental education among teachers because when they talk about environmental education they think it is education that will provide learners with knowledge about different environmental problems and how to solve them. This reflects environmental education's background of concern for environmental problems, which can be illustrated by Ksheru, Sina and Fremo's utterances:

> "It is skills or strategies which are given to a person so that he/she can solve different environmental problems that he/she might face in his/her environment. Man needs to solve different problems in his environment like soil erosion and water pollution which causes diseases like typhoid, deforestation, and drought." (Ksheru, F)

> "Environmental education is education about how to solve environmental problems. Given the current situation, there is growing environmental degradation, therefore people need to rehabilitate the environment to return it to its former state. For example, if you look at the forests, a large part has been cleared. And man is the main destroyer. Therefore, if the natural state is to be revived, man has to be educated on how to do it." (Sina, M)

> "There is the issue of soil erosion, which is very serious in many parts, so if the pupils get environmental education, they will use their skills to solve the problem of soil erosion and take care of the environment by planting trees and cover grass. If they do this I think the environment will be good and escape from the risk of desertification." (Fremo, M)

The teachers' statements in this aspect show that, generally, the teachers thought that environmental education would give individuals skills that will enable them to solve problems that exist in their environment like soil erosion, water pollution, and desertification, which result from man's various activities.

C-B2. Adaptation to the environment

Concern with adapting to one's environment was the focus of teachers categorized in this aspect. Adaptation is the process by which an organism makes itself fit for its environment. In order for people to be able to live in the environment they have to adapt to the conditions in that environment. For example, Sina said:

> "As I understand it, environmental education is education that enables us as human beings to live in our environment." (Sina, M)

But Retha is concerned not only with the ability to live, but also the ability to live in different environments, in saying that:

> "Environmental education is education which is offered to a person so that he or she can live in his/her environment based on the weather of that place. I mean to be able to cope with the environment of that particular place." (Retha, F).

One of the teachers' ways of conceiving the environment is "as living space". The teachers' responses in this aspect are concerned with how people adapt to the environment. Therefore, they suggest that through environmental education

people develop the skills to adapt to the environment. In other words, environmental education enables individuals to adjust to the different conditions of the environment.

C-B3. Resource utilization

Teachers saw environmental education as education that will enable them to utilize the resources in the environment well for their survival. Human survival is dependent on the resources in the environment. The notion of resource utilization refers to how the resources are used to serve different purposes. Some of the teachers pointed out that environmental education will help people use the resources in the environment well. For example, Shani and Hai said:

> "It focuses on how to use of the resources in the environment well and the benefits we can get from the environment. For example, in environmental education the importance of trees is taught and also we learn about how to take care of them." (Shani, M)

> "[…] for example, we depend on the environment to get the different resources to sustain us in life. Take the example of firewood. It is the main source of fuel for most of our people. If we do not use this resource well it can be finished. Therefore we have to learn how to use it well by planting trees and controlling deforestation." (Hai, F).

The issue of developing skills to take care of the environment, solve problems in the environment, man's adaptation to the environment and proper utilization of resources are the critical issues in the category of skills development. First, people have to be able to live in their environment in different contexts. Second, they have to be able to use the resources in their environment well to sustain their lives. The responses in this category suggest dependency and interrelationship between man and the environment. Therefore the issue of care for the environment is not for the sake of the environment but for the sake of human beings or it can be said it is for utilitarian purposes.

From the analysis of the teachers' perceptions of environmental education, it can be seen that there are variations in the way teachers perceive environmental education. The perceptions given by the teachers emphasized the cognitive aspect. In the first category their focus was on knowledge. They described environmental education as knowledge about the environment and also knowledge about how to take care of the environment. This mirrors the teachers' conception of environment as entity or object detached from man, "the total of all the things that surround man," therefore the need to be knowledgeable about it and also how to take care of it. In the second category some teachers perceived environmental education as education that enabled individuals to develop problem-solving, adaptation and resource use skills. The core idea in this category is the environment as something to be used by man. The focus therefore is utilitarian. In general, the teachers' perceptions of the environmental education focus on the "what", "how" and "why" perspectives of environmental education based on how they perceive the environment. According to the different aspects in the two categories, the category of knowledge focused education addresses the issue of "what", while the category of skills focused education addresses both the issues of "how" and "why".

4.2 Teachers' perceptions of sustainable development and education for sustainable development

The concepts of sustainable development and education development are value-laden in nature, so people in different places understand and define them differently. Since teachers have to integrate education for sustainable development into their teaching, it is important to investigate how they perceive them so that their teaching meets the needs of sustainable development. In order for teachers to understand education for sustainable development, they need to understand what sustainable development is.

4.2.1 What sustainable development means to teachers

Since sustainable development forms the core of the concept of education for sustainable development, I started by asking the teachers if they have heard about sustainable development. Most said that they have heard about sustainable development from the media (television, radio and newspapers) while some of them said that they have not heard about it. These results suggest that sustainable development is not included in the primary education curriculum. Since the teachers indicated that their sources of information were TV, radio and newspapers, all those who said that they have not heard about sustainable development were from the rural schools, where TV programs and even newspapers are not available. Radios are available in rural areas, but it all depends on the kind of programs they listen to.

The perceptions of the teachers who have heard about sustainable development could be categorized into two broad categories. There are those who perceive sustainable development in terms of time span and those who perceive it in terms of its purpose. In the first category, the teachers referred to the duration and time coverage of the development process. This category was characterized by two aspects. The first aspect referred to sustainable development as development that is continuous and never ending or continuous development. The notion of continuity refers to a condition where something is unending and therefore goes on and on and is always there. This way of perceiving sustainable development can be said to be based on the literal translation of sustainable development in Kiswahili, which is "Maendeleo Endelevu", meaning that it is development which is continuous. Apart from being continuous, they described it as development that takes into consideration the wellbeing of the future. This can be demonstrated by some of the teachers' statements as:

> "I have heard it from radio and TV only but I think sustainable development is development that is continuous and is always there." (Mapia, F)

> "I understand sustainable development is development which will be of benefit in the future. For example, the development which will involve improving the availability of the social services to the people should be done in such a way that it does not cause problems in future." (Sina, M)

The second category of the teachers' perceptions of sustainable development included perceptions of sustainable development in terms of its purpose. According to them, development has a purpose or aims at achieving something. From the teachers' responses it was seen that they talked about sustainable

development as development that aims at equity and environmental conservation. The following quotations from the interviews illustrate how the teachers perceived sustainable development with reference to its purpose. On the aspect of equity one of the teachers said:

> "Sustainable development in our case involves all the people having access to the basic resources for their own use. For example, people should have access to land, water, and clean air. This is possible through good agricultural practices, good animal keeping and taking care of water sources because they are for our needs now and also the coming generations will also need to find the land in good conditions so that they can also cultivate their own food." (Pesa, F).

With reference to environmental conservation, some of the teachers said:

> "[…] when we teach people about environmental education, it is sustainable development because it is for conserving the environment so that future generations may find it is in good condition." (Hai, F)

> "I have heard about sustainable development [……] But I think perhaps it is about conserving the environment by planting trees so that the environment can go on to be of good quality." (Kasi, F)

4.2.2 How teachers perceive education for sustainable development

Having asked the teachers how they perceive sustainable development, the teachers were asked to explain what they understood by the term education for sustainable development, which is very closely related to environmental education. In analyzing the teachers' responses, two broad categories emerged from the data. The variations between the categories were based on what it focused on and the expectations of education for sustainable education. From the two categories, four aspects could be identified, as shown in Table 5 below.

Table 5. Teachers' perceptions of education for sustainable development

Concept	**Category**	**Aspect**
Education for sustainable development	C-C. Education for sustainable development as sustainable development focused education	C-C1. Education about sustainable development C-C2. Education for a sustainable future
	C-D. Education for sustainable development as human development focused education	C-D1. Meeting people's needs C-D2. Human empowerment.

C-C. Education for sustainable development as development oriented education

One of the ways of perceiving education for sustainable development among the teachers is characterized by its focus. Teachers talked about education for sustainable development in terms of education that aims at sustainable

development. In this sense, development refers to improvement from one situation to another. Analysis of the teachers' responses revealed two aspects. These are education about sustainable development and education for a sustainable future. The distinction between the two aspects is that the first focuses on the cognitive domain, while the second focuses on the qualitative domain of sustainable development.

C-C1. Education about sustainable development

Education for sustainable development here is perceived as education that helps individuals understand what sustainable development is. The teachers assume that as long as there is sustainable development, people should get education on what kind of development it is. Below, Aziz demonstrates this kind of perception:

> "It is education about sustainable education because to understand what sustainable development is, you need to get education about it." (Aziz, M)

Similarly, Manka, when referring and equating it to environmental education, also says:

> "I think as environmental education is education about the environment, then education for sustainable development is education about sustainable education." (Manka, F)

From the teachers' statements, knowledge about phenomena is necessary if one is to understand it. Apart from knowledge about sustainable development, some of the teachers also pointed out the aspect of being able to live sustainably in the future, as seen in the next aspect.

C-C2. Education for a sustainable future

Striving for a sustainable future is the intended goal of human society (UNESCO, 2002; Yang, Lam & Wong, 2010). Similarly, some of the teachers described education for sustainable development as education that focuses on achieving a sustainable future. They argue that in order to attain a sustainable future, one has to learn how to get it. For example, they pointed out that people need to get education on how to lead good lives and be able to progress within the framework of sustainable development. To emphasize this, the teachers said:

> "I think it is education on how we can get development now so that future generations can also develop and lead a good life. This means that the development or progress we get now should not stop. It should continue in the future." (Mwasu, F)

> "It is education that will benefit the coming generations by being able to sustain their lives and those of their children." (Kinara, M)

Although Kyeku admitted that she did not know much about the concept, she thinks that education for sustainable development is education that will make people attain a sustainable future, as she said:

> "Although I do not know much about it, I think it is education that will make people live sustainably now and in the future. It is education that will help a person develop and live sustainably in future." (Kyeku, F)

Kaji describes education for sustainable development as a means for achieving sustainable development:

> "If sustainable development is something that goes on for a long time, then education for sustainable development is education on how to make development go on for a long time." (Kaji, M)

From the teachers' utterances, it shows that they have positive ideas about how development activities need to be undertaken so that coming or future generations do not fail to achieve their own development. They clearly show that education is needed if we are to achieve sustainability both at present and in the future.

C-D. Education for sustainable development as human development focused education

Education for sustainable development was discussed in terms of human development. The teachers emphasized that development involves people, so education for sustainable development is concerned with the development of people. In analyzing the responses, two aspects emerged. These are the aspects of meeting the people's needs and human empowerment.

C-D1. Meeting people's needs

The teachers talked about education for sustainable development as education that focuses on enabling people to meet their needs. The teachers seem to emphasize that development of any kind has to enable people to obtain their basic needs like food, clean water, shelter and other needs easily and all the time. For example one of the teachers said:

> "In education for sustainable development, people learn how to get food, clothing, and water, without difficulties every day. If they encounter difficulties in getting these things then we cannot say that they have sustainable development." (Fremo, M)

C-D2. Human empowerment

The teachers saw education for sustainable development as a means of human empowerment. The notion of empowerment refers to the process of increasing the capacity of an individual or a group of individuals to make decisions and take action in different matters concerning their lives. Therefore, education for sustainable development empowers individuals to participate in local and global environmental issues (Chatzfotiou, 2002). Concerning empowerment, the next quotations are examples of how teachers see education for sustainable development as human empowerment:

> "People who have been given education for sustainable development are able to make decisions and do what they think will make them develop in a sustainable way. For example, they can decide on how they can use or protect their forests so that they can be of benefit to them." (Kinara, M).

Subira's statement also reflects the aspect of empowerment. Talking about education for sustainable development in terms of empowerment, she said:

> "[....] to promote sustainable development, education is necessary. It improves the capacity of the people to address environmental problems and development issues. Without education they cannot address them because they will not know how to do so." (Subira, F)

Teachers who perceived education for sustainable development as human empowerment were mostly concerned with the role of education as a tool for helping individuals gain power for decision-making and action-taking for their environment and for development purposes.

4.2.3 Different focus in ESD among teachers

From what the teachers said, their perceptions of education for sustainable development could be organized into two categories. In each of the categories, the concept of development was implied, but in different aspects. In the first category the teachers described it in terms of the aim or interest of education for sustainable development. Therefore, the teachers perceived education for sustainable development as education that aimed at development. The category was characterized by two aspects, which are education about sustainable development and education for sustainable development. The first aspect involves getting knowledge about sustainable development, while the second involves how sustainable development is attained.

In the second category, which is termed human development focused education, the teachers talked about meeting the people's needs and human empowerment.

If seen from an increased level of complexity, the categories and aspects can be hierarchically placed, as shown in Figure 8. This increased level of hierarchy exposes more diverse and higher levels of understanding of the concept of education for sustainable development among the teachers with focus on what, how and why education for sustainable development should be taught.

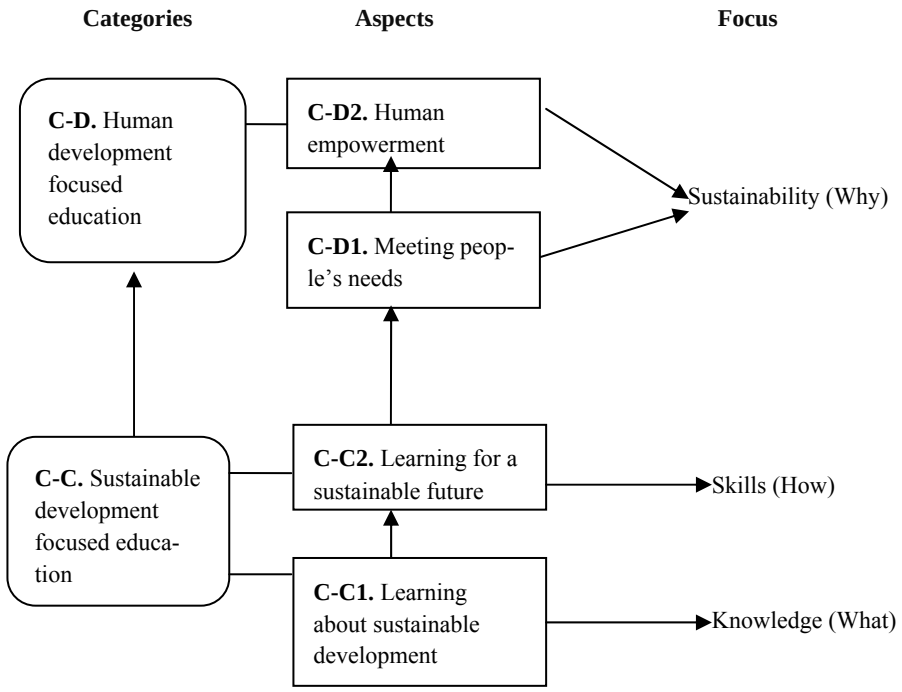

Figure 8. Hierarchical summary of categories and aspects of teachers' perceptions of education for sustainable development and their focus

4.3 Teachers' perceptions on the integration of environmental education into the primary school curriculum

My second research question focused on teachers' perceptions of the integration of environmental education into primary school education. Integration here refers to linking or making connections across the disciplines. In this case it involves linking environmental education content with the content of the different subjects taught at primary school level. Although the central issue in this research question was integration, the results of the teachers' perceptions have been presented in three themes. These include the teachers' perceptions of the importance of teaching environmental education in primary school, their awareness of integration of environmental education into the primary school curriculum, and suggestions on how best environmental education could be included into the school curriculum. The results for each theme are presented in categories and sub-categories.

4.3.1 Teachers' perceptions of the importance of teaching environmental education

The teachers were asked to explain the importance of teaching environmental education in primary schools. All the teachers considered environmental

education as important to be taught there. To probe into their responses further, they were asked why they thought it is important. From the analysis of the reasons that they gave, two categories emerged, which are the *development of knowledge, skills and attitudes* and *role models*. From the two categories, five sub-categories were identified, as shown in Figure 9. The category on the development of knowledge, skills and attitudes was characterized by three subcategories: understanding the environment, positive attitudes and problem-solving skills. The category on role models was characterized by two sub-categories: dissemination of knowledge and responsible citizenship.

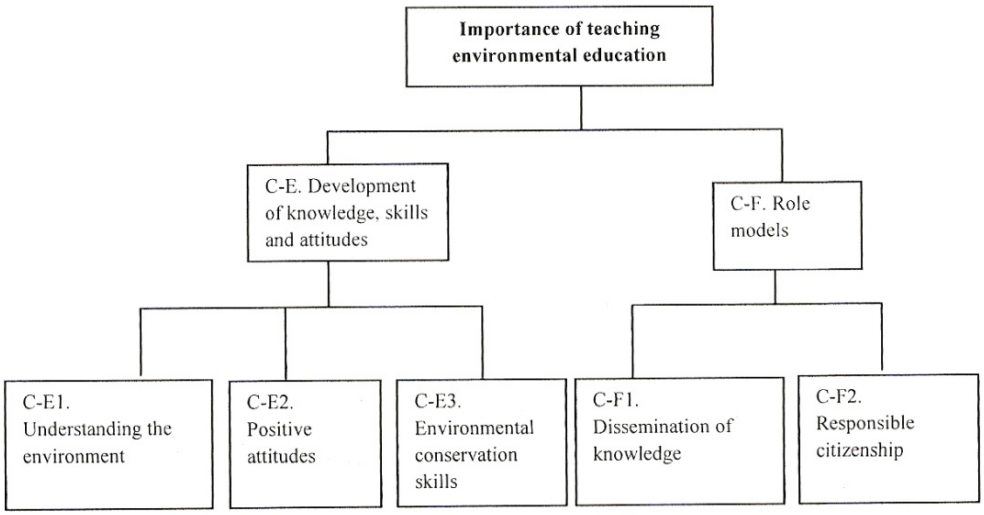

Figure 9. Teachers' perceptions of the importance of teaching environmental education

C-E. Development of knowledge, skills and attitudes

The majority of the teachers thought it important to teach environmental education in primary school to make the pupils develop knowledge about their environment and also develop skills in managing their environment. The aspects which the teachers were concerned with in this category were developing an understanding of the environment, developing positive attitudes towards the environment and developing problem-solving skills. However, most of them were concerned with the aspect of developing positive attitudes towards the environment. Possibly the teachers assume that when the pupils understand their environment, they will develop positive attitudes towards it. The issue here is, does understanding the nature of something necessarily lead to the development of positive attitudes towards it?

C-E1. Understanding the environment

Perceiving the importance of environmental education in terms of making the learners understand their environment was the central idea in this aspect. This implies developing knowledge about the environment, or in other words making

them environmentally literate. In this aspect, teachers used phrases like "*understanding, know about, and developing knowledge"*. They argued that the knowledge referred to here is knowing what the environment is, the components of the environment, its importance and relationship to man, and how to use it so that one can live in harmony with these things, hence making life comfortable. For example, two of the teachers said:

> "I think it is really important. Even if it is not taught in depth, it can even be taught lightly so that the children develop an understanding of their environment." (Mangowi, F)

> "Oh Yes, It is very important. I think it is important because it helps the pupils understand themselves and their environment where they live so that they can live comfortably." (Pai, M)

Taking into consideration what the pupils will be engaged in after completing school, some of the teachers suggested what they need to be taught in order to develop an understanding about the environment. When some teachers were interviewed in phase two, they emphasized why the learners need to be taught environmental education at primary school level. First, they pointed out that it is important they know about the things that surround them. Secondly, they should be taught good agricultural practices and animal husbandry. They argued that most of the pupils will later engage in these activities as a means of generating income to support them. Thus, environmental conservation should be taken into consideration when performing different activities so that the environment is not destroyed. Some of their perceptions can be seen from the following extracts:

> "I think teaching environmental education in the primary schools is very important. I think so because as I have said before, environment is the first thing that we should know. Environment includes the land and all the things on it such as air and water; therefore, a person needs to know all these things from when he/she is a child because they are around us. If someone gets knowledge about these things, he/she will be able to live in harmony with them and therefore make his life comfortable." (Mapia, F)

> "First, they should be taught about the things that cause environmental destruction, particularly in the agricultural sector. For example, there are some agricultural practices which are destructive to the environment, like cultivating on slopes without using terraces. When the rains come, rain water carries the soil away to the low lying areas. Therefore, if the children are educated from the time when they are in the primary schools, they will be able to understand how to cultivate in steep slopes without causing destruction." (Aziz, M).

The statements from the teachers show that they describe the importance of teaching environmental education in relation to its applicability to what the pupils will do later in life. The teachers considered that the knowledge they will get through the learning of environmental education will prepare them "to enter the world of work", as stated in the Education and Training Policy (MoEC, 1995). As most of the pupils will be engaged in agricultural activities after completing primary school education, some of the teachers suggested that they need to be taught good agricultural practices so that they will not destroy the environment.

C-E2. Positive attitudes

The previous sub-category focused on developing an understanding of the environment. In this sub-category, the development of positive attitudes towards the environment was the major focus. Therefore, most of the teachers were concerned with the aspect of developing positive attitudes towards the environment when they used words and phrases like *value, concern, respect, be conscious and care for.* For example, one of the teachers who focused the issue of attitudes said:

> "It is very important that environmental education is taught in the schools because it is the children who are going to inherit the environment from us, so if they get education from the very early stage, when they grow up [……..] they will have developed positive attitudes towards the environment. They will not see environmental education as something new to them when they grow up." (Chaka, M).

C-E3. Environmental conservation skills

Within this sub-category, the importance of teaching environmental education was focused on helping the learners develop environmental conservation skills. Since environmental problems are mainly caused by man, the teachers feel that man is responsible for rehabilitating the environment as expressed in some of the following utterances:

> "Yes, I think it is good if they are taught environmental education because given the current situation, there is growing environmental degradation, therefore they need to rehabilitate the degraded areas so that they return to their former state. For example if you look at the forests, a large part has been cleared. And man is the main destroyer. Therefore if the natural state is to be revived, man is the only person who can do it. I therefore suggest that it is good if the children at primary school are taught environmental education so that they can understand how to solve such problems arising from human activities." (Aziz, M)

> "It is important for environmental education to be taught in our schools so that we can conserve the environment by solving environmental problems around us like drought, water pollution and poor waste management which are critical in our municipality." (Pazi, M)

> "Yes, I think it is important for environmental education to be taught in our schools. Because there is the issue of soil erosion, so if the pupils get environmental education, and conserve the environment by planting trees and cover grass, I think the environment will be good and escape the risk of desertification." (Furaha, F)

As can be seen from the statements above, the teachers are of the opinion that pupils in the primary school need to be taught environmental education due to the growing trend of environmental degradation. If they get knowledge and skills, they would use them to identify environmental issues and problems in their environment, solve them and prevent new ones from occurring in order to maintain a quality environment.

C-F. Role Models

In the second category, the importance of teaching environmental education in primary schools will be described in terms of education that will make the pupils role models in the communities where they live. The notion of role model here refers to someone who sets good examples. The comments of the teacher suggest that after getting environmental education in schools, the pupils will develop knowledge, skills and good attitudes towards the environment. These attributes can be passed on to other community members in different ways. In this category, the teachers were concerned with the aspects of children disseminating environmental education to the communities and also being responsible citizenship.

C-F1. Dissemination of knowledge

Some teachers talked about the importance of environmental education in terms of knowledge dissemination. They assumed that if primary school children are taught environmental education in the schools, they will disseminate that knowledge at home and to the people in their communities. This assumption stems from the fact that pupils talk about what they learn in school to their parents, neighbours and peers. Through talking to different people, they will be disseminating the knowledge they got in school. As an example, two of the teachers talked about the pupils going to teach or tell their parents and their relatives what they have learnt in school about the environment. Apart from verbal communication, the teachers said that they can disseminate the knowledge through practice if they practice what they learn from school at home. These practices are likely to be adopted by other people at home and even in the community as the teachers said:

> "Yes, it is important to teach environmental education in our schools because the pupils will go to educate the communities where they live by telling them about the environment." (Fremo, F)

> "It is important for environmental education to be taught in schools and especially in primary schools because what the pupils are taught they will go to tell their parents. Therefore the parents will understand that when they do something, it can result in a problem." (Pesa, F)

To elaborate more, Pesa and Sinta gave examples of how pupils can disseminate what they learn in school about environmental education:

> "For example, in school we tell the pupils that they should boil drinking water so that it is safe for drinking. If the water is not boiled, you will get stomach problems. When the child gets home, he/she will tell the parents that they have been told by the teacher to boil water. So from there onwards he/she will boil drinking water and the others will have learnt from him/her. In this way, he/she has disseminated the knowledge to the family." (Pesa, F)

> "It is important because they will practice at home, hence educate the community. Take the example of what we teach them about waste management here in the school. We tell them that all waste should be collected in waste collection containers then it should be put in waste pits. In the school we make waste collection containers using palm leaves during vocational skills lessons and use them in school. What has

happened is that all the pupils have made waste collection containers and they have waste pits at home. This shows that they have put into practice what we have taught them. As a result, others will learn from them." (Sinta, F)

In summary, the teachers' statements suggest that the education which is offered in schools can be disseminated by the pupils to individuals in their local communities. Embedded in the responses of the teachers in this aspect is the idea of multiplier effect. It is assumed that if environmental education is taught in primary school, the pupils will learn from it through their practices and will also convey their knowledge to other people.

C-F2. Responsible citizenship

The teachers in this aspect talked about the importance of environmental education with regard to developing responsible citizens among the pupil. Responsible environmental citizenship refers to individuals having the knowledge, skills and attitudes necessary for identifying their values towards the environment and therefore being able to act responsibly (Berkowitz, Ford and Brewer, 2005)

The teachers emphasized that environmental education should be taught in primary schools because the children, who are future citizens, need to get a good foundation for an understanding of their environment from a very early stage. This will make them develop the necessary knowledge and skills required to enable them take care of the environment and therefore live in a healthy environment.

The teachers also linked good citizenship with getting knowledge in basic education. They argue that if we want to get good citizens we should provide our children with good basic education, and that includes environmental education. This can be seen in the next statements from the interviews:

"It is very important that environmental education is taught in schools because it is the children who are the future citizens who are going to inherit the environment from us. So if they get education from a very early stage, when they grow up they will have the knowledge and skills to take care of the environment and also they will have developed positive attitudes towards the environment. They will grow up as responsible citizens who are supposed to take care of their environment." (Chaka, M).

"Yes, it is important because primary school lays the foundation for learning, therefore, it is at this stage that children start to learn and know about their environment and its importance. If they do not know at this level, will they be able to know at the higher levels? As a result, they will not know their responsibility as citizens towards the environment." (Kyeku, F)

"Yes, it is important that environmental education should be taught in the primary schools because primary education is basic education for all. So this basic education also includes environmental education. As future citizens, the children should be taught environmental education at this early stage so that they can develop the necessary knowledge, skills and attitudes towards the environment." (Wamo, F)

From the teachers' statements, it can be seen that the teachers are of the opinion that environmental education should be taught in the primary school so that the

pupils can get to know their environment and its importance at an early age to enable them become responsible for their own environment.

However, the teachers' perceptions on the importance of teaching environmental education in primary school focus on the cognitive aspect of knowledge acquisition and the affective aspect where learners develop positive attitudes towards the environment. Equipped with knowledge, skills and attitudes, the teachers believe that the children will act as role models both at role and in the community.

Although all the teachers feel that it is important for the pupils to be taught environmental education in the primary schools, the differences in the teachers' perceptions lie in what the teachers consider being the outcome of their learning. While in the first category the teachers focused on the gaining of knowledge, in the second category they think of the learners becoming role models.

The main idea in these categories is that environmental education is important because it equips the individual with knowledge and skills which he/she can use in life and also build the capacities of others in understanding and taking care of the environment. The responses from the teachers suggest that they assume a linear relationship between the two categories, in that one gets knowledge first then demonstrates it through practice as an individual and/or in cooperation with other members of the community, as illustrated in Figure 10.

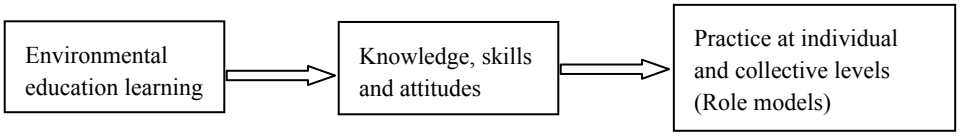

Figure 10. Teachers' perceptions of the relationship between environmental education learning and individual practice

4.3.2 Teachers' awareness of the integration of environmental education into the curriculum

The approach used to include environmental education in the primary school curriculum is that of integrating it into the content of different subjects. Integration, as discussed before in the theoretical framework of this study, involves the making of connections across subjects. In order to integrate, there must be integration of something with something else. The curriculum of Tanzania is subject-based; therefore, integration is contrasted with the traditional syllabus, which is characterized by the compartmentalization of knowledge. In this sense, environmental education has to be integrated into the other subjects content. Through integration, it is assumed that learning becomes holistic and linked to real life situations because all the different subjects would contribute to environmental education. Although integration is a pro concept, the integration of environmental education into teaching depends very much on the teachers' understanding of the concept and their ability to link environmental education content with subject matter content.

When the teachers were asked to explain if they were aware if environmental education was integrated into their subjects, their experiences varied from one subject to another. The responses of the teachers could be put into two main categories. In one category they said that environmental education was *integrated into their subjects,* while others said that it was *not integrated*. The category of teachers who were aware that environmental education was integrated into their subjects, could be put into two sub-categories, namely as subject content and as teaching and learning resource. Those in the category of teachers who said environmental education was not included into their subjects, could also be divided into two sub-categories. One sub-category represented those teachers who said they were certain that there were no environmental education topics in their subject and another category represented teachers who were uncertain if there were environmental education topics or content integrated into their subjects. The categories and sub-categories of teacher' awareness if environmental education integrated into their subjects is as shown in Figure 11.

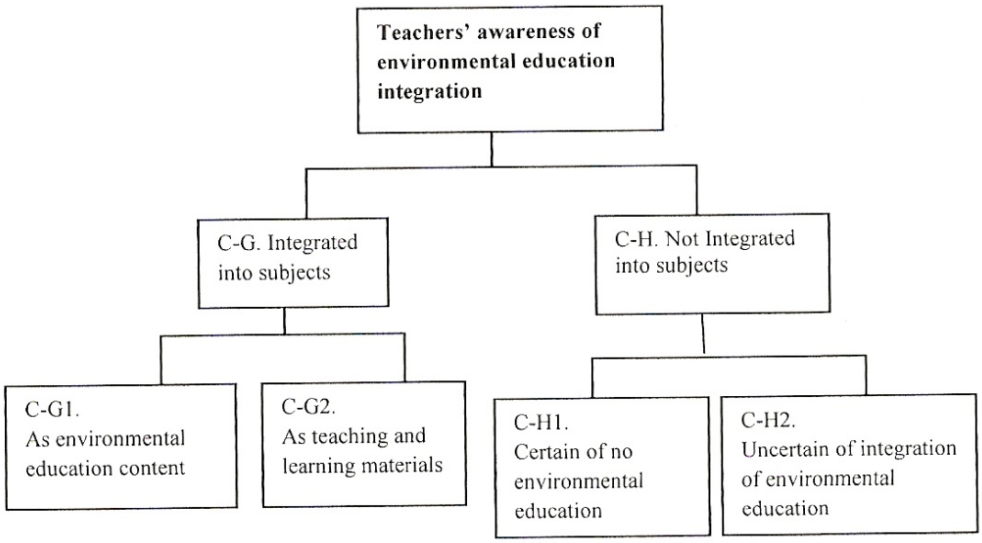

Figure 11. Teachers' awareness of the integration of environmental education into the curriculum

C-G. Integrated into subjects

The teachers who pointed out that environmental education is integrated into their subjects focused on environmental education being integrated into the subject as environmental education content and as teaching and learning materials.

C-G1. As environmental education content

In the first sub-category, teachers said that they were aware of environmental education being integrated into the subjects they teach. The teachers talked about environmental education being integrated as subject matter content related to the

environment. The notion of subject matter content here refers to the specific content that needs to be covered in a particular subject. The teachers in this sub-category say that environmental education is integrated as part of the subject content that they teach, as can be seen from the teachers' statements below:

> "In geography, most of the topics are on the environment. There are topics on "things in the school environment, the natural vegetation and natural resources amongst others." (Kasi, F)

> "In vocational studies, some of the environmental education topics are agriculture and animal keeping and basketry." (Mapia, F)

When the pre-school teacher was asked if there was any environmental education in the syllabus, she said that all the things that she taught are environmental education. At this early stage, the pupils need to know and be familiar with their environment and how they relate to it. Below is a further elaboration on what is learnt at pre-school level as environmental education:

> "For example, in science, most of the topics are about the environment. As the children begin to learn science, they learn about their body cleanliness. This is learning about their environment because they need to know about their bodies, know how to clean their eyes, nose and the mouth. After finishing learning about the body, then they learn about the outside environment, which includes the living and non living things. Then there is the topic if water. In learning about water, the pupils will know about the use of water. Another topic is on diseases. They get to know what causes diseases in their environment. For example, when they learn about diseases, they will, for example, know that if they cough they should cover their mouths so that they so not infect the other pupils. They should know that if they have whooping cough, they can spread it to the others if they do not cover their mouths when they cough." (Kyeku, F)

The teachers' statements in this sub-category suggest that environmental education is integrated into the subjects of geography, science and vocational studies as environmental education topics in the subject content. Therefore, teachers teach it in the same way as they teach other topics in the subjects. In general, environmental education content in these subjects is integrated.

C-G2. As teaching and learning materials

Other teachers talked about environmental education being integrated into the subjects they teach as materials for teaching and learning. Teaching and learning materials here means the different things, including physical objects, pictures and texts, which the teacher uses to help the learners develop the intended knowledge and skills. This can be seen from the teachers' utterances:

> "Yes there is environmental education in my subject. In the subject of Kiswahili for example, a reading passage on "The benefits of forests". Pupils use it for reading aloud and silent reading. Also there are environmental components in language exercises like in the topic of plural and singular." (Bite, F).

> "In English, there are topics in which I can teach environmental education. For example, in the topic on expressions, you can take the pupils out of the classroom and use the environment to teach the expressions. You can teach the superlative form like tall, taller, tallest or short, shorter, shortest by using the trees in the school

grounds and telling the pupils that, this tree is tall, that one is taller than this one, but that tree is the tallest." (Furaha, F)

Apart from using environmental education texts to help the learners develop language skills in English and Kiswahili, teachers also said that they use different objects in the environment as resources for teaching and learning. They explained that usually they use the objects to help learners develop different concepts. For example, Heri said:

> "In mathematics we have topics like geometry. In geometry for example, there is the topic of perimeter. In this topic there is environmental education because when you draw a diagram of a playground and teach them how to find the perimeter of that playground, you are teaching them about their environment. You have used the real environment to teach the concept of perimeter." (Heri, M)

When teachers were further asked if the environmental education content integrated into the primary school curriculum could be identified clearly or not, most teachers indicated that there was a problem in identifying environmental education in the different subject syllabi. Although it is said that it is integrated into the content of all the subjects, the environmental education content is not stated clearly in most subjects, so it is left to the teacher to decide what to teach. For example, teachers teaching mathematics, languages (Kiswahili and English) and vocational skills described the situation like this:

> "No, they are not clearly shown. They are hidden. Therefore, the teacher needs to think of the environmental aspects which are to be taught in the different topics. But not all the teachers have the knowledge of how to do so." (Muso, M)

> "The environmental content in the topics is not stated clearly in the syllabus so it is left to the teacher to think how to link the subject content with environmental education." (Heri, M)

> "They are not stated clearly in all the topics, so sometimes I do not know what environmental content I should teach in the various topics." (Mwasu, F)

Teachers' perceptions of how environmental education has been integrated into the curriculum reveal that the approach which has been used to include environmental education content into the curriculum makes the teachers find it difficult to teach it because they cannot identify the environmental topics or content easily. Only teachers teaching science, social studies and vocational skills (to some extent) admitted that the environmental education topics can be identified easily in their syllabi. This is a tricky situation in a centralized curriculum, where the same thing is taught in schools all over the country.

C-H. Not integrated into subjects

In this category, teachers revealed that environmental education is not included into their subjects. Analysis of the teachers' responses indicated that this category included teachers who were definite that there were no environmental education topics in their subjects and those who admitted that they were not sure whether environmental education was integrated into their subjects or not.

C-H1. Certain of no environmental education integration

The teachers who were included into this sub-category were those who concretely expressed that environmental education is not shown in the syllabus, despite the fact that they are told that they have to teach it. This can be supported by the teachers' utterances, as follows:

> "I have not seen environmental education topics in the subject I teach. The education officers from the municipality tell us to teach environmental education, but when we look into the syllabus we do not find the topics, and even when we look into the books we do not see them. However, I try to include environmental education when I teach where I find it possible." (Mwasu, F)

> "I have not come across any environmental topic in my subject." (Wamo, F)

> "In English for standard 6, there are no environmental education topics." (Pesa, F)

From the teachers' statements, it can be said that although it has been stated that environmental education should be integrated into all the subjects, the teachers' experiences show that they cannot find environmental education topics in the subjects that they teach. However, some of the teachers are not quite sure if there are environmental education topics included into their subjects or not. This is revealed in the next sub-category.

C-H2. Uncertain of integration of environmental education

Since all the topics to be taught are usually stated clearly in the syllabus, the teachers who could not find topics that were directly related to environmental education admitted that they were not sure if there was any environmental education integrated into their subjects. They admitted that the environmental education content might be there, but since it is not stated clearly, then they have not noticed it, as shown in the following statements:

> "No. I am not sure if in mathematics for standard five there are environmental topics. They might be there, but they are not stated explicitly." (Kaji, M)

> "In the Kiswahili subject for standard VII there are no environmental topics, but we can read passages on the environment and in structure we can make sentences related to things and situations in the learners' environment. I am not sure if this is environmental education or just reading passages." (Ksheru, F)

The teachers' voices above suggest that teachers are doubtful if there are any environmental education topics in the subjects that they teach. This implies that there could be environmental education topics included, but since they are not labeled explicitly as environmental education, the teachers have not been able to identify them.

Concerning the issue of teachers' awareness of environmental education being integrated into the subjects that they teach, the teachers' experiences can be divided into two categories. Some teachers revealed that there was no difficulty in identifying the environmental education components which are integrated into the subjects which they teach, while other teachers said that they experienced difficulties in finding out if they were integrated or not.

In the first category, the teachers said in some subjects the environmental education topics are explicitly shown as topics, or as content to be taught, or even as a teaching and learning resource. Teachers teaching these subjects (science, social studies, languages and vocational skills) seem to be comfortable in integrating environmental education into their teaching.

In the second category, teachers seem to be dissatisfied because they are told to integrate environmental education into their teaching, but what is to be integrated is not stated clearly or is not indicated at all. This makes it difficult for teachers to know or decide what to integrate as they have to teach what is stated in the curriculum. Given this controversy it was necessary to ask the teachers how they think environmental education can be integrated into the curriculum so that it can be taught effectively as planned.

4.3.3 Teachers' suggestions on integration of environmental education into the curriculum

The discussion on teachers' perceptions on how environmental education has been included in the curriculum was followed by teachers' suggestions on how environmental education can be integrated into the primary school curriculum. This aimed at seeking teachers' perceptions on how environmental education can best be included into the primary school curriculum to facilitate its effective implementation. As a result of the analysis, three categories could be distinguished.

The first category included teachers who thought that environmental education should be included in the school curriculum as an *independent subject*. The second category consisted of teachers who thought that it should be *integrated as topics* into the different subjects, and the third category consisted of those who thought that it should be *integrated into a few subjects* only. Within the three categories, there were seven aspects. The first category included teachers who suggested that by making environmental education an independent subject, it would be accorded subject status treatment, while others said that due to its vital significance, it needs to be an independent subject. Other teachers were of the opinion that if it is included in the curriculum as an independent subject, it would be covered adequately. The second category included teachers who talked about effective teaching and overloaded timetable. In the third category the teachers talked about the aspects of match and mismatch with subject content. The different categories and subcategories are shown in Figure 12 below and discussed in the following sections.

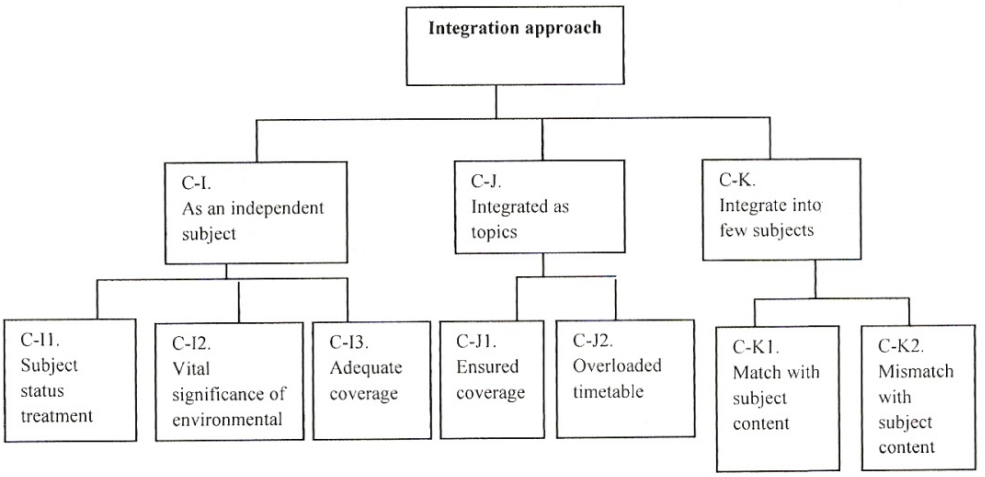

Figure 12. Teachers' suggestions for integrating environmental education into the curriculum

C-I. As an independent subject

The first category contains suggestions on including environmental education into the primary school curriculum as an independent subject. Teachers in this category were concerned with making environmental education an independent subject just like the other subjects in the primary school curriculum. When asked why they think so, they gave different reasons. Classification of these gave revealed that the teachers mainly focused on four aspects, which are subject status treatment, vital significance of environmental education and adequate coverage, as will be discussed in the following sub-categories.

C-I1. Subject status treatment

The majority of the teachers talked about the inclusion of environmental education into the primary school curriculum in terms of being accorded the status of an independent subject. They pointed out that if environmental education is made an independent subject, it will be treated like other subjects. They claimed that, it will have its own syllabus, books and other teaching materials, with time allocated on the timetable and allocated to teachers. It seems that teachers have this kind of thinking because they are used to a curriculum which is made up of different subjects. So if environmental education is to be taught in the primary school, it should be made a new subject. The teachers also tended to describe it from two different perspectives. First, they talked about its characteristics as an independent subject, and second the need for it to be assessed. Two of the teachers said it would make environmental education have its own syllabus, books, and it would be placed in the timetable just as with other subjects hence taught effectively and in depth:

> "I think it would have been a good thing if environmental education is taught as an independent subject with its own syllabus and periods allocated on the timetable. I think so because it is only by doing this that it will be taught effectively in the

schools As you know, teachers are used to teaching subjects and not linking other content with subject content. They teach what is specified in the syllabus." (Muso, M)

"On my part, I think environmental education is very wide. It has a lot of things to be learnt. For this reason I think that it would be a good thing if it is considered as an independent subject so that it can be taught in depth." (Heri, M)

In further probing into the teachers' responses, the teachers were encouraged to talk more about why they think environmental education should be taught as a separate subject. They referred to environmental education being taught as a subject in terms of assessment. Teaching in the primary school is examination-driven. So, one of the teachers suggested that if it is to be taught as a subject, it should also be examined, as two of the teachers commented:

"I think the best approach is to make it a separate subject […….] Well, I think so because it will be taught and examined. If something is not stated in the syllabus, or not shown on the timetable and assigned to teachers, and above all not examined, it is not taught seriously."(Sina, M)

"I think environmental education should be treated as an independent subject like the other subjects because teachers will be serious in teaching it because it will be examined. You very well know the emphasis we place on examinations. We teach the pupils so that they pass the exams. If we do not teach they will fail." (Mark, M)

Despite the fact that teachers teach so that pupils pass their exams, Manka is of the opinion that even if it is not examined but taught as a subject, the pupils will have gained environmental education knowledge and skills which will be useful to them in life.

"[…] In addition, if environmental topics are examined, making it an independent subject will enhance its teaching. On the other hand, even if it is not examined, they will still have gained the knowledge required to help them live in harmony with their environment. For example, when they go back home after finishing school, they will know their environment and how to take care of it, like making it clean, planting multipurpose trees for their own use." (Manka, F)

The teachers' statements indicate that the issue of considering environmental education as a separate subject is necessary if it is to be taught effectively. However, they are of the opinion that effective teaching will also depend on whether it is examined or not. But other teachers talked about making it an independent subject in terms of its importance, as will be seen in the following subcategory.

C-I2. Vital significance of environmental education

Whereas the teachers in the previous sub-category were concerned with the issue of status, teachers in this sub-category were concerned with the significance of environmental education. The respondents talked about environmental education being made an independent subject on the basis of the significant role it plays in our lives. The teachers considered environmental education important because it helps the pupils develop knowledge and skills which help them to live comfortably in their environment. This kind of thinking can be seen from what the teachers said:

"From my point of view, because environment is the one which makes us live, environmental education should be treated as an independent subject and not to be included in other subjects. It is so important that we need knowledge and skills on how to survive under different conditions[...]." (Ksheru, F)

"I think environmental education can best be included in the school curriculum as an independent subject because of its importance despite the fact that there may be too many subjects on the school timetable. As we know, environmental education helps the individual develop knowledge and skills that will help him live in harmony with the environment [....]." (Salase, F)

In this sub-category the teachers expressed their concern that pupils learn about the environment because it is important to their lives even after school. So by being taught environmental education they will be able to use the knowledge and skills which they get from learning environmental education in real life situations for survival purposes. The question is whether this is realistic in an examination-driven curriculum?

C-I3. Adequate coverage

Some of the teachers were concerned with environmental education being made an independent subject, claiming it will be adequately covered as the other subjects are. As stated earlier by some of the respondents, if something is not taught as a subject it will not be taught seriously. These teachers seem to interpret learning in terms of knowledge being divided into subjects. I take this as an indication that teachers are used to teach subject-based content only. They suggest that if environmental education is made an independent subject, it will be understood well by the pupils because its teaching in the schools will be done more seriously. They also suggested that if it is made an independent subject the teachers will know exactly what to teach and how much to be taught because it will be specified in the syllabus. For example, some of the teachers said:

"I think the best way to include environmental education in the school curriculum is by making it an independent subject so that it can be taught in depth." (Pesa, F).

"What will make it be taught in depth?" (Researcher)

"All the subjects are taught according to the syllabus. So if environmental education is made an independent subject, it will also be taught according to its syllabus and text books. As a result it will be taught in depth because teachers know what to teach and how deep they should go in each topic. Moreover, if the pupils learn it as a subject they will understand it more." (Pesa, F)

"In my opinion I think people would understand it better if it is taught as an independent subject. This is because if I teach about diseases in science, if we consider a small part of the lesson on the reinforcement of new knowledge, I can tell them that these diseases are caused by dirty water, therefore we should take care of the water so that we do not get sick. I cannot explain much how the water can be taken care of, or how can the water be handled so that it can be safe water. If it was treated as an independent subject, then I would have been able to treat the aspect of water sanitation in depth." (Kyeku, F)

From the teachers' utterances, it can be said that teachers strongly believe that the best way to include environmental education into the primary school curriculum is by making it a separate subject. They argue that it should have

subject identity, which will ensure that it is taught effectively. Teachers believe in the importance of putting knowledge into separate bodies, and believe that by doing so teaching will be easier, the pupils will learn better and the importance of environmental education will be realized. However, there are other teachers who think that it should not be included into the curriculum but integrated into all the subjects, as will be discussed in the following section.

C-J. Integrated as topics

The category is characterized by the perception that environmental education should be included into the primary school curriculum by integrating it as topics in all the subjects. The idea of integration suggests holistic and meaningful learning. When environmental education is integrated into all the subjects taught in the primary schools, it becomes a thread that runs through the whole curriculum. The idea of integration is new to some primary school teachers because from the interviews I learnt that environmental education is not taught in teacher training colleges, and most teachers have not attended any in-service training in environmental education. As a result, most of them feel uneasy in teaching things that they have never been taught in teacher training college.

However, some of the teachers, particularly those who have attended environmental education in-service workshops perceived that environmental education can best be included in the school curriculum by integrating it into the different subjects as independent topics. Some teachers in this category are of the opinion that by making it an independent subject, the coverage of the environmental education content will be ensured, while others suggest that the timetable will not be overloaded by many subjects. Each of the sub-categories will be discussed in the following sections.

C-J1. Ensured coverage

Teachers perceptions in this subcategory emphasized that integration of environmental education into the subjects being taught as environmental education topics in primary schools will ensure that it is taught effectively. In Tanzania, teachers make sure that they teach everything which is stated in the syllabus. So in this sub-category teachers feel that if environmental education is included in the syllabi of different subjects as topics, it is certain that it will be taught. They also said that if a topic is not covered well in one subject, it will be taught in another subject. For example, some of the teachers said:

> "In my opinion, I think environmental education topics should be included in all the subjects. This will help the learners understand the environment well because every time they are taught, the environment is taught. Therefore, they will realize that it is a very important thing." (Aziz, M)

> "I think that environmental education should be integrated as independent topics in the various subjects. I think so because if one topic is not covered well in one subject, it will be covered in the other subjects [….]." (Fremo, F)

Other teachers further emphasized that environmental education should be integrated as topics in all the subjects and not in the content of the different topics. The reasons they gave are that the approach will ensure that it is taught

effectively, because every teacher will teach it as specified in the subject syllabus as shown in the following excerpts and dialogue:

> "I suggest that for environmental education to be taught effectively, it should be included in all the subjects as independent topics and not to be integrated in the subject content in every topic". (Mark, M)
>
> "Why do you think so?" (Researcher)
>
> "It is because teachers teach all the topics included in the syllabus. So if environmental education topics are included in the syllabus, the teachers will not skip them. They will have to teach them. If environmental content is integrated into the content of the different topics we might fail to know what to emphasize when teaching. I mean we would not know if emphasis should be on the subject content or the environmental education content." (Mark, M)
>
> "I am saying that it should be included as topics in all the subjects because teachers cannot skip topics. This is because if it is examined, the pupils will fail. As a result, all the pupils will be taught some environmental education." (Mkame, F)

On the basis of their statements, it is evident that if environmental education is integrated as topics in the different subjects, the teachers will be obliged to teach them. As a result, every pupil will learn environmental education.

C-J2. Overloaded timetable

Several teachers were concerned with the issue of overloading the timetable. The teachers talked about including environmental education into the school curriculum as topics in different subjects because they are concerned with the issue of overcrowding of the timetable. They argue that environmental education is an issue that cuts across all the subjects. There are many other cross-curricular issues like gender, poverty alleviation, reproductive health, and many others. If each one of these is given the opportunity to be a subject of its own, then the timetable will be overcrowded. This kind of thinking can be seen from the following statements from the teachers:

> "I am of the opinion that if environmental education is treated as an independent subject in the curriculum, it may be difficult because there would be too many subjects on the timetable and we would need more teachers to teach the subjects. Therefore, I think it would be appropriate if it is included as topics in every subject." (Mapia, F)
>
> "We cannot create a new subject for all the issues which need to be addressed through education in the society. For example we are told that as we teach, we have to address gender issues, poverty, reproductive health, HIV/AIDS amongst others. If we make environmental education an independent subject, we will have many subjects. But if environmental education topics are identified and included into the syllabus of every subject, it will be more useful. Also it will make the teachers teaching the different subjects be able to teach it well and help the pupils effectively." (Kaji, M)

The teachers' statements reveal their concern that if environmental education is included into the curriculum as an independent subject, there will be too many subjects. In order to avoid overloading the timetable and to ensure that it is

taught effectively, the teachers proposed that environmental education should be included as topics in the existing subjects.

C-K. Integrated into few subjects

In this category, teachers suggested that environmental education can best be included into the school curriculum in just a few subjects. The reasons they gave for this kind of thinking are that there are subjects whose content corresponds or matches with that of environmental education. Others said that there are subjects whose content does not correspond or match with environmental education. Therefore based on the reasons given by the teachers, two sub-categories emerged from this category, namely *match with subject content* and *mis-match* with subject content.

C-K1. Match with subject content

Regarding the sub-category of match with subject content, teachers refer to subjects where the content is similar or related to the environmental education content. Examples of such subjects are science, social studies and vocational skills. These are sometimes referred to as carrier subjects. The teachers argued that if environmental education is included in these subjects, it will be easy to teach because the teachers have the knowledge. This can be seen from the following excerpts:

> "I think the best way to include environmental education in the school curriculum is to include it in science. This is because science is about the environment. So, the teachers will not find it difficult to teach environmental education content if it is included into the science syllabus. They have enough knowledge." (Sinta, F)

> "I think environmental education can be included in some subjects only because its content matches with the subject content […..] It therefore can be included in civics, history, geography, vocational skills and social studies. In these subjects, environmental education topics can be included so that when a pupil studies the subjects, the aspect of environment is covered. For example, in vocational skills, when you teach the topic of agriculture, you can teach environmental conservation through good agricultural practices. This will make the pupils develop a deep understanding of the environment, hence be able to answer all the questions asked by the teacher correctly and without any difficulty." (Wamo, F)

C-K2. Mismatch with subject content

While in the previous sub-category the teachers suggested that environmental education should be included in the subjects where the subject content matches with environmental education, teachers in this sub-category had different arguments. The teachers said that environmental education should be included in some of the subjects only, because in some of the subjects the content does not match with the content of environmental education. The subjects which they mentioned were mathematics and the language subjects (English and Kiswahili). For example, Shani was worried that in these subjects environmental education may not be taught at all, because the subject content is not related to environmental education. This can be seen in the next statement:

> "In my opinion, I think environmental education can be included in some of the subjects only because in some subjects like mathematics, English and Kiswahili it is not easy to include environmental education. The content of these subjects does not match with the environmental education content. If they say that it should be taught in these subjects then I think the teachers will not be able to do so." (Shani, M)

On the approach to be used in integrating environmental education into the school curriculum, the teachers' experiences were different. The first group of teachers suggested that environmental education can be included into the school curriculum as an independent subject. The teachers suggested this approach in connection with what they are used to doing. They see knowledge as divided into different disciplines and therefore are used to teaching specific subjects. They also prefer this approach because they feel that environmental education will be given the required emphasis like other subjects.

The second group of teachers feels that environmental education should be included into the curriculum as topics in all the subjects. This suggests the linking of environmental education content with subject content. However, the focus here was making sure that it is taught, because teachers will not skip it. In an examination-driven curriculum, teachers try to cover all the topics so that the pupils do not fail.

While the teachers in the second group think that environmental education should be integrated into all the subjects, teachers in the third group think that it should be included into a few subjects only. The subjects they suggested were those whose subject content relates to environmental education content. Although the teachers in primary schools are expected to teach all the subjects, this feeling emanates from the teachers' thinking that environmental education is science, so if they have not learnt science, it would be difficult for them to teach.

Despite the teachers' suggestions on how environmental education could be integrated into the curriculum, the education and training policy has directed that it should be integrated into all subjects. To find out how it is implemented, the third research question investigates the teachers' teaching practices in their teaching of environmental education.

4.4 Teachers' teaching practices in teaching environmental education

The third research question is concerned with the teachers' teaching practices in the teaching of environmental education. This research question focuses on the teachers' competence in teaching environmental education, the ways in which teachers integrate environmental education in teaching different subjects, the teaching methods used, the challenges which teachers face in the teaching of environmental education, and teachers suggestions' on how the teaching of environmental education can be improved in primary schools. The interviews were followed by a few lesson observations to see how teaching was actually being carried out in the classroom. The results from the teachers' interviews and lesson observations are presented in the following sections.

4.4.1 Teachers' perceptions of their competence in teaching environmental education

In order to be able to understand whether teachers were competent in teaching environmental education at primary school level or not, I started by asking them if they feel that they have enough knowledge and skills to teach environmental education.

The teachers involved in this study initially taught one or two of seven different subjects taught in primary school, namely mathematics, science, English, Kiswahili, social studies, and vocational skills. Recently, the subject of social studies has been separated into three subjects, which are geography, history and civics. So, the teachers teach more than two subjects.

In the analysis of the teachers' responses concerning their competence in teaching environmental education, two categories could be distinguished. The first category included responses which showed that the teachers feel that they are *sufficiently competent* to teach environmental education, while the second category included teachers who felt that they are *not competent* in teaching environmental education. Supporting their arguments, the teachers who said that they are sufficiently competent talked about the knowledge of environmental education required at primary school level being elementary, learning some of the content to be taught by themselves and in-service training. The teachers who said that they were not competent attributed this to frequent changes of environment and inadequate training. The categories and sub-categories are as shown in Figure 13.

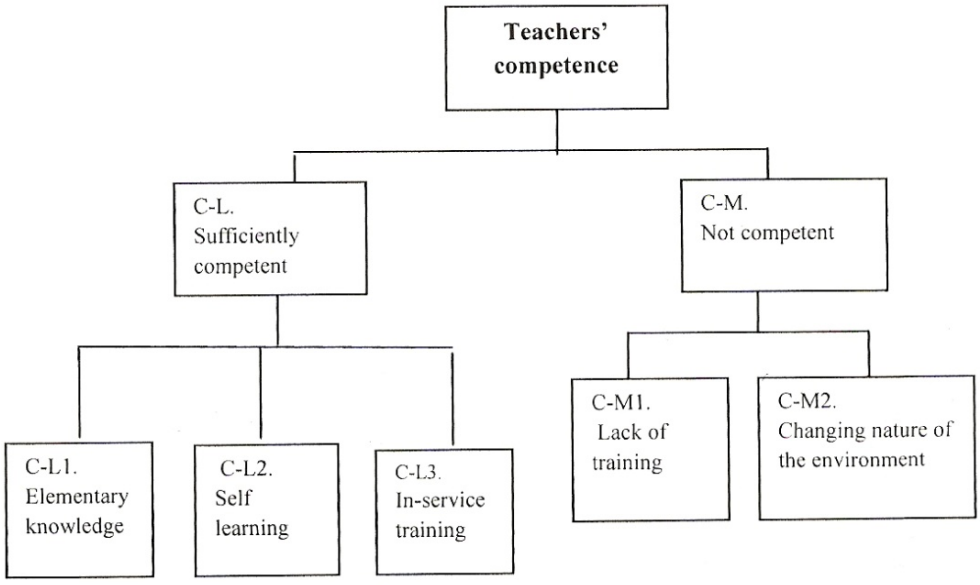

Figure 13. Teachers' feelings of competence in the teaching of environmental education

C-L. Sufficiently competent

The teachers' knowledge base and skills are the basis of effective teaching of environmental education. Teachers with such qualities are considered to be competent teachers. While there are a number of competencies that a teacher should have in this study, the kind of competence referred to here is focused on subject matter (content) and pedagogical competence. Most of the teachers involved in this study said that they did not learn environmental education when training as teachers and they have not even undergone any in-service training in environmental education. However, some of the teachers interviewed said that they were competent in teaching environmental education at primary school level. These teachers based their competence on the aspects of elementary knowledge, self-learning and in-service training, which will be discussed in the following sections.

C-L1. Elementary knowledge

The teachers who said that they feel competent in teaching environmental education in the primary school said that what is taught at primary school level is elementary knowledge, which they already have. They said that the knowledge that they have is above the level that they teach. A teacher's minimum qualification to teach primary school is Form IV (ordinary level secondary education (16–17 years old). Also some of the teachers have privately upgraded themselves to advanced level secondary education (Form VI), which is two years of further secondary education after completing form IV. With such academic qualifications, they claim that the content taught in the primary school is very elementary for them because most of it is covered in primary and secondary schools as can be seen from the teachers' statements:

> "Yes, as a teacher I have adequate knowledge to teach environmental education. The reason I am saying so is because what I teach at the primary school level is very elementary. Most of the things I teach here I learnt in secondary school." (Pesa, F)

> "Yes, as a teacher I think I have knowledge and skills in the teaching of environmental education in the primary school. This is because what is taught in the primary school is very elementary." (Hai, F)

From these comments it can be said that the teachers are quite confident in terms of their knowledge base. It shows that they are positive and ready to teach environmental education because teaching content is not a problem to them.

C-L2. Self-learning

Some of the teachers talked about self-learning. In this context, the teachers referred to self-learning meaning that they learn through their own initiatives in search for more knowledge and also to keep in touch with current issues. These teachers are aware that learning is something that goes on and is not confined to school or to a specific group of people like students:

> "Yes, I have adequate knowledge and skill to teach environmental education, because as a teacher I am supposed to have adequate knowledge and skills. When it happens that there is something I do not know I search from books or ask my colleagues to

educate me. As a teacher I have to develop the initiative to learn by myself and not waiting to be trained so that I can teach well." (Pai, M)

"I think I have enough knowledge and skills to enable me teach environmental education well because [.....] I learn a lot of new things by reading a lot of environmental and science books." (Muso, M)

The critical idea in these teachers' statements is the teachers' role in the search for knowledge to develop their own knowledge base. From the teachers' statements it can be seen that as teachers they have self-initiative in searching for teaching content from different sources. They also realize the importance of collegial support in developing their own knowledge base.

C-L3. In-service training

Some of the teachers feel that they are competent because they have attended in-service courses either in environmental education or in related areas like agriculture. Although the trainings were short-term, the teachers admitted that they have developed their abilities to teach environmental education to a great extent. This can be supported by the following statements from the interviews:

"I think I have some knowledge and skills in the teaching of environmental education from the training I got in agriculture. I went to an in-service course in agriculture at Vikindu teachers college for one year." (Pazi, M)

"Yes, I have enough knowledge and skills to teach environmental education in the primary schools. I say so because I attended a number of in-service courses in the teaching of environmental education in the primary school. From the training I got skills on how to include environmental education into the different subjects in the primary school. Now I have no problem because even with topics which other teachers think they cannot include environmental education content into I can." (Ksheru, F).

Elaborating further on how in-service training has helped her, Ksheru gave an example of how she can integrate environmental education when teaching the topic of the national anthem:

"For example, the topic of the "National Anthem". I can include environmental education by asking the pupils, where, when and how it is sung. I told the pupils that the national anthem is sung when our national leaders like the president comes and wants to speak to the people. Then I ask them, is it proper to sit in the sun and listen to the leaders giving their speeches? We have to sit in the shade. And where do we get the shade from? It is from trees. Therefore, trees are very important to our lives because they provide us with shade and many other things." (Ksheru, F)

What can be seen from the teachers' statements is an emphasis on the importance of in-service training. Although in-service training makes the teachers more competent and also innovative, as seen from the example given by one of the teachers, it is dependent on the availability of funds. Thus, not many teachers get the opportunity to go to in-service training or courses. However, there is a need to provide teachers with in-service courses so that they can teach environmental education effectively.

C-M. Not competent

While some of the teachers considered themselves competent in teaching environmental education, there were teachers who felt that they were not competent. The results revealed two sub-categories indicated that teachers do not feel competent to teach environmental education first because they *lack training* and second because of the *changing nature of the environment*. As a result, the teachers in this category reflect the need for training in environmental education for teachers. They suggested that they need to be trained through workshops, seminars and short courses if they are to teach environmental education in the primary schools effectively.

C-M1. Lack of training

The basic idea characterizing this sub-category is lack of training in environmental education among teachers in primary schools. The teachers claim that they were not taught environmental education while training as teachers in teacher training colleges. They added that they have not even attended any in-service course or seminars in environmental education As a result, they do not feel competent to teach environmental education. The teachers concerns can be supported by the following excerpts:

> "To tell the truth, I do not have the knowledge and skills to teach environmental education, because I was not taught in school and in teacher training college. If there were frequent seminars for all the teachers, it would be a good thing. It is important to train all the teachers because if only one teacher from a school attends the seminar, if he/she is not available, then nothing will be done. Therefore, all the teachers should attend the seminars. Alternatively, seminar organizers can go to the schools to run seminars for teachers. If this is done, I am sure every teacher will be able to teach environmental education as intended by the curriculum." (Wamo, F).

> "I do not have enough knowledge to teach environmental education. I think I need to be educated on the subject more because I have never been taught in college. And it is not only me. A lot of teachers have never been trained in environmental education. It is necessary for teachers to be trained so that they can be shown what and how to integrate environmental education into their teaching." (Tunu, F)

> "I do not think that I have enough knowledge to enable me teach environmental education comfortably. I think so because there are things that I do not know, as I was not taught them in college. Therefore, I need to be taught about many things. For example, I do not know what the problem of greenhouse effect is in the environment, although I very often hear it mentioned. As a result, I cannot teach it because I do not know what it is." (Salase, F).

On the basis of what the teachers said, it is evident that teachers experience difficulties in teaching environmental education, since some of the teachers do not even know some of the concepts used in environmental education like the concept of greenhouse effect, as one teacher said. However, they indicate that the teaching of environmental education can be implemented effectively in primary schools if teachers receive training both in pre-service and in-service programs.

C-M2. Changing nature of the environment

The teachers in this sub-category stressed that the environment is constantly changing, it is not static. As a result, what we know about the environment at a particular time may not be true after some time. Thus, teachers need to keep in pace with these changes. This can be seen from the following statements:

> "I can say that I have adequate skills and knowledge to teach environmental education at the moment, but since things are constantly changing, I think I need constant training to update my knowledge and skills." (Kinara, M)

> "What I know about the environment in Morogoro is not the same as the environment in another place like Mwanza. If I go to teach in Mwanza I have to find out what the environment in Mwanza is like. An even what I find may change over time. So I can say that I am not adequately competent to teach environmental education because the environment is always changing." (Mangowi, F)

These teachers' voices indicate that teachers attribute their lack of competence in the teaching of environmental education to the changing nature of the environment. They suggest that they have to update their knowledge in order to keep in pace with the changes.

While discussing further with the teachers about their competence in teaching environmental education in primary school, the responses revealed that there are variations among the teachers. There are those who feel that they are competent and some who feel that they are not competent. The basic idea characterizing the first category is that teachers feel that they are competent in teaching environmental education at primary school level. According to what they say, these teachers seem to be innovative and confident. The second category is characterized by teachers who say that they are not competent to teach environmental education. They attribute this to the changing nature of the environment and inadequate training. Unlike teachers who feel that they are competent, these teachers seem to be desperate and rather helpless and need to be rescued from the situation through seminars and workshops. This is a critical issue because if teachers do not feel that they are competent to teach environmental education it is likely that it will not be taught as planned in the primary schools.

4.4.2 Teachers' classroom practices in teaching environmental education in different subjects.

Apart from investigating the teachers' competence in teaching environmental education, the teachers were encouraged to discuss how they teach environmental education in the subjects that they teach. They admitted that there is no uniform way in which they can include environmental education in their various subjects because the approaches differ from one subject to another. They discussed how they integrated environmental education when teaching their various subjects. Their responses were categorized into two main categories. Some said that they taught environmental education as *subject content,* while others said that they used it as *teaching and learning resource*. Within the two categories, five sub-categories could be identified, as shown in Figure 14. In the category of subject content, there were three sub-categories namely as specific

topics, as integrated into subject content and as content for skills development. In the category as teaching and learning resource there are two sub-categories, namely source of teaching materials and learning context.

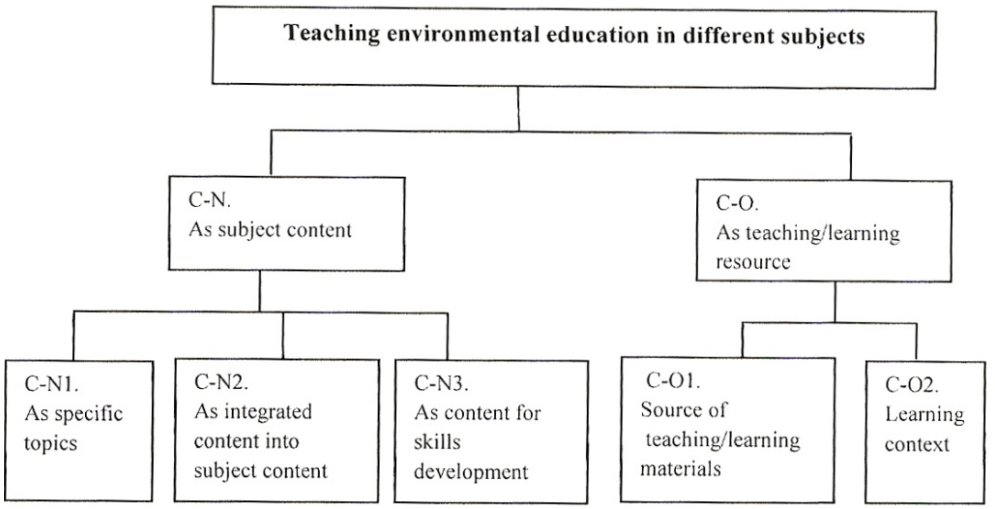

Figure 14. Teaching environmental education in different subjects

C-N. As subject content

Teaching content is used when the teacher aims at providing the learners with factual knowledge. The main task, and specifically the role of the teacher, is to provide or transmit factual knowledge to the learners. The teachers in this category therefore talked about teaching environmental education as teaching content, which is included in the subject as *specific topics* or when it is *integrated into the content of the subject topics* or when they use it *as content for skills development.*

C-N1. As specific topics

Teachers teaching science, social studies and vocational skills said that environmental education is taught as topics because they are stated in the syllabus. So they find it easy to integrate environmental education into their teaching, because they teach it as specific topics included in the syllabus. For example, a teacher teaching science and geography said:

> "In my science subject I teach about living things, health and diseases, energy and other topics. I do not have difficulty in finding them because they are stated in the syllabus. And this is environmental education." (Fremo, M)

A geography teacher was also of the opinion that environmental education is integrated into geography as topics. For example, the teacher said:

> "In geography most of the topics are about the environment. For example, in standard three, there is the topic on the things in the school environment. What I do is that I take the pupils out and make them identify the different things found in the school environment and then ask them to discuss their importance. This is followed by the

topics of our ward and district. Generally, I think most of the topics in geography from standard three to seven are related to environmental education." (Mwenda, F)

The teachers' statements show that when environmental education content is included in the syllabus as a specific topic, teachers can teach it without any difficulty. They even expand on the topic by relating it to real life situations or behaviour development.

C-N2. As integrated content into subject content

The integration into subject content approach is used in subjects where environmental education content is not stated explicitly as topics to be taught. The teachers said that they integrate it into the subject content as they teach. They described the process using words like linking, including and integrating. Teachers teaching physical education, social studies, vocational skills and even mathematics indicated that they integrated environmental education content into the subject content as they teach. For example, a physical education teacher said:

"I do integrate environmental education content into my teaching by linking the subject content with the environment. For example, on the topic of preparation of playgrounds, I teach the pupils that when we prepare playgrounds, we have to be careful not to destroy the environment of that place by making sure that we plant cover grass and trees around the playground after clearing the place. Also I tell the pupils that we should locate playgrounds in areas which are not steep so that we do not cause soil erosion." (Hai, F)

Other teachers teaching social studies said:

"I integrate environmental education in my teaching by including environmental education content into the subject content. For example, when I teach the topic of water in social studies, I teach also how to tackle the problem of water shortage, how to conserve water sources and management of catchment areas, although they are not stated in the syllabus." (Pazi, M)

"I usually integrate environmental education into my teaching when I teach the topic of agriculture. In standard 7, I teach agriculture in the world - the cultivation of different crops. After teaching about the world, I turn back to the pupils and discuss how the cultivation of the different crops is done in our country or in our area. We also discuss the problems that we face in cultivating these crops and how we can solve them." (Tunu, F)

A vocational skills teacher had a different way of integrating environmental education into her subject through awareness raising. The following excerpt exemplifies this:

"When I teach my subject I relate it to the environment. For example, when I teach printing in vocational skills in standard 4, I ask the pupils to use the skills they have developed to write posters concerning the environment and put them in different places. Examples are "Usitupe taka hapa", meaning "Do not Put Waste Here" or " Usipite hapa" meaning "Do not Trespass or "Hifadhi mazingira" meaning "Conserve the environment" and put them in different places in the school grounds. The messages on the posters can raise environmental awareness among the pupils concerning taking care of the environment. I think this also is environmental education." (Mwasu, F)

In a similar way, a mathematics teacher explained how he integrates environmental education when teaching mathematics, as shown in the excerpt below:

> "In teaching mathematics, I include environmental content. For example when I teach the topic on calculating area, for example the area of a circle, after showing them how to calculate, I ask them to identify different things which are circular in their environment and the importance of these things to us. For example, they can mention things like the roundabouts in town, water storage tanks, flower and vegetable gardens and houses. After mentioning them they discuss their importance." (Kaji, M)

The teachers' descriptions of how they integrate environmental education as content into their teaching in various subjects show that each one tries to link what they teach with the learners' environment to make learning meaningful. This approach requires the teachers to be very innovative and have skills for linking the subject content with environmental education content, which in most cases is not stated in the subject content.

C-N3. As content for skills development

While teachers in the previous sub-category integrated environmental education into the subjects they teach as teaching content, some teachers used the environmental education content in developing various skills among the pupils. They said that they teach environmental education when they want to help learners develop language and mathematics skills. Skills can be defined as the ability to do something as a result of training. The language teachers said that they teach environmental education when they teach structure, vocabulary, comprehension, poetry and composition skills. Similarly, mathematics teachers stated that they include environmental education to help learners develop numeracy and measurement skills. This is clearly seen from the quotations below:

> "When teaching, for example, reading aloud or for comprehension in Kiswahili, I use a passage about the environment. When I come across vocabulary which is related to the environment like trees, bushes, etc., I use it to teach about the environment. Using the passage and the vocabulary you can discuss with the pupils the uses of trees, importance of taking care of trees and bushes in the environment, and what will happen if we cut down the trees or clear the bushes." (Wamo, F)

> "In Kiswahili I include environmental education into the subject topics when I teach. For example, I include it in composition writing, like "Write a composition on the benefits of forests" or I ask the pupils to compose poems with environmental messages." (Bite, F)

> "In English for standard V, I make the pupils learn vocabulary from the things in their environment, make sentences which have environmental messages and read environment passages for comprehension. For example, in teaching the use of "because" and "since" they would make sentences like, "the maize crop was poor because there was no rain" or "He got sick because he drank dirty water." (Subira, F)

> "In mathematics for example when I want them to develop subtraction skills I give them problems related to the environment such as: In the year 2001, the village had

1000 cattle. In 2002, the village experienced a big drought because there were no rains. A total of 70 cattle died. How many cattle were left?" (Kaji, M)

The teachers' statements reveal how environmental education texts can be used in developing language and mathematics skills, while at the same time helping the learner develop environmental knowledge. In languages for example, as the pupils read the texts, they do not only develop language skills, but also get knowledge about the environment.

C-O. As teaching and learning resource

While teachers in the previous category taught environmental education as subject content in their subjects, some of the teachers in this category said that they teach environmental education through the use of learning resources. There were teachers who indicated that they teach environmental education by using it as a *source of teaching materials* and others said that they used the environment as a *learning context*.

C-O1. Source of teaching and learning materials

The teachers pointed out that they use teaching and learning materials from the learners' environment. For example, a teacher teaching mathematics said that:

> "I include environmental education in my teaching by using the different things in the environment as teaching resources. For example, in teaching whole numbers, I use trees in the school grounds, or seeds collected from the environment or even small stones." (Shani, M)

Other teachers who talked about teaching environmental education through the use of teaching and learning materials from the learners' environment are the teachers of vocational skills. For example, Mwasu and Tunu who teach vocational skills in standards IV and II respectively, revealed that they used materials from the learners' environment to teach them how to make things like mats, baskets, and hats. The excerpts below reveal what they said:

> "In teaching vocational skills I include environmental education through the use of teaching and learning materials. For example, when I teach the topic of basketry – making hats. In making hats the pupils use palm leaves. In places where palm leaves are not available, they have to be innovative and use other materials from their environment like banana leaves. In doing this, the children will have used their environment in learning. Also while collecting the materials from the environment, they are reminded that they have to be careful not to destroy the plants they are collecting the materials from, so that they can go on using them." (Mwasu, F)

> "In vocational skills I include environmental education in my teaching when I teach about the drawing and coloring of pictures. Because I do not have ready-made colors, I make colors from the different leaves and flowers in our environment. This is learning by using the things in the environment." (Tunu, F)

C-O2. Learning Context

Apart from using learning materials from the environment, some of the teachers said that they teach environmental education through various activities carried out in the environment. They use the environment as a learning context.

Sometimes it is referred to as outdoor learning. Outdoor activities here refer to activities done outside the classroom.

For example, teachers teaching mathematics explain that they include environmental education in their teaching by carrying out different mathematics activities outside with the learners like counting things, or demonstrating something. The teachers in this category are of the opinion that after teaching the subject content in the classroom, the teachers can take the pupils out of the classroom to relate what they have learnt to the real environment. This can be exemplified by the following utterances:

> "I try to link what I teach in mathematics to the children's environment. For example, when I am teaching about how to find the perimeter of rectangular shapes, after showing the pupils examples of how to do it, they go out and identify things with rectangular shape, measure them and find out their perimeter. Some of the rectangular things they would identify and measure are the football or netball grounds, the blackboard, an exercise book, etc." (Retha, F)

Another teacher described her way of teaching geography to her pupils using the environment as a learning context.

> "In geography, most of the topics are about the environment. For example, in standard 3, there is the topic on the things in the school environment. What I do is take the pupils out and make them identify different things found in the school environment and then ask them to discuss their importance." (Kasi, F)

Within this category, teachers showed that they integrate environmental education into their subjects through the use of the environment as a teaching and learning resource. However, there were differences in the way they used it. While some teachers used it as a source of teaching and learning materials, others pointed out that they used the environment as a learning context.

Lesson Observations

After conducting interviews with the teachers on how they teach environmental education, I observed some lessons. In the following section, two of the observed lessons are described as examples of what may be considered as teaching the subject while integrating environmental education into the subject content. Both lessons, vocational skills for years 9 to 10 (standard IV) and science for years 7 to 8 (standard II) are taught by the teachers who usually taught those subjects. So they were quite knowledgeable and familiar with what they were teaching.

Lesson descriptions:

Lesson 1.

Subject: Vocational skills years 9 to 10 (standard IV) (Mwasu, F)

The lesson which I observed in vocational skills was on printing in standard four. It was a forty minute period. The pupils were learning how to print the

capital letters T, U, V, W, X, Y, Z. They had already learnt how to print the other letters of the alphabet.

The teacher started by demonstrating on the blackboard how to print the letters. Then she showed the pupils how to print whole words like PITA, VUA, WAZO, UA etc., (meaning PASS, FISH (Verb), IDEA, FLOWER). After the demonstration, the pupils individually practiced printing the letters and words in their exercise books.

Then the teacher linked what they had learnt with the learners' environment by giving them an assignment. She told the pupils that they had to make posters using the printing skills they had learnt to remind people that they have to keep the environment clean and stop trespassing and other activities which destroy our environment.

The teacher then assigned the learners the task of writing posters with environmental messages like "USITUPE TAKA HAPA", meaning do not put waste here and "USIPITE HAPA", meaning do not pass here. She reminded the pupils that these were just examples, so they could decide on the messages which they wanted to write.

She also told them that they could use pieces of boxes and banana leaves in making the posters, cautioning them not to destroy the banana plants when collecting the leaves for making the posters.

After completing the posters, the teacher told them that they would put them up in the appropriate places, depending on what the message is.

Reflection on the lesson

After the lesson, the researcher and the teacher reflected on the lesson. The interviewer asked the teacher whether she had been successful in integrating environmental education in her lesson. In response to this, the teacher said:

> "Yes, I think I managed, although in the syllabus it does not say what I should include as environmental education." (Mwasu, F)

Giving examples of environmental education content which she included, the teacher explained:

> "As you have seen, I included things like care for the environment, proper waste management, cautious harvesting of plant products, and different uses of resources and things in the environment. Also, in my subject, most of the materials I use for teaching are collected from the environment. For example, I use materials like palm leaves, banana leaves, sisal and wood from the environment to make things like mats, hats ropes and wooden spoons." (Mwasu, F)

When asked if she took the learners outdoors for learning, she said:

> "Sometimes I do and sometimes I do not. It depends on the topic that I am teaching. For example, I take them outdoors if I am teaching about gardening, physical education, music, theatre arts and handcraft." (Mwasu, F)

From what the teacher did in her lesson, it could be seen that she was very innovative in integrating environmental education into the content which she

taught in terms of content and resources, although the topic was not directly related to environmental education. The school had serious problems of trespassing and littering. The teacher in this subject tried to link the subject content being taught with the learners' environment by using the skills they learnt for the environment by making posters that would make help to stop trespassing and littering. Also by using materials (boxes and banana leaves) found in the environment as resources for learning, the teacher developed among the learners the concept of re-use and the importance of taking care of plants when collecting materials from them, which is a concept of sustainable use of resources.

Lesson 2.

Subject: Science for years 7 to 8 (standard II) (Klenga, F)

In the science lesson for standard two, the teacher was teaching the topic of "Cleanliness and Safety of Water and Water Sources".

By using questions and answers, the teacher started by asking the pupils to mention the different uses of water in their homes and school. They said that they used water for drinking, washing, cooking, for irrigation and for keeping fish (the school has a fish pond).

Then the teacher asked the pupils to name the different places where they can find water.

The pupils mentioned places like rivers, lakes, ponds, oceans, springs and rain.

This was followed by small group discussion on the different activities which can make water dirty. After five minutes of discussion, each group in turn mentioned one activity that makes water dirty. Some of the activities which they mentioned included washing clothes, bathing in the river, sending animals to drink in the river, lake or pond, and dumping waste in the river.

After the group work, the teacher gave the pupils the assignment of finding out the dangers of making water dirty, which they would discuss in the next lesson.

Reflection on the lesson

After the lesson, the observer and the teacher reflected on it. The observer started by asking the teacher if she was successful in integrating environmental education on the lesson. The teacher responded by saying that:

> "I think I was successful because the topic itself was related to environmental education. Although I was supposed to teach it as science knowledge, I related it to the learners environment and daily lives by asking them where they get the water they use at home, how they use the water and many other things, as you saw. And since the lesson was on cleanliness and safety of water, together with the learners we identified the things that we do that can make the water dirty." (Klenga, F)

The researcher then asked her if she could have taken the learners outdoors in teaching this topic because there is a river near the school. The teacher said:

> ”I usually do not take the learners outdoors because they are many and young, so it would be difficult for me to manage them all by myself. And also, although it would be good to take them to the river, I did not take them because it is dangerous. But there are some topics where I take them out.” (Klenga, F)

The researcher then asked for examples of when the teacher takes the learners out of the class to learn:

> “Yes, for example there are topics where I can take the learners out, like when I am teaching about living things in our environment, cleaning the school compound and many others.” (Klenga)

Although this topic is a science topic, it is related to environmental education. Instead of the teacher teaching about the scientific aspects of the topic only, she linked the subject content with the pupils’ life situations.

In all, six lessons were observed. These two descriptions presented are just examples of how teaching and learning take place in the primary classroom while integrating environmental education. Although what is to be integrated into the subject content as environmental education is not clearly stated in the syllabi for different subjects, teachers still try to link the subject content with the learners’ environment and their daily lives.

4.4.3 Teachers’ perceptions of the methods they use in teaching environmental education

Since the approach adopted in including environmental education into the curriculum is to integrate it into the existing subjects, it was difficult to talk with the teachers about what methods they use in teaching environmental education. Given this situation, environmental education is an integral part of their teaching. In order to understand the methods that they use in their teaching, the teachers were asked to describe the methods which they usually use.

From the teachers’ descriptions, two broad categories of teaching methods could be identified. The distinction between the categories lies in the extent to which the teachers make the pupils participate in the teaching and learning process. As a result, the methods were categorized either as *participatory* or *less participatory*. I have used the terms participatory and less participatory because currently in Tanzania teachers are being oriented to move from teacher-centered methods to learner-centered methods. Learner-centered methods as participatory methods, and teacher-centered methods are referred to as less participatory methods. In the context of this study, participatory methods are those methods where the learner is provided with the opportunity to participate in the learning process and constructs knowledge. In contrast, less participatory methods are those methods where the teacher is the main actor, authoritative, using a whole class approach where the teacher transmits knowledge and the learners are passive recipients of that knowledge.

In analyzing what the teachers said about using participatory or less participatory methods, five sub-categories could be identified within the two main categories. In the category of participatory methods, the three sub-categories were facilitation of learner participation, enhancing thinking and enhancing

cooperation. In the less participatory methods category, two sub-categories could be found, namely content coverage and suitability for large classes. The main categories and sub-categories are presented in Figure 15 below.

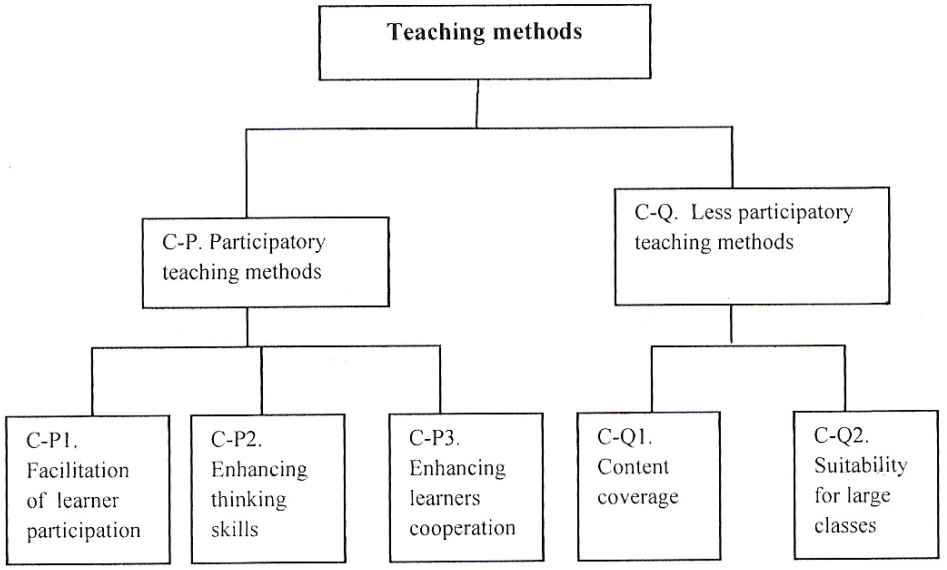

Figure 15. Teachers' perceptions of the teaching methods

C-P. Participatory teaching methods

Teachers in this category talked about teaching in terms of engaging the pupils in the teaching and learning process. The use of participatory methods, believed to be good teaching practice, is a new development in transforming teaching and learning in schools in Tanzania. Therefore, whenever one asks teachers what methods they use in teaching, they would tend to say that they use participatory methods. Even the syllabi suggest different types of participatory teaching methods which the teachers should use in teaching different topics. Teachers were then asked to give reasons why they use participatory methods. In the discussion with the teachers they focused on learner participation, enhancing thinking and learner cooperation, as will be discussed in the following sections.

C-P1. Facilitation of learner participation

Teachers believe that in environmental education, learners learn best when they actively participate in the learning process. Teachers argue that when learners participate in learning, they understand easily, and they get to know their environment well. In addition, they said that by participating in the learning process they would develop various skills which they can practice at home. Therefore, teachers are of the opinion that environmental education teaching methods should make the learners participate through learning by doing. This can be seen in the following statements:

"The methods which involve the pupils in actual doing are good. It is through practice that we get to know how to do things. For example, we do not learn how to make terraces by reading from a book only, but by actually making the terraces." (Hai, F)

"The methods which are appropriate in the teaching of environmental education are those which give the individual learner the opportunity to do things for himself or herself. It is by doing that the learner develops different skills. For example, we insist that they plant trees so that they can get fruit, firewood, and timber for building. If we just tell them without making them do it they will not be able to grow even a single tree when they go back to the community after finishing school." (Chaka, F)

"In participatory methods learners learn by doing. These methods are good because if you are teaching, for example, cleaning the environment, they should actually do it. If it is sweeping, slashing the grass or even draining ponds with stagnant water they should do it in practice. This will make them do the same at home." (Kaji, M)

Teachers in this sub-category seem to emphasize learner participation through learning by doing when teaching environmental education because they believe making pupils do what they learn will make them develop various skills which they can use in life. Linked closely to learner participation is the enhancement of thinking skills, as will be seen in the following sub-category.

C-P2. Enhancing thinking skills

The teachers in this sub-category see that participatory teaching methods enhance thinking among the learners. In this study enhancing thinking skills refers to the enhancement of the mental processes and skills that we use to shape our lives. Teachers claim that using methods that engage the learners in the learning process develop or improve learners' thinking. Such methods encourage questioning, sharing of ideas and points of view, discussion of different issues and problem-solving. These methods expose the learners to other people's thinking:

"Participatory teaching methods are good in teaching environmental education. This is because they make the pupils think. For example, when they see something in the environment they ask themselves questions. Like when they see the river where they get water for their use drying up, they will ask themselves why is the river drying up? They will come up with a lot of possible reasons and therefore they may go further to think how they can solve the problem." (Heri, M)

"Participatory methods are those methods that give the pupils the chance to participate in the lesson instead of just sitting and listening to the teacher. These methods are good because they make the pupils think, solve problems, share ideas and find learning interesting." (Tunu, F).

The respondents in this sub-category consider that participation in learning stimulates thinking among the learners. They suggest that as the pupils are encouraged to ask questions and share ideas, they develop thinking skills. The thinking skills which the learners are expected to develop include problem-solving skills, critical thinking skills, creative thinking skills and formulation of concepts (Fisher, 2001).

C-P3. Enhancing learner cooperation

Learner cooperation is emphasized in participatory teaching methods. It is believed that learners learn best not only when they are actively engaged in the learning process but also when they work collaboratively with their colleagues to accomplish a particular task. When learners cooperate they learn from each other because each of them has different experiences and they use these different experiences to strengthen their knowledge base. The teachers also pointed out that learner participation is important because it will help the learners develop social skills which they would need to interact and communicate with others on matters concerning the environment. Below are two examples from the teachers:

> "I feel that the participatory methods are good. Particularly the question and answer method and discussion can be good in the teaching of environmental education. The pupils work in small groups, on a given question and ask each other questions. This is because in teaching the teacher should give the pupils the opportunity to ask questions to make them think and reflect on what they think." (Furaha, F)

> "I use group-work because in the groups the pupils can share ideas and work together either to solve a problem or make decision on a certain issue. This helps them develop the skills of working together, which are necessary for real life situations." (Manka, F).

Here, the teachers' experiences in using participatory methods indicate that cooperation and interaction among the learners is important because knowledge is gained in a communicative context. They also suggest that through cooperation, pupils develop communication skills.

To sum up, the ideas of the teachers in this category have revealed the value of using participatory teaching methods in teaching. However, from the lesson observations it could be noted that participation was limited to the use of questions and answers and to an extent, group discussion. This could be due to the nature of the context within which learning was taking place. As a result, some of the teachers resort to the use of less participatory methods, as will be seen in the next sub-category.

C-Q. Less participatory methods

While most of the teachers claimed that they use participatory methods to engage learners in the teaching of environmental education, some of them admitted that they use less participatory methods which do not engage learners much in the teaching and learning process. The concept of less participatory methods in this study refers to the methods which allow minimal pupil participation. An example of such methods is the lecture method, where the teacher transmits knowledge to the pupils who try to receive and keep it. This implies a view of teaching as transfer of knowledge from one person to another. The use of less participatory methods in teaching has been the prevailing mode of teaching in Tanzania for a long time, so that some teachers are still caught in the trap of looking at teaching as the process of transmitting knowledge to the learners. But when discussing why they use such methods, the teachers talked about the aspects of content coverage and large classes.

C-Q1. Content coverage

Coverage of the subject content was one of the aspects discussed by the teachers. According to these teachers, it seems that coverage of the content is the determining factor on the kind of methodology they use in teaching. One of the teachers emphasized that the content has to be covered because it will be examined in the national examination. Through discussions it was revealed that they see participatory teaching methods as time-consuming, so if they use them then they will not cover the content specified in the syllabus:

> "There are many methods. In most cases I use methods which will enable me cover the content which is stated in the syllabus because the syllabus has to be covered if the children are to pass the examinations. Therefore, if I use participatory methods I will not be able to cover the syllabus. So, what methods do you use? I sometimes use lectures, reading from books and writing notes, which I later discuss with them as a whole class." (Wamo, F)

> "I know that we are supposed to use participatory methods. But most of the time I use the lecture method so that I can ensure that the pupils get the required content. If they do not get the right content they will fail the examinations." (Mangowi, F)

The quotes from the teachers point out that in a content-focused and examination driven curriculum, teachers use teaching methods which will ensure coverage of the content as specified in the syllabus. This will ensure that the pupils get the knowledge which will enable them pass the examinations.

C-Q2. Suitability for large classes

While teachers in the previous sub-category were concerned with coverage of the content, other teachers were concerned with the number of pupils in one class. They said that if the number of pupils is big, the teacher cannot use participatory methods. They argue that in real life situations it is difficult to organize many children into groups and also to get them do what you want them to do. This thinking is based on the teachers' belief that engagement of the pupils in learning is by making them work in groups. Thus it seems that teachers have reduced participatory teaching methods to group work and discussion. For example, some of the teachers said:

> "I think because of the large number of students in the class the lecture method, where the teacher gives the pupils the required knowledge, is the best one. For example, I have 70 pupils, how many groups will I be able to organize in the class and ensure that everybody learns effectively? They might end up doing other things. So I think I can lecture to them, then ask them questions to find out if they have understood." (Tunu, F)

> "Another issue is the class size. In my class there are 199 pupils. How can I teach them if not making them sit and listen to me? With this large number I cannot even attempt to organize field observations because managing them would be very difficult." (Muso, M)

> "The methods which are good in the teaching of environmental education and teaching in general are participatory methods. But in real situations I cannot use them because the number of pupils in the classroom is very big. I cannot engage them all in meaningful activities. So the methods which I think are suitable for such classes

are ones which are less participatory like the lecture method and doing individual work." (Kasi, F)

From what the teachers have said it can be seen that they feel compelled to use less participatory methods because factors such as large classes and ensuring that the content of the syllabus is covered are not in their capacity to handle. For example, in the case of content coverage they cannot do anything about it because teaching and learning in the schools is examination driven. Also as individual teachers they have no means of reducing the number of pupils in the classroom. So they say that the only solution is to resort to less participatory methods like lectures.

In describing the teachers' teaching experiences, it could be seen that they used different ways to include environmental education into the subjects they teach. Their experiences were grouped into two categories.

The first category included teachers who said that they taught environmental education in their subjects as subject content. This is the traditional way of organizing learning content. Therefore, teachers in this category admitted that they did not find it difficult to integrate environmental education into their teaching because it is specified in the syllabus just as other subject content.

The second category was formed by teachers who said that they integrated environmental education into their teaching through the use of the environment as a teaching resource. These teachers seem to be innovative and skilful because it requires a lot of skills on the part of the teacher to link the subject content, environmental education content and the teaching and learning resources. This could be seen from the example cited on lesson observation for vocational skills on the topic of printing.

The analysis of the teachers' teaching experiences also included the methods they used in teaching. The methods used were described in terms of participatory and less participatory methods. The teachers' description of the methods which they use showed that they were concerned with pupils' participation in learning.

In the first category, where teachers said that they used participatory methods, they pointed out that they focused on the learners' ability to construct knowledge, develop thinking skills and also social skills.

The second category, which included teachers using less participatory methods, focused on coverage of the syllabus and class management. From the teachers' statements they claim that they are compelled to adopt less participatory methods because they are constrained by class size and curriculum pressures. Therefore, it is through the use of less participatory methods that they can reach all the children and cover the specified content

However, a careful examination of the teaching and learning methods reveals that the teachers in both categories are all concerned with the learner, but in different ways. The teachers who use participatory methods are concerned with the pupils' learning, while those who use less participatory methods are concerned with the pupils' coverage of the syllabus content and their performance in examinations.

4.5. Barriers facing teachers in teaching environmental education

Although the teachers admitted that they teach environmental education in their various subjects, they feel that they do not teach it well because they are constrained by a number of factors. The factors which they mentioned can be grouped into four categories, namely *curriculum related factors*, *teaching and learning factors* and *teacher related factors*. All these factors were discussed with reference to the different aspects indicated in Figure 16.

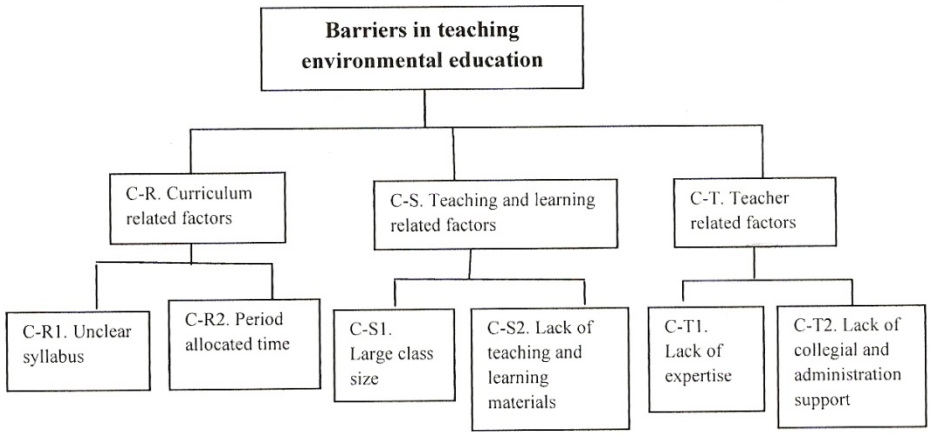

Figure 16. Barriers facing teachers in teaching environmental education

C-R. Curriculum related factors

In this category, teachers talked about the curriculum as a constraining factor in the implementation of environmental education. Their discussions were based on the aspects of unclear syllabus, and the time allocated for one period.

C-R1. Unclear syllabus

Most of the teachers see unclear syllabi as the one of the critical challenges which inhibits them from effective teaching of environmental education in primary schools. I have used the term unclear syllabus here to mean a syllabus where the environmental content to be integrated into the subject content is not described in detail. The approach which has been used to include environmental education into the curriculum is the integration approach where the content of environmental education is woven into the subject content.

Normally, the content to be taught in every subject is specified clearly in the subject syllabus. Therefore, teachers are guided by the syllabus and the teachers' guides on what to teach. Teachers in primary schools are used to prescribed and specified syllabuses, which are subject-based. But in practice, environmental education curriculum is emergent, in that the content arises as the teacher teaches. Discussion with the teachers revealed that in some subjects like mathematics and languages the content to be integrated is not specified, so teachers of these subjects claim that they do not know what environmental

content they should include. The prevailing situation can be seen from the excerpts below:

> "I am challenged by not knowing what environmental education content to integrate in the different topics. There is nowhere where environmental content is stated in mathematics." (Sina, M)

> "In Kiswahili for example, there are environmental passages which I use to teach comprehension. In the syllabus it is not stated clearly what I should emphasize when teaching. Therefore, I do not understand if I should emphasize environmental content or comprehension skills." (Bite, F)

Although in social studies environmental education is included as topics and subtopics, the teacher claims that some of the questions included in the text books confuse the pupils. This can be exemplified by one teacher's utterance:

> "The questions in the pupils' book make children mix up things. For example, they are asked to mention four things which cause environmental destruction. Some say improper waste disposal, others say indiscriminate clearing of forests and agriculture. This is because in the syllabus it does not specify the kind of environment which is being referred to. So it is left very open." (Kasi, F)

As can be seen from the teachers' statements, they feel that the syllabi of subjects like mathematics and languages, and to some extent social studies are not clear on what environmental content is to be taught. Such feelings are expected from teachers who are used to follow detailed syllabi. This situation has implications for the teaching of environmental education, because if teachers are not told what to teach and they have not been trained how to integrate environmental education into what they teach, they will not teach it.

C-R2. Period allocated time

The teachers believed that the time allocated for a period is not enough. Each period in the primary school is allocated 40 minutes, but in the lower classes, standards one and two, the duration of one period is thirty minutes. Also the syllabus specifies the number of periods for each topic. As most teachers suggested, in environmental education the learners should be engaged in active learning, where they learn by doing. But they wondered if 40 minutes are enough to organize the pupils into doing different activities, then link what they have done with the subject content. Examples of the teachers' concern with time can be seen in the following statements:

> "The challenges I get include [...] short periods – the duration of one period is 40 minutes, so it is very short for me to involve pupils in doing things outside [.....]." (Pai, M)

> "Another challenge is that the time allocated for a period is not enough. Before you start, the period it is over! For example, how can you teach practically how to prepare a garden in vocational skills in 40 minutes? I say forty minutes because sometimes we borrow periods from other subjects to make double periods, because at least with 80 minutes you can try to do something." (Shani, M)

> "The challenges which I have in teaching environmental education are that the period time is too short. Forty minutes are not enough to do anything. Before you organize them and assign them with tasks, the time is over and another teacher comes to teach

another subject. I would plan to take the pupils out to see the things we learn from the real environment, but the time is too short." (Muso, M)

The complaints of teachers on the time allocated for one period as seen from some of their statements is a constraint to the teaching of environmental education. As they say, the time allocated for one period is 40 minutes. If environmental education is to be taught effectively, the time allocated for one period is not enough. The teachers' concerns make sense because the learning of environmental education involves learning by doing.

C-S. Teaching and learning related factors

While the teachers in the first category were concerned with curriculum factors, the teachers in this category were concerned with constraints related to teaching and learning. The most common constraints which the teachers were concerned with were the large number of pupils in the classrooms and lack of teaching and learning resources. The teachers admitted that these factors contribute to ineffective teaching of environmental education in primary schools. Referring back to what was said before, effective teaching and learning takes place when a variety of teaching strategies and resources are provided in the classroom and when the emphasis is on understanding rather than receiving knowledge from the teacher.

C-S1. Large class size

Most of the teachers mentioned large class size as one of the constraining factors in the teaching of environmental education. Large class size refers to classes with many students. Discussing large classes, the teachers in this sub-category talked about classes having too many children, hence being a challenge to teaching and learning. The teachers said the classes are so big that they have up to 199 pupils. Some of them sit on the floor, making the teacher unable to move round the class to support the children in learning. As a result, most of the teachers who have big classes cannot use participatory methods and methods that involve taking the pupils out of the classroom. Below are examples of the teachers' opinions on class size as an obstacle to teaching and learning:

> "Another challenge is too many pupils in one classroom. First of all they are very noisy. Secondly, I cannot even plan to take them out for field observation because with 199 pupils in the class it is difficult to control them when they go out. Some of them may go to other places instead of what you want them to do. This is a big challenge because we teachers cannot teach in the way we think is good." (Muso, M)

> "Too many pupils in one classroom (Large classes) – Sometimes a class may have 70 to 80 pupils, so it is difficult for one teacher to organize and manage activities for all the pupils especially outside the classroom." (Sina, M)

From the teachers' comments, large classes are more challenging in the upper classes, standards five to seven (aged 10 – 13 years), than in the lower classes, standards one and two (aged 6 – 8). One of the teachers teaching in the lower classes had a class of 105 pupils in standard two. She said that although the number is big she managed them because the small children have high respect for their teachers. For example, in keeping order in the class she just calls,

"Watoto!" meaning, "Children" and they reply, "Mwalimu" which means, "teacher". Then they would keep quiet and listen. This can be exemplified by statements of two of the teachers who said:

> "With the small children, I do not face any challenges, although the number is big. But I manage to teach them well. For example, if they are making noise in the class I call them "Watoto!" and they reply, "Mwalimu" Then they keep quiet and listen to me or do what I have instructed them to do." (Sinta, F)

> "There are no problems because the small children mostly need to be guided. If the teacher tells them to do something they will make sure that they do it as the teacher has directed or has asked them to do so." (Kyeku, F)

C-S2. Lack of teaching and learning materials

With overcrowded classes, the issue of lack of teaching materials is expected. Therefore, most of the teachers who were interviewed said that in teaching and learning, one of the critical challenges they face is lack of teaching and learning materials. Examples of the teaching materials which they mentioned were books, and gardening/farming tools. The teachers accounted for this situation as a result of lack of funds in the schools. Registering their concern for lack of teaching and learning materials, some of the teachers said:

> "Lack of teaching materials and funds to buy them is another challenge. For example, in agriculture you have to have seeds, hoes, and many other things to teach the pupils about good agricultural practices. Lack of these things means that I will not be able to teach them practically." (Klenga, F).

> "[...] Also when it comes to teaching, there are no teaching and learning resources, even books. One book is shared among more than five to eight pupils. So my class of 45 pupils has got eight books only. Therefore the teacher has to write everything on the blackboard." (Heri, M)

> "The problem is lack of funds – schools do not have funds to carry out different environmental education activities like buying tree seedlings and even books. All these things are necessary for the learning of environmental education." (Sina, M)

Apart from lack of funds to buy teaching and learning materials, the teachers also said poor funding also makes them unable to plan and go on field trips, which they feel that is a very effective method of teaching environmental education. This concern can be illustrated by the following statement from one of the teachers:

> "Another problem is lack of funds. When we teach environmental education we sometimes plan to take the pupils to places where they can see real life situations. In some cases the places we want to see are far from the school, so we need transport. The issue of transport has been one of the burning problems because our schools do not have transport and also no funds to hire transport when teachers want to go on field trips with the pupils. This prevents the teachers from going to visit places where they can learn from actual situations like visiting a farm to learn good agricultural practices or see some initiatives of good environmental practices." (Muso, M)

While some teachers considered the issue of lack of teaching materials as an obstacle, they also tried to think of ways to solve the problem. One of the strategies used was asking the pupils to bring some tools and materials from

home. However, this strategy has not been very successful. This can be seen from the following extracts from the interviews:

> "The challenge that I have in implementing environmental education is lack of equipment for environmental management in the school like hoes, watering cans and hose pipes. Sometimes, we ask the pupils to bring them from home, but they do not because the parents do not allow it for fear that they may get lost or other parents might be using them. If the school had money we would buy these tools, but the school does not have money." (Sina, M)

> "Yes, there are problems because first of all there are no teaching materials. For example, in vocational skills, you might plan to make a certain picture with the pupils, but you will not be able to because of lack of materials. Sometimes we used to solve this problem by asking the pupils to bring the materials from home, but nowadays they do not bring them. They just say they have forgotten. As a result, we most of the time teach in theory and no practice. It is good if the materials are available in the school so that when the pupils come to class they find them ready and make the things as stated in the syllabus." (Tunu, F).

Many teachers emphasized that lack of teaching and learning materials was one of the constraints facing them in the teaching of environmental education. The materials which were mostly referred to were text books and teaching guides. This suggests that teachers are dependent on text books as a source of knowledge. However, environmental education knowledge can be obtained from different sources like newspapers, radio, and the environment itself. It all depends on the teachers' awareness and initiative. The aspect of lack of teaching materials was also linked to lack of funds. Teachers pointed out that schools did not have funds for buying teaching and learning materials and also for conducting field trips.

C-T. Teacher related factors

Among the constraints which the teachers face in teaching environmental education are factors which contribute to the teachers' ability to teach environmental education effectively. The issues which the teachers were concerned with are related to teacher competence in environmental education. Competence here refers to the teachers' ability to teach environmental education in terms of content and methodology to make the pupils understand it well. Another issue was support from colleagues and the school administration. In analyzing the responses of the teachers it was noted that the critical aspects in this category are lack of expertise and lack of collegial and administrative support.

C-T1. Lack of expertise

The teachers talked about the notion of expertise in terms of having mastery over environmental education knowledge. They argued that in order for teachers to be able to teach environmental education they have to know the content and also be confident that they can teach it. As stated earlier, most of the teachers claimed that they have not been trained to teach environmental education while training as teachers in teacher training college nor have they received any in-service training in environmental education. As a result of this they feel that it is a

challenge to teach environmental education. Examples of these feelings are shown below:

> "The challenge which I face in the teaching of environmental education is that I do not have the expertise to teach it. I lack environmental knowledge and skills [...]." (Fremo, F)

> "Inadequate environmental education knowledge and skills on the part of teachers is a big challenge to the teaching of environmental education. It is true that not all the teachers who are now teaching in the schools have been trained in environmental education when training as teachers in teacher training college. So there are teachers who are in schools who have no idea of environmental education. As a result, we feel challenged when we are told that we should teach environmental education in our subjects." (Muso, M).

> "[....] another challenge is lack of adequate knowledge and skills to teach environmental education. To teach any subject you need to have knowledge about that subject. So in order for me to be able to teach environmental education, I need to have the knowledge. Since I did not study that subject in school or in teacher training college, I find it very difficult to include it in my subjects." (Mark, M)

According to what the teachers said, they face constraints in the teaching of environmental education because they claim that they did not get enough training on how to teach it while they were being trained as teachers. So there are teachers in schools who have no idea of how to teach environmental education. The situation could have been improved through collegial support, as discussed in the next sub-category.

C-T2. Lack of collegial and administration support

Some teachers pointed out that one of the challenges of teaching environmental education is lack of support from their fellow teachers and sometimes from the school administration. This lack of support prevents them teaching environmental education effectively and even carrying out environmental management activities in the school with the pupils:

> "As teachers we need to support each other. One of the challenges I have in teaching environmental education is lack of support from other teachers. For example, if I want to teach something that I do not have enough knowledge about, and I go to ask other teachers for help, sometimes they say they do not have time or they tell me that they also do not know."(Mangowi, F)

> "[....] In addition to lack of collegial support, another challenge is lack of support from the school administration. Sometimes as a teacher I may plan to do something like starting a tree nursery in the school so that we can get seedlings to plant in our school ground. When I go to ask support from the head teacher, instead of the head teacher supporting me he/she discourages me by telling me that you cannot have a tree nursery in the town or there are no funds for the activity." (Muso, M)

Teachers expect to learn from each other and also they expect the school administration to support them in what they plan to do and teach. But from the teachers' utterances, there is lack of collegial and administration support among the teachers in the primary schools as far as the teaching of environmental education is concerned.

The constraints perceived by the teachers above reveal that the implementation of environmental education in the primary schools is not done effectively. The fact that teachers realize the presence of these constraints indicates that they are concerned with finding ways in which to overcome them so that they can teach environmental education effectively.

4.6 Teachers' suggestions for improving environmental education in primary schools

In the teachers' suggestions on how the teaching of environmental education can be improved in primary schools, I could identify two categories, namely *training needs* and *teaching and learning materials needs*. In the first category the focus is developing the teachers' environmental education knowledge base through training. The teachers' suggestions could be grouped into two sub-categories, which were pre-service training and further training. The availability of teaching and learning materials was expressed in the second category. In this category the teachers' suggestions were grouped into two sub-categories, namely the availability of teaching guidelines and availability of textbooks. An overview of the categories and their sub-categories is shown in Figure 17.

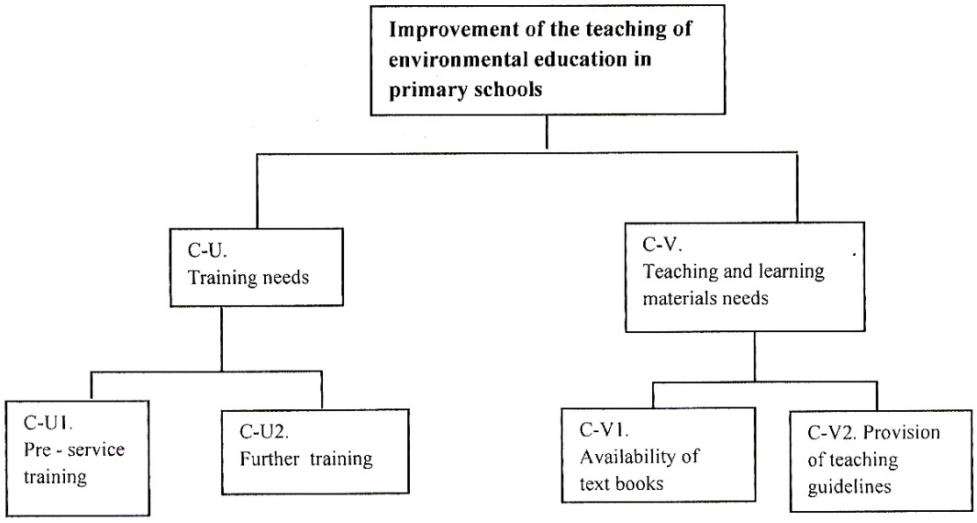

Figure 17. An overview of teachers' suggestions for improving the teaching of environmental

C-U. Training needs

The teachers thinking in this category focused on the need for training. The teachers expressed the need for both pre-service and in-service training. They argued that since they are required to teach environmental education, they need to be trained just as for other subjects. Also, they suggested that there should be in-service training programs for teachers.

C-U1. Pre-service training

The perceptions of the teachers with regard to improving the teaching of environmental education in primary schools emphasized the need for pre-service training. The teachers thought that since in pre-service training teachers are prepared to teach different subjects taught in the primary school, they also should be taught how to teach environmental education if it is to be included in the curriculum. This can be seen from the following excerpts:

> "I think the teacher is at the centre of the learning of environmental education. So, teachers have to be prepared well to teach the subject while training as teachers. In this way they will teach environmental education in the schools effectively." (Mapia, F)

> "To improve the teaching of environmental education I would suggest that teachers should be given training on how to include environmental education in the subjects they teach while at college." (Chaka, M)

> "I am of the opinion that it is important that when student teachers are training as teachers in the teacher training college they should be taught all the things which they will be required to teach and do in schools. As for the other subjects, it is done. Why not environmental education?" (Mwasu, F)

The researcher further asked the teachers to suggest what they think the student teachers should be taught in environmental education as one of the dialogue with one of the teachers illustrate:

> "You previously said that student teachers should be taught environmental education in college, can you say what they should be taught?" (Researcher)

> "Yes. We should be taught the content and methodology of environmental education like the other subjects so that we know what to teach and how to teach it. The things that they need to be taught are the subject content for environmental education. Just like one has to know mathematics to be able to teach it, one has to have knowledge of the environment to be able to teach it." (Tunu, F)

> **"**Can you please give me examples?" (Researcher)

> "Yes for example we need to be taught about environmental problems, their effects and how to solve them. And concerning methods, we should be taught different methods to teach environmental education and put them into practice to see how they work." (Tunu, F)

The quotes suggest that the teacher thinks that teachers should get some training on how to teach environmental education when they are being trained to become teachers. They therefore suggest that teacher education programs should include environmental education in terms of content and teaching methods.

C-U2. Further Training

The vast majority of the teachers suggested that they would be happy if they could get further training in the field of environmental education to improve their teaching. The teachers argued that it is important for teachers to get frequent training in environmental education because if they have to keep up with the changing world, they need constant training to improve and update their

environmental and pedagogical knowledge. This can be seen from the statements made by the teachers during the interview:

> "Teachers should be given seminars frequently so that they can know what things they are required to teach and what things they are expected to do." (Bite, F).

> "The teaching of environmental education can be improved in our schools by making sure that all the teachers are trained so that they all have the knowledge and skills to teach it." (Mangowi, F)

One of the teachers even suggested that there should be a college where teachers can go to be trained as environmental education teachers:

> "I think there is need to organize both short and long term seminars for teachers. Also, there should be a college where teachers can go to get training on the teaching of environmental education so that every school can get at least three teachers to this college for training and when they come back they can train the other teachers in the school." (Meya, M)

The quotes above the teachers expressed the need for developing teachers' knowledge through seminars and workshops and even courses. This can be considered as a means of empowering teachers, hence making them more competent in their teaching. Also the notion frequent there implies that the workshops and seminars should be ongoing. In other words, the teachers meant that there should be ongoing training of teachers to help the teachers develop their knowledge and improve their professional skills in environmental education.

C-V. Teaching and learning materials needs

Within this category teachers see that the way to improve the teaching of environmental education in the primary schools is ensuring that teaching and learning materials are available. For example, one of the teachers emphasized that the ministry also should provide teachers with teaching and learning resources. Because of a lack of teaching and learning materials most teachers just lecture and make the pupils write notes. They do not practice what they learn. With reference to teaching and learning materials, some of the teachers talked about the availability of teaching and learning materials in terms of textbooks while others talked about receiving guidelines for teaching environmental education.

C-V1. Availability of textbooks

The availability of textbooks was another suggestion put forward by the teachers. The teachers claimed that the unavailability of textbooks on environmental education, as stated in the earlier section on the constraints facing teachers, poses a big challenge in the teaching of environmental education. In schools where they had environmental education books, the teachers admitted that these were very useful to them and it made teaching easier. Regarding the issue of textbooks, some of the teachers suggested that instead of waiting for the government to produce books the teacher together with the pupils can develop their own books for the class to read. They gave two examples of small books which they wrote to teach the children about the environment:

> "Teaching and learning resources particularly books have to be available. For example, although we are expected to teach environmental education, there are no books which we can refer to. Text books are very important because they are the teachers' source of knowledge." (Pesa, F).
>
> "I also suggest that just like in the other subjects, we need a pupil's book and teacher's guide in environmental education. These will help us know what to teach and what methods we should use." (Chaka, M)
>
> "Lack of books both for the teachers and the pupils is a big problem in the teaching of environmental education. The ministry should ensure that books on environmental education are available in schools. But the teachers can start solving this problem by writing small pamphlets or booklets on environmental aspects in the school which the pupils can read. For example, in our school I with a colleague have written two booklets on environment on "Our environment" and "Our Trees."(Sina, M)

C-V2. Provision of teaching guidelines

Several teachers suggested that if environmental education is to be effectively taught, then it would be a good idea if guidelines can be issued for the teacher to use. They argue that guidelines help the teacher to know what to teach and how to teach it. Also they suggested that guidelines would be very useful because they have not been trained to teach environmental education when preparing to be teachers. The following excerpts may serve as illustrations:

> "The first thing to develop would be guidelines for the teaching of environmental education in the schools for all the subjects. To have specific topics for every subject and every class from the primary school level to the college level. This will help the pupils get education that will help them in their lives in the community when they finish schooling." (Kaji, M)
>
> "Since environmental education needs to be integrated into the subjects that we teach, there is need for the ministry to develop guidelines to help the teacher in understanding how to implement it in his/her subject. The guideline should show the teacher what to integrate in each topic and what methods to use just as in the other subject teacher's guides." (Tunu, F)

From what the teachers said, it can be observed that the availability of teaching and learning materials particularly textual materials is essential. These concerns expressed by the teachers show that they heavily rely on textbooks and guidelines in teaching as the source of knowledge. This can be attributed to the way they have been trained and also the scarcity of other sources of knowledge in the schools.

However, it is encouraging to see some teachers have taken the initiative themselves and have written small booklets for their pupils to read. This can be seen as an indication that there are innovative and motivated teachers, a quality that needs to be developed.

4.7 Summary of results

The results have been presented according to the research questions. In the first research question where the teachers' perceptions of environmental education and education for sustainable development were investigated, most teachers

focused on the development of knowledge about the environment and sustainable development, respectively. The teachers' perceptions reflect the way they perceive the environment and sustainable development. From the results of the study it could be identified that teachers perceived environment as a physical entity, while sustainable development was perceived as development that is continuous and focused on the future. Concerning teachers' perceptions of environmental education most teachers perceived it as education that helps individuals develop knowledge about and how to take care of the environment. However some teachers perceived it as education that helps individuals develop various skills which included problem solving skills, skills for adapting to the environment and resource use skills. The teachers' perceptions of education for sustainable development focused on knowledge about sustainable development which aimed at meeting people's needs and empowerment of the people.

In general, most of the teachers' perceptions of environmental education and education for sustainable development mainly focused on knowledge *about* the environment and sustainable development, and to a less extent on the aspect of skills. The assumption is that knowledge is the basis for other levels of thinking and taking action: first you get knowledge, and then you make decisions to take action *for* the environment on the basis of that knowledge. On the basis of these results it can be concluded that teachers perceive environmental education and education for sustainable development differently. This is because teachers have different experiences and exposures to these concepts which may have influenced their perceptions.

The results for research question two focused on the teachers' perceptions of the integration of environmental education into primary education. The results are presented in three main themes. Theme one focused on the teachers' perception of the importance of teaching environmental education in the primary schools, theme two on teachers' awareness of environmental education being integrated into the subjects they teach, and in theme three the focus was on the teachers' suggestions on how environmental education can be integrated into the school curriculum.

In theme one, all the teachers admitted that it was important to teach environmental education in primary schools. However they had different reasons why they think environmental education should be taught in primary schools. Their reasons they gave could be divided into two categories: development of knowledge, skills and attitudes among learners, and developing role models. In category two on the expectations placed on the learners after learning environmental education – that of being role models both at home and in the community.

Theme two focused on the teachers' awareness of environmental education being integrated into the subjects they teach. The results showed that there are teachers who are aware that environmental education is integrated into the subjects that they teach and described how the integration is done. These teachers included those who teach science, social studies, vocational skills and to some extent languages (Kiswahili and English). In these subjects environmental education is either integrated as subject content and/or teaching and learning resource. However, there are teachers who claimed that they were not aware of

environmental education being integrated into the subjects that they teach. The subjects included mathematics, and languages in some of the classes. However, concerning the way environmental education has been integrated into the various subjects, most teachers said that it is not clear. The results indicate that, teachers were not pleased with the way it was integrated into the subjects of the primary school curriculum because it difficult to know what is to be taught.

Theme three focused on teachers' suggestions on approaches of integrating environmental education into the curriculum. While most teachers suggested that it could be included in the curriculum as a separate subject some suggested that it could be integrated into all the subjects as topics, and others suggested that it could be integrated into a few subjects whose content matches with the environmental education content. The teachers' suggestions mirror the way the curriculum is organized in Tanzania. However some of the teachers recognize the interdisciplinary nature of environmental education. In general, the results indicate that there is need to reflect on how environmental education has been integrated into the school curriculum, so that teachers can implement it easily.

The third research question which was on teachers' teaching practices presented the teachers' competencies in the teaching of environmental education, teachers' experiences in teaching environmental education in different subjects, teaching methods, barriers facing teachers and suggestions on how the teaching of environmental education in the primary schools.

The teachers' feelings about their competence varied as some said they were competent and others said they were less so. The teachers who said they feel competent attributed this to the training that they received both in pre-service and in-service training and also self-initiated. The teachers who claimed to be competent show the importance of training for teachers and also self-initiated learning to make teachers feel competent in teaching environmental education.

The teachers' experiences of teaching environmental education in different subjects differed from one subject to another. Some teachers said that they taught environmental education as subject content in the form of topics, or by integrating it into subject content or using it as content for skills developing. The teachers in this category included teachers who taught science, social studies, geography and languages. These teachers referred to environmental education being integrated into their subjects as factual knowledge. Other teachers said that they integrated environmental education into their subjects through the use of teaching and learning materials and also through the use of the environment as a learning context. This category included teachers who taught mathematics, vocational skills and languages. This group of teachers saw that even when they use teaching materials from the environment and as a learning context is environmental education.

On the teaching methods which the teachers used in teaching environmental education, the results revealed two categories namely participatory and less participatory methods. The teachers who used participatory teaching methods focused on enabling learners to participate in the teaching process, develop thinking skills and social skills. However, from the lesson observations it was noted that although teachers said that they used participatory teaching methods,

were limited to questions and answers, and to a lesser extent, group discussion. The teachers who said that they used less participatory teaching methods were concerned with content coverage and the management of large classes.

Focusing on the barriers facing teachers in teaching environmental education, the findings of the study revealed that there were barriers resulting from curriculum related factors, teaching and learning factors, and teacher related factors. On curriculum related factors the teachers said that the syllabi were not clear on what to teach with regard to environmental education and also the time allocated for one period was too short. Concerning teaching and learning related factors, the teachers were concerned with class size and lack of teaching and learning materials. They argued that the class size was too large to conduct practical or outdoor activities. This shows that there is a clear need for reducing class size and increasing the time allocated to a single period or to make the timetable flexible. Regarding teaching and learning materials, particularly text books, the teachers said that they were very few and in some cases not available. This barrier reflects the teachers' perception of books as main sources of knowledge and skills which the learner needs to acquire.

The teachers who talked about teacher related barriers referred to the issues of teachers' lack of expertise and lack of collegial support. The results suggest that teachers need to be provided with opportunities for professional development focused on environmental education so that they can develop a strong environmental education knowledge base which will also enhance collegial support among the teachers.

Finally, on the teachers' suggestions as to how the teaching of environmental education could be improved, the results revealed two main categories of suggestions. While the first category emphasized the need for training, the second focused on teaching and learning materials. Regarding need for training, the teachers suggested that they should get both pre-service and in-service training in the teaching of environmental education so that they can teach it effectively. On the issue of teaching and learning materials, they suggested that books, teachers' guides and other teaching materials for teaching environmental education should be available.

While in this chapter the findings of the study were described, discussion of the results will form the basis of the following chapter, and will be guided by the three research questions.

5 Discussion of results

The aim of the study was to investigate primary school teachers' perceptions of the integration of environmental education into the primary school education and their teaching practices in Tanzania. In this chapter I present the discussion of the main findings of the study. The discussion will be done in the light of the three research questions which this study sought to answer, and will be linked to the literature review. The discussion starts with the teachers' perceptions of environmental education, and education for sustainable development. These will be followed by a discussion of the teachers' perceptions on the integration of environmental education into the primary school curriculum and teachers' teaching practices in the teaching of environmental education. Discussion of the methodological issues will be done after the discussion of the findings from the research questions. Finally, implications of the study for curriculum development and teacher education will be discussed, together with suggestions for further research.

The study was qualitative in nature and it adopted phenomenography and phenomenology approaches because it sought both teachers' perceptions and experiences. The data was collected through interviews, which were analyzed according to the phenomenograhic approach (Marton, 1988) in order to identify teachers' perceptions on environmental education and education for sustainable development. Then the phenomenological approach was used to identify the teachers' experiences of teaching environmental education. By making a comparison of the teachers' utterances and lesson observations, variations in perceptions, experiences and teaching practices could be identified.

5.1 Perceptions of environmental education, and education for sustainable development among primary school teachers

The results for the first research question focus on the teachers' perceptions of environmental education, and education for sustainable development. Although the study is on environmental education, education for sustainable development was also reflected upon, as the two concepts are sometimes taken to be the same. The concepts of environmental education and education for sustainable development are complementary to each other as both are concerned with the environment and a sustainable future (Nordström, 2008; Wals & Jickling, 2000). Also the scope of environmental education has widened to include the social, economic and political aspects of the environment because the environment cannot be considered in isolation of these aspects.

In this study, environmental education is considered as education about, in, and for the environment (Palmer, 1998). Also education for sustainable development is defined as education that would enable people to develop knowledge, values and skills which would help them participate in making decisions on how to act responsibly towards the environment to improve their lives without compromising future generations. (CEE, 1998).

The results of the study show that there are similarities and variations in the way teachers perceive environmental education and education for sustainable

development. Some of the teachers perceive environmental education and education for sustainable development in terms of knowledge acquisition and skills development. While some teachers were concerned with obtaining knowledge in order to understand the environment and sustainable development, others were concerned with getting knowledge on how to achieve sustainable development. In the first aspect the teachers are concerned with the "what" aspect, while in the second aspect they are concerned with the "why" and "how" aspects, respectively. However, education about the environment was the most prevailing perception.

On the category of environmental education as *knowledge focused education*, the teachers were concerned with getting knowledge about the environment and knowledge of how to take care of the environment. These results support those found in an earlier study on teachers in England. For example, many English school teachers' perceived environmental education as education *about* the environment. This could possibly be due to the fact that any education is expected to provide knowledge (Chatzifotiou, 2006). As a result, environmental education and education for sustainable development are considered to give knowledge about the environment and sustainable development.

In the skills oriented education category the teachers seem to be practically oriented when they describe environmental education in terms of skills development. The aspects which characterized this category are problem-solving skills, adaptation skills and resource utilization skills. The teachers in this category anticipate that as one lives in the environment one will encounter various problems. In order to overcome the problems one encountered, one needs to have skills to solve them. In order for people to be able to live in the environment they have to adapt to different conditions. Therefore, the teachers who focused on adaptation skills saw it necessary that in order for people to live comfortably and survive in the environment they have to develop skills to adapt to it. People utilize the resources in their environment for survival. Therefore, to sustain the resource base they have to develop skills in using the resources in a sustainable manner.

The results of this study are similar to those found in studies carried out earlier in Tanzania, by researchers like Mtaita (2007) and Lindhe (1999), who produced similar findings on how environmental education is perceived by teachers in Tanzania. Lindhe (1999) suggested that such findings are expected in a society where people's survival is dependent on the environment. However, the results differ from results on teachers' perceptions on environmental education and education for sustainable development from other countries. In Finland, for example, a study on teachers in North Carelia revealed that although the dissemination of knowledge about the environment is important, teachers perceive environmental education as a means of helping learners develop responsible behaviour on how to use natural resources, understand what a sustainable way of life is, and what it means to take care of the environment (Pulkkinen, 2006). This indicates that teachers in Finland have a wider scope of environmental education compared to primary school teachers in Tanzania because they consider both the natural and built environment, and the issue of sustainability.

Alternatively, the teachers' lack of emphasis on education in the environment is possibly due to the assumption that once individuals develop knowledge, then they will automatically develop the necessary skills and attitudes, as stated in the traditional model developed by Hungerford and Volk (1990). In teaching environmental education, all the three dimensions of environmental education are important and they build on each other. One has to learn about the environment, then develop ways of acting towards the environment and finally develop positive attitudes towards it. Therefore, it would be difficult to teach the second and third levels before teaching the first level, which is education about the environment.

While in the first category the teachers were concerned with knowledge and skills, in the second category they were concerned with the role of education for sustainable development. In this aspect, although not directly mentioned, the teachers were referring to the environment. Meeting people's needs means use of resources. These teachers talked about resource use because they assumed that education for sustainable development is just another way of talking about environmental education. In actual fact, this way of looking at education for sustainable development is expected, because as Chatzfotiou (2006) suggests, there are no clear indications as to where these two concepts differ or are similar.

The study findings partly reflect the definition which was adopted in this study which is education *about*, *in* and *for* the environment (Palmer, 1998). I think it is partly because most teachers' perceptions of environmental education were limited to education about the environment, which is mainly concerned with getting factual knowledge about the environment. Very little emphasis was given to education for the environment which is concerned with the development of skills and attitudes towards the environment. None of the teachers described environmental education as education in the environment, which refers to the environment as a learning platform where learners can engage in observations and investigative activities. This could be because most of the teaching is conducted in the classroom through the dissemination of knowledge.

One can conclude that this study reveals that teachers consider environmental education as education which is focused on helping learners develop knowledge about the environment, and in most cases they referred to the biophysical component of the environment only. This way of perceiving environmental education reflects the way teachers perceive the environment. The teachers in this study perceive environment as the physical objects which surround human beings. This suggests that man sees the environment as a separate entity (Tani, 2006). However, very few teachers considered man as part of the environment, but rather with the role of a user of the environment. That is why some teachers involved in the study described the environment as a socially constructed entity. The perception that it is an object is not dismissed, but they go further to qualify it as influenced by people's social conditions such as culture and politics. But in Zimbabwe, teachers considered the biophysical, social and political aspects of environmental education (Van Petegem et al., 2007). Studies have revealed that individuals' understanding of the environment can be limiting or expansive. Studies on meanings assigned to the environment show that most individuals have limited meanings of the concept (Ballantyne & Packer, 1996; Loughland,

Reid & Petocz, 2002; Stanistreet & Boyes, 1996). This suggests that there is need to help teachers develop an expanded perception of what the environment is, which would include the biophysical, social, political and economic components.

In summary, the findings of this study reveal that most teachers perceive environmental education and education for sustainable development as education about environmental education and education for sustainable development respectively. In a way, this seems to detach the aims of environmental education and education for sustainable education from the people. However a few perceive these concepts as education that helps individuals develop skills for the management of the environment and for sustainable development. This indicates lack of an understanding of environmental education and education for sustainable development, which has implications for the teachers' teaching practices. Therefore, teachers need to be helped to develop a wider understanding of environmental education and education for sustainable development before they are expected to teach it in schools.

5.2 Environmental education in the primary school curriculum

The different approaches which can be used in including environmental education into the school curriculum have been discussed (Section 2.2.2). Effective teaching of environmental education will depend on the importance which teachers place on its teaching, their awareness of it being included into the syllabus and the teachers perceptions on how best environmental education could be included in the curriculum.

5.2.1 The importance of teaching environmental education

The importance of environmental education lies in what it aims to achieve. Environmental education is aimed at helping individuals develop knowledge and awareness of the environment to develop positive attitudes towards the environment and skills to take responsible action (Sanera, 1998; UNESCO-UNEP, 1976, 1978).

The participants of the study viewed the teaching of environmental education in the primary school positively. They also pointed out that the primary school age (6 – 13 years) is the appropriate age for developing knowledge and skills about the environment. It can be said that their thinking is based on the fact that their survival is dependent on the environment, therefore survival strategies should start to be developed at a very young age. These results support studies on teachers regarding the importance of teaching environmental education in four European countries, which were Cyprus, Germany, the United Kingdom and Switzerland (Lindermann-Matthies et al., 2009). In the study carried in the four countries, it proposed that it is important to teach biodiversity (a component of environmental education) at the primary school level because they are at a suitable age range of awareness development (Lindermann-Matthies et al., 2009). It is argued that the time between grades one and five are the appropriate

ages for children to develop affective, emotional and concern for living things (Chawla, 1998).

The analysis of the teachers' responses revealed that they had different perceptions concerning why they think it is important. These perceptions could be categorized into two categories, namely *development of knowledge, skills and attitudes* and developing *role models*. Each category was characterized by different sub-categories.

In the category of development of knowledge, skills and attitudes the teachers focused on the *understanding of the environment*, *developing positive attitudes* towards the environment and *developing problem solving skills*. These three significances of learning environmental education are in line with the aims of environmental education as established in the official documents developed in international forums concerning environmental education, and also in line with the aims of teaching environmental education in Tanzania (MoEVT, 2007). They are also interwoven with the three components of environmental education, namely education about, in and for the environment, which focus on knowledge, skills and attitudes, as mentioned earlier. These results are also confirmed by teacher surveys done in Wisconsin province in the USA and in Europe (Lane, et al., 1994; Lindemann-Mathies, et al., 2009).

In the sub-category of *understanding the environment,* the teachers thought that it was important to teach environmental education in primary schools because it would help the pupils develop knowledge which will enable them understand the environment. The teachers suggested that that it should be taught as early as possible in the primary school so that the foundation for an understanding of the importance of the environment can be established at an early age. This kind of thinking is expected in the Tanzanian context because from the time the children are very young they start to learn the things around them and how to perform different tasks. Therefore, these teachers assume that helping the children develop environmental knowledge from the time they are in primary school will enhance their understanding and awareness of the environment and also on the factors that contribute to environmental degradation and the problems resulting from them. In a similar way, they also pointed out that since the livelihood of the people is dependent on the quality of the environment and natural resources, it is important that they are taught environmental education. The dependence on the environment for one's livelihood is typical in Southern African countries (Lotz-Sisitka, 2004). So the emphasis on understanding the environment is based on utilitarian purposes. This is evident in a study done in the United Kingdom, where one of the respondents was concerned with the need to value all the things in the environment because some may be useful and also some are becoming scarce (Lindemann-Mathies et al., 2009). It is also assumed that a person who has an understanding of something is likely to value it and develop positive attitudes towards it particularly if the knowledge is gained through real life experiences, although that may always not be the case.

On the aspect of helping the learners *develop problem solving skills*, some teachers pointed out that the learning of environmental education will not only enable learners to understand the environment but also develop skills to solve the problems in their environment. The development of skills involves doing

because skills are developed when learners actively participate in activities where they can be applied (Kolstø, 2005). Although the teaching of environmental education involves hands on activities, the situation prevailing in Tanzanian primary schools does not provide the opportunity for teachers to do so. Most of the teaching in primary schools is characterized by the transmission of knowledge. Therefore, although the teachers emphasized that the learners will develop problem-solving skills, it may be difficult if the learners do not learn by doing. Teachers in the study assumed that if pupils obtain the knowledge and are told how to solve different problems in their environment, they might develop skills to solve environmental problems.

The development of *positive attitudes* is another important aspect mentioned by the teachers. Teachers believe that environmental education should aim at helping individuals be responsible citizens who act responsibly towards their environment (Chatzfotiou, 2006; Simmons, 2005). On the one hand, attitudes can be considered as part of environmental education and also as an aim of environmental education (Simmons, 2005). As part of environmental education, it emphasizes the role of attitudes in shaping the environment. On the other hand, attitudes are considered as the goal or aim of environmental education, so it involves helping individuals develop positive attitudes towards the environment by acting responsibly towards the environment. The teachers in this study in fact talked about attitudes as a goal of environmental education. It is suggested that attitudes should be developed through experiences and practical application and not through the transmission of knowledge methods like lectures (Kolstø, 2005). This suggests that pupils should be exposed to real life situations in learning environmental education. The development of attitudes therefore focuses on education for the environment. But when the teachers were describing what they perceive as environmental education, most of them talked about environmental education as education *about* the environment. Few teachers talked about environmental education as education for the environment. Chatzfotiou (2006) suggests that sometimes it is assumed that when teachers consider environmental education as education *about* the environment, education *for* the environment is implied.

Development of role models was another significant aspect of teaching environmental education which the teachers mentioned. In the category of role models, the teachers focused on the *dissemination of knowledge* and *developing responsible citizens* among the learners. The teachers argued that when the pupils are taught environmental education, they will communicate what they learn to the other people at home and in the community through their actions. These are the expectations of many teachers. In the study by Lindhe (1999), many teachers believed that when pupils finish school they would teach their parents. Although it is assumed that children feel powerless in effecting changes in the environment, studies have shown that children can influence their parents and even the community into adopting environmentally friendly practices learnt in school. For example, in 1992 a group of twelve pupils in grades 3 to 6, from a school in Björköby village on the west coast of Finland as part of their "Greenkids" school project sensitized their community on the use of environmentally harmless products. They succeeded in making the community of that village be interested in their environment and thought of ways in which

they could preserve nature through the use of more friendly products and make their environment beautiful (Palmberg, 1996). In a similar way, Paterson (2009) also says that when students are motivated to care for something, that motivation spreads to other areas in school and at home. Therefore, the findings of the study confirm that when pupils learn environmental education in school, they can be role models both at home and in the community. However, it all depends on the culture, beliefs, values, and in general the people's way of life, of a particular society. Sometimes it is referred to as "place-based education" (Nordström, 2006). Therefore, if the cultural practices are different from what was taught in school, then the children will not be able to change their practices. For example, if the people have the cultural practice of bathing in the river after a funeral to cleanse themselves, it would be difficult to change their practices even if they are told that they will pollute the water (Oral tradition).

However, some studies have shown that there is little evidence that people can apply knowledge gained in one context to solve problems they encounter in others. It is for this reason that pupils may show that they have learnt school knowledge by reproducing it correctly in examinations but failing to apply it in everyday life situations outside school (Solomon, 1983) or as McClaren and Hammond (2005) say, in many cases learners fail to apply the knowledge and skills learnt in school in out-of-school contexts. This was evident in a survey done in Tanzania to find out if primary school leavers practiced what they learnt in school as environmental education when involved in agricultural activities. The results show that they did not, because they were influenced by people in the community to adopt practices which were not environmentally friendly despite the fact that they learnt proper agricultural practices in school (Makundi, 2000).

Despite the fact that the teachers strongly felt it important to teach environmental education in the primary schools, they were concerned with the way environmental education has been included in the different subjects. While some teachers said that it was *integrated into their subjects,* others said that it was *not integrated into the subjects.* This indicates that some teachers were aware of the presence of environmental education in the subjects they teach while some were not. Alternatively, it could mean that teachers do not have a clear understanding of what environmental education is, as Lindhe (1999) found out in her study of primary and secondary school teachers in Tanzania. In her study, some of the teachers said that there are no environmental education topics in the subjects which they taught: when looking at their syllabi there were environmental components included. Similar findings were evident in a study in England to find out if teachers were aware of the existence of environmental education in the National Curriculum. The study revealed that most teachers were not aware of the presence of environmental education in the National Curriculum. The teachers said that they did not know any environmental education in the curriculum (Chatzfotiou, 2006). Similarly, in a study carried out in four European countries, teachers said that they were not aware of a policy that enhances the teaching of biodiversity in primary schools (Lindemann-Matthies et al., 2009). This shows that if there are no policy guidelines, then the teaching of environmental education will not be implemented. These studies show that the integration approach has been a challenge to teachers in

implementing environmental education as an integrated component in the school subjects (Chilumba, 2006; Hwang, 2009) because they are not aware of its presence in the various subjects.

Given that there are different approaches to the integration of environmental education into the curriculum, I would like to suggest that the success of this will only come about when curriculum developers state clearly what environmental content is to be integrated into the different topics in the syllabus and teachers are trained how to integrate it into their teaching. But it seems the curriculum developers also find it difficult to know what environmental education content to include in the subject content. Therefore, they leave it to the teachers to decide on what they would include as environmental education. Confirming the issue of lack of clarity on how environmental education is integrated into the curriculum, Makundi (2003) a curriculum developer, expressed her concern by saying that environmental education elements in the school curriculum are not stated explicitly, but are only implied. So it depends on the understanding and orientation of the teacher who translates the curriculum. Given this situation, environmental education is taught in some subjects only and not in all the subjects as directed in the Education and Training Policy. The critical issue here is that curriculum developers need to indicate the environmental education content which is integrated into all the subjects clearly so that teachers know exactly what they are required to teach.

5.2.2 How environmental education can be integrated into the curriculum

Since the teachers raised concern about the way environmental education has been integrated into the school curriculum, they were given the opportunity to suggest the approach that they think could be used to integrate environmental education into the curriculum. They had varied suggestions. Their variations constituted three categories: *integrated as an independent subject*, *integrated as topics into subjects* and *integrated into a few subjects* only.

In the category of teachers who thought it can be integrated as an independent subject, three sub-categories, namely subject status treatment, vital significance of environmental education and adequate coverage, were identified. In general, teachers were referring to how the curriculum is usually organized. So if there is new body of knowledge it should be considered as an independent subject.

Therefore the first sub-category includes teachers who think that environmental education should be made an independent subject so that it will get *subject status treatment*. This means that it will have its own body of knowledge, hence its own syllabus, text books and teacher's guides, and also it will be allocated time on the timetable just as the other subjects. This thinking reflects the kind of orientation the teachers had from their pre-service education and the practice which prevails in schools. Knowledge is broken down into various subjects. As stated earlier, teachers argue that environmental education is of vital importance to the children because it will help them to cope with life. As a result, they suggest that making it an independent subject will enable it be covered in depth.

Although the teachers' suggestions could be of importance, it was envisaged that environmental education should not be treated as an independent subject. Instead it should permeate through the social and natural sciences, and the humanities in order to enable learners to understand the interactions between both natural and human resources and also between development and environment (WCED, 1987).

However in some countries, realizing the importance of making environmental education an independent subject, despite the recommendations made by the international forums, some countries have treated environmental education as an independent subject taught as environmental studies or environmental science or as a new learning area among the other subjects in the curriculum (Gough, 1997). For example, in Tanzania, the Ministry of Education and Vocational Training in Zanzibar has included environmental education as a separate subject in the lower classes for ages six to eight (standard 1 to 3) of primary education. The reason they give is that they want the children to understand their environment well at an early stage of their lives. Some teachers in England also had similar feelings that children need to be taught about the environment at an early age (Chatzfotiou, 2006; Spodek & Sarancho, 2005; Talts & Vikat, 2007). For example, Talts & Vikat (2007) argue that early experiences in childhood have lasting effects on social development and behavioural competencies. I also would agree with these researchers, because it is true that childhood experiences tend to have an effect even later in life. However, division of knowledge into different disciplines encourages the fragmentation of knowledge. As a result, learners will not be able to relate what they learn in one subject to another, or even relate what they learn to real life situations.

The second category includes teachers who suggested that environmental education could be integrated into all the subjects as topics. The teachers in this category could be divided into two sub-categories, namely *ensured coverage* and *overloaded timetable*.

To ensure that environmental education content is covered adequately, some teachers suggested that it should be included as topics in the different subjects. They argued that by including them as topics, their teaching will be ensured because teachers will not skip the topics. In an examination driven curriculum this kind of thinking is expected because the examination determines what is to be taught so that the learners can pass their examinations. As a result, teachers teach all the topics stated in the syllabus. Thus, if environmental education is included as topics in the subjects, teachers will not skip any of them for fear that it may come up in the examination. If it is not taught, the pupils will fail. So teachers make sure that everything is covered.

However, some teachers suggested that environmental education should be integrated into existing subjects to avoid overloading the timetable. The idea of overloaded timetable is also pointed out by Flaws & Meredith (2007) when they say that integration has been used as a strategy to cope with overcrowded curriculum and fragmentation of knowledge. The primary school curriculum currently has thirteen subjects which were previously reduced to seven subjects based on the argument that there were too many subjects. But now the subjects have been increased again to thirteen subjects. Therefore the findings of the

study show that teachers seem to be aware of the need for integration to avoid having too many subjects, which will mean overloading the timetable.

Within the category of teachers who suggested that environmental education should be included in a few subjects only, teachers emphasized the aspects of *match* and *mismatch* of the subject content with the environmental education content, hence forming two sub-categories. Regarding the aspect of match with subject content, the teachers suggested that it should be integrated into subjects whose content matches with the content of environmental education. The subjects which they identified were science, social studies, geography and vocational skills. Sometimes these subjects are referred to as carrier subjects. They pointed out that in these subjects, learners can learn about the different phenomena in their local environment and also how to take care of the environment, which is closely related to the content of the subjects. Such a situation is found in other countries, where, for example, geography teachers are responsible for the teaching of environmental education (Reid, 2002) because most of the topics relate to the physical, social and economic environment. Also in Zimbabwe, 90 % of the teachers studied indicated that the subjects which were most suitable for integrating environmental education were agriculture, geography and science. In Hong Kong, teachers felt that science is the most suitable subject for the integration of environmental education because environmental education is a branch of science, and environmental issues involve scientific knowledge (Chi-chung Ko & Chi-kin Lee, 2003). Although the teachers' thinking may be true, they seem to overlook the social and economic aspects which interact with the scientific aspects of environmental education. In general, most teachers felt that science subjects were the most appropriate ones to include environmental education although they saw the possibility of integrating it also into other subjects (Van Petegem et al., 2007). The findings of these studies seem to emphasize the bias towards science subjects and against other subjects concerning environmental education.

While in the previous sub-category teachers suggested that environmental education should be integrated into subjects where the subject content matches with environmental education content, there are teachers who said that it should not be included into subjects whose content does not match with the environmental education content. The subjects which they mentioned were mathematics, languages, TEHAMA and, to some extent, vocational skills. The teachers claimed that the content of these subjects is very different from that of environmental education, so the teachers will not be able to integrate it into the subjects. The content of these subjects is taught as facts which are not related to the learners' lives. Similarly, in Zimbabwe, non-science teachers believe that their subjects are less relevant to environmental education. Although these teachers acknowledged the importance of environmental education, they admitted that they spend very little time on it because they find it difficult to relate the environmental content to their own teaching area (Van Petegem, 2007). This situation can be attributed to lack of environmental education training among the teachers.

In conclusion, the teachers' perceptions on the integration of environmental education into the curriculum revealed that they think that the teaching of

environmental education is important, emphasizing that the knowledge would help the pupils cope with life. This positive attitude indicates that teachers are ready to teach it if they get support. If teachers do not realize the importance of teaching something, there is a possibility that they will not teach it or they will teach it superficially. Generally, all the teachers insisted that environmental education should be taught in primary school, regardless of the subjects they were teaching.

In primary education, teachers are required to integrate environmental education into all the subjects. In order to teach it they must be aware of the integrated components. However, there were variations among teachers with regard to their awareness of the existence of environmental education in the subjects which they teach. Some said they were aware of the environmental components in some of the subjects. But others said that they were not aware of these. This indicates that in some subjects like mathematics and languages, environmental education is not taught because the teachers cannot identify it from the syllabus. Looking at the way environmental education has been integrated into the syllabi of different subjects, it is not clear. As a result, some teachers are not aware of its presence in the subjects which they teach.

With these variations, there is a need to identify the kind of integration approach that can be adopted to include environmental education into the school curriculum. Therefore, suggestions on how it can be made visible in the curriculum were suggested to enable its smooth implementation. The teachers also had different suggestions concerning how environmental education should be included in the curriculum so that it can be implemented effectively. The majority of teachers suggested that it should be made an independent subject, which is the traditional way of organizing the curriculum and the one they are used to.

However, the integration approach, if implemented well, has some advantages. It has been observed that many students improved in science, reading and writing skills, critical thinking, motivation and behaviour through environmental education (Flaws & Meredith, 2007; Paterson, 2009). Elaborating on the contribution of environmental education in improving learners' performance in science, Paterson (2009) goes on to say that environmental education offers a richer science experience, because the approach used integrates science with the learners' interests in outdoor activities, where they get real encounters with what they learn. Similarly, studies done in California on children of many ethnic groups have shown that attitudes towards school and academic performance in the natural sciences, social sciences and mathematics improved when environment was used as a context for integration (SEER, 2000).

5.3 The teaching of environmental education

The findings of teachers teaching practices in environmental education were presented in Section 4.4. The focus was on teachers' competence in the teaching of environmental education, integration of environmental education into teaching different subjects and teaching methods. Therefore, my discussion in this section will revolve around these areas.

5.3.1 Teachers' competence in teaching environmental education

Regarding teachers' competence, the study shows that teachers have different feelings on the issue. Some teachers felt that they were *sufficiently competent* and others felt *not competent.* In the first category the teachers felt that they were adequately competent to teach environmental education. From this category, there were three sub-categories based on the teachers' feelings of competence. The sub-categories include elementary knowledge, self-learning and in-service training.

In the sub-category *elementary knowledge*, the teachers considered the environmental knowledge taught in primary schools to be elementary. As a result, they feel that they are confident and possess the required knowledge as far as teaching environmental education is concerned. They argue that most of what they have to teach they learnt in school and at college when training as teachers. And also some of the things they have to teach are quite elementary, like identifying things in the environment. The teachers' observations are true in the sense that at primary school level, the subject content to be taught is very elementary. However, as a teacher, at times you may be required to explain complex issues in simple ways to fit the elementary level of the learners.

Other teachers said that even if they did not have the knowledge, they could learn on their own, i.e. s*elf-learning,* which forms the second category of teachers who said they are competent to teach environmental education. These teachers feel that they have the responsibility to seek the knowledge that they have to teach from different sources. Teachers in Switzerland share the same thinking because they feel that they are responsible for filling their own knowledge gaps and it is a way to continue developing professionally (Lindemann-Mathies, 2009). Searching for knowledge by teachers indicates their ability to expand their view of knowledge by going beyond the textbook. This supports the idea that teachers who have developed environmental ethics seem to find ways of integrating environmental education into their programs as they teach (Hart, 2008). It is believed that schools with self-learning teachers develop attitudes of sensitivity, responsiveness and adaptability necessary to meet the external and internal changing conditions of the environment (Cheung & Cheng, 1996). Therefore, teachers should be encouraged to search continuously for knowledge from different sources instead of waiting for the government to organize courses and workshops for them.

Other teachers attributed their competence in teaching environmental education to *in-service training.* The training which they got was from non-governmental organizations like the World Wide Fund for Nature (WWF) and Wildlife Conservation Society of Tanzania (WCST), in the form of short seminars and workshops aimed at exposing the teachers to environmental content in the syllabus, the teaching of environmental education and the greening of schools. Although non-government organizations have trained teachers, only a few could benefit because of limited funding. The teachers in this category demonstrate the importance of in-service training for teachers. Training widens their knowledge base and their professional skills, hence making them competent.

From what the teachers revealed, it seems that when they talk about being competent, they refer to subject matter only, which Shulman (1986) refers to as subject matter knowledge. But competence is more than the possession of enough subject matter knowledge. It also includes the pedagogical knowledge and knowledge of context (Grossman, 1990; Shulman, 1986). Therefore, although teachers' competence in subject matter is important, the teachers' ability to help learners understand what they learn and the learner's context is also of great importance.

In contrast to teachers who claimed that they were competent, there were other teachers who said that they were not competent enough to teach environmental education. These teachers were grouped into two categories based on the factors which contributed to their not being competent. These factors were the *changing nature of the environment,* and *inadequate training*.

Teachers who attributed their incompetence to the changing nature of the environment claimed that since the environment is constantly changing, the knowledge about it also changes. This implies that environmental knowledge is not static but dynamic: what is true today about the environment, may not be true tomorrow. Moreover, the environment is different from one place to another. Thus, wherever you go you have to learn. Therefore, as far as environmental education is concerned, no one can claim that they are competent, because one needs to learn all the time. In this subcategory the teachers focused on change and time in relation to place. By change they meant the increase in scope or transformation of the way people see, understand, experience or perceive something in their environment. The change process is related to time because it happens over time. As a result of these changes in the environment, the teachers said that they always have to search for new knowledge if they are to teach environmental education effectively. In support of this, Hua (2004) suggests that environment and environmental science are advancing rapidly; therefore, teachers have to continually educate themselves so as to update their knowledge base in order to improve their understanding of the environment.

The other sub-category of teachers who considered themselves not competent, are those who attributed this state of inadequacy to *inadequate training*. These teachers hoped that they would be trained adequately to teach environmental education when they were being trained as teachers. But they said that they did not have environmental education training either as pre-service or in-service training. Similar findings were observed by Lindhe (1999) among teachers in primary and secondary schools in Tanzania. The study revealed that teachers did not get any training in environmental education. Also in a study of primary school teachers in Greece by Spiropoulou, Antonakaki, Kontaxaki and Bourasfound (2007), it was found that there is knowledge gap among teachers in education for sustainable development because they did not receive any pre-service training, which, they argued, cannot be covered by short in-service training programs.

The issue of teachers not being trained in what they are expected to teach is crucial because it would be difficult for them to teach what they have not been trained to teach. For teachers to be able to teach efficiently, they need also to be trained adequately. Teachers must master the content to be taught to learners,

and the content must be scientifically and ideologically correct (Hua, 2004). For example, in this study, it is observed that teachers are required to teach about the environment while most are not content specialists. Thus they could not responsibly teach the scientific principles behind environmental problems. Also, teachers cannot be experts in all areas of the curriculum and might be unable to help learners understand the complex relationship between social, economic and environmental problems (Hungerford, 2010). This situation suggests that teachers should be trained in environmental education when training as teachers and also should be given the opportunity to attend in-service courses in environmental education. It can be said that teachers who did not receive any training in environmental education and do not have the initiative for self-learning are not competent to teach environmental education because they lack pedagogical content knowledge (Shulman, 1986).

5.3.2 Integration of environmental education into teaching

Variations were also found in teachers' practices in how they integrated environmental education into their teaching. This was noted from their interview responses and through observing how they teach. The teachers revealed that they use different ways to integrate environmental education into the different subjects. From the data analysis, two categories could be identified. While in one category the teachers said that they teach environmental education in their subjects *as subject content,* teachers in another category said that they teach it as a *teaching and learning resource*. Across the two categories, five sub-categories could be identified: In the category of subject content these were taught as specific topics, as integrated content into subject content and as content for skills development. In the category of teaching and learning resource the sub categories were as a source of learning materials and as learning context.

In the first sub-category as *subject topics*, the teachers indicated that they teach environmental education by integrating it as topics, teaching it as with the other topics. The subjects where environmental education was taught as topics within the subject content are science, social studies, geography and vocational skills for some of the classes. However, a look at the syllabi for these subjects reveals that although they contain some environmental education content, current environmental concepts and issues like global warming, depletion of the ozone layer, acid rain and desertification, which are of global concern, are not included. A similar practice can be found in Zimbabwe, where environmental education is also mostly taught as topics in science, geography, biology and agriculture subjects (Van Petegem, Blieck & Ongevalle, 2007). Although these subjects are perceived to contain environmental education topics, a close look at them shows that the content does not focus on environmental education but rather on factual or scientific knowledge. As a result, in science the social component may be lacking, and in social studies, the scientific component may be insufficient.

Where environmental education did not feature as a topic in the subject, the teachers said that they taught it by integrating it into the content of the subject they taught. The teachers explained that as they teach they enrich the subject content with environmental education notions and link the subject content with

the real environment. For example, the teachers said that when teaching the topic on vegetable gardening in vocational skills, they discuss the effects of using chemicals in agriculture and the importance of organic fertilizers. These results are in line with what is also done in Scotland in teaching outdoor education. Although in outdoors education the guidelines as to what is to be taught as environmental education in the different topics, are not stated, teachers said that while conducting outdoor activities, boiling water on an open fire can initiate a discussion on how carbon is stored and released in wood, the global carbon balance and its contribution to the greenhouse effect. Such a discussion would embrace the social, economic and environmental dimensions (Higgins & Kirk, 2009). Although this approach to integration makes learning meaningful to the learners because they link it to real situations, it demands a lot of innovation and skills on the part of the teacher. In doing this, the learners see that everything they learn is related to the environment, even in subjects which teachers claim that are not related to environmental education, such as mathematics.

The third subcategory composed of teachers who used environmental education content to help learners develop different skills. The subjects in which the teachers used this method were languages, vocational skills and mathematics. For example, in teaching structure on the use of the word "*because*", the teachers helped the pupils to make sentences which had environmental messages like "The maize crop was poor because there was no rain" When learners read and make sentences like this one, they understand that if there are no rains the crops will be poor. At the same time, they will have developed the language skills of sentence construction and the use of the word *because*. While other language teachers said that they used environmental education passages to teach comprehension, vocabulary and structure skills, others said that they used stories about the environment to teach environmental education like the issue of deforestation. The use of stories in teaching English has proved to be very effective in teaching and it can be used in teaching different subjects and not only languages. In a study by Li (2006), the use of stories in the classroom was successfully used to teach environmental education in English and social ethics. Emphasizing the use of stories in teaching environmental education, Bai et al., (2010) point out that children need stories to develop ideas about the world, how they relate to it and the different kinds of relationships they can have with the world. They further pointed out that stories make children develop deep meanings and values about issues and different phenomena which they cannot forget easily because they integrate them into their experience. In mathematics the teacher can help the learners develop numeracy, mathematical functions and problem-solving skills by using different objects and situations in the environment. As a result, Jianguo (2004) emphasizes that the claim that mathematics is not related to environmental education is a misconception. He gave a number of examples of how environmental education can be integrated into different mathematics topics, as shown in the example below:

"According to a calculation made by Professor Dais of Calcutta Agricultural University in India, a fifty-year-old tree is worth $31,000 in oxygen production, $62,000 in absorbing poisonous gasses preventing air pollution, $31,200 in increased soil fertility, $37,500 in water conservation. Its total value without

taking its flowers, fruit and wood into account, is approximately $165,000" (Jianguo, 2004, p. 54).

The teacher then can ask the learners to calculate the value of 10 or 18 trees. Through this example, the teacher will have taught mathematics problem-solving skills and the value of trees to the environment, hence the need to plant more trees to improve the quality of the environment. Therefore, teachers' use of real life situations and the learners' environment in learning enhance the understanding of what the pupils are taught more than using abstract ideas.

Another category was that of using the environment as a resource for learning. The use of teaching and learning materials was emphasized by the teachers. Teachers are advised to use the environment as a learning resource to enhance learning. The teachers who revealed that they use environmental education as a learning resource could be grouped into two sub-categories namely *source of learning materials* and *learning context*.

In the sub-category *source of learning materials,* the teachers said that they teach the pupils environmental education through the use of teaching and learning materials. Teachers in Tanzanian schools are urged to use teaching and learning materials which are available from the environment. The point is that learners should relate what they learn to the environment and also due to scarcity of resources and funds, ready-made teaching resources cannot be available in schools. In implementing this, teachers of mathematics and vocational skills explained that they use materials collected from their environment for teaching their subjects. For example, one teacher explained that as they collect and use materials, the teacher educates them on how to take care of the environment by not destroying the plants they collect the materials from so that they can go on using them in future. In doing this he tries to make them develop the concept of sustainability. Also after using the materials, the teacher tells the pupils to dispose of them properly so that they do not litter their classrooms or the school compound. This shows that teachers in this subcategory see environmental education as part of teaching and not something to be taught as a topic. This could be observed in one of the observed lessons (vocational skills) when the pupils were learning how to make mats in the topic of basketry.

The teachers in the sub-category of *learning context* described their teaching about the environment as using the environment as a context for learning, where learners apply what they have learnt in their own environment. This approach to learning is in line with the conception of environmental education as education in or through the environment (Palmer, 1998). Sometimes this approach to teaching is referred to as outdoor learning and place-based education (Stevenson, 2008; Van Kannel-ray, 2006). It is important to use the environment as a learning context for the learners because the learners get concrete experience of interacting and exploring their immediate environment. The knowledge they develop can be used as reference point to extend to other parts of the country and the world at large, as suggested by one of the geography teachers in the study. From observing pupils in standard three during their geography lesson, where the teacher took the pupils outside to identify things in their environment, it could be seen that the pupils enjoyed this kind of learning. Although there are different outdoor activities like field trips, investigations, and many others, the

teachers in this study limited their outdoor activities to the school grounds, because of large class size, lack of time and lack of funds, as will be discussed later. However, Harvey (1989) suggests that learning in school grounds can be just as effective as field trips. Also it is considered to be more appropriate for young learners (Falk & Balling, 1980).

Using the environment as a learning context can be extended to the community around the school. This will make the learners understand that environmental issues are rooted in the society (Bolstad, 2005). Making learners learn in the community will also make them identify and analyze environmental issues in a way that can help them take action which will address the root causes of the environmental issues hence education for the environment.

5.3.3 Teaching methods used in teaching environmental education

Since environmental education is not a separate subject, it was difficult for the teachers to describe the methods which they specifically used in teaching environmental education. However, they described the methods which they used in teaching in general, which include environmental education. In mentioning the kind of methods that they used, two categories could be identified from their explanations. The first category was *participatory methods* and the second *less participatory methods*.

In the category of participatory methods, the teachers could be divided further into three sub-categories. These sub-categories were to *facilitate learners participation*, *enhance thinking* and *enhance cooperation*. The question is, given the prevalence of traditional teaching methods in the schools, referred to as chalk and talk methods (Mahenge, 2004), how well are we preparing student teachers for Tanzanian schools to adopt a culture of imparting knowledge to the students by the use of participatory methods? Many teachers fail to implement participatory methods in their teaching due to constraints resulting from economic conditions which result in material inequalities among schools.

The use of participatory teaching methods can be traced back to the 1960s when the innovation of teaching new science was introduced into the country by the Physical Science Study Committee of the Massachusetts Institute of Technology. The program aimed at teaching that makes use of the child's first-hand experiences of natural phenomena (Ishumi & Malyamkono, 1995). This approach to teaching can be equated to teaching which involves hands-on activities or learning through experiences in the environment and cooperative learning, which are very much advocated in the teaching of environmental education. This is evident in a study carried out in four European countries, where in all the institutions involved, emphasis was placed on interactive, hands-on activities and cooperative learning (Lindemann-Matthies et al., 2009).

Some teachers pointed out that they use participatory teaching methods during their teaching as seen in the sub-category of *enhancing thinking*. Participatory methods which are based on the constructivist view of learning have been found to enhance the capacity of thinking because we think with others (Mortari, 2003). They also stimulate the development of more independent learning skills and higher order thinking skills (Vavrus, 2008). According to the teachers

participation encourages the learners to ask many questions about the different phenomena around them, which require them to think. Apart from asking questions, participation in the learning process also exposes learners to different ideas and also to different alternatives and making informed decisions about issues presented to them.

While some teachers focused on the development of thinking skills, others focused on the social aspect of learning. They pointed out that participatory methods *enhance cooperation* among the learners. Participatory methods enable learners take control of their own learning and cooperate with each other in the learning process. This is a shift from learners working individually to working cooperatively, where they freely share ideas (Tabulawa, 2003). In emphasizing how participatory methods can enhance cooperation, student teachers in two teacher training colleges in Tanzania said that participatory teaching methods increase the quality of learning among learners and they help to develop mutual understanding between teachers and learners (Emsheimer & Mtana, 2004).

Therefore, to enhance cooperation, the teachers in the study gave the learners tasks which they did together as a group. In addition, when the pupils do extracurricular activities like cleaning the school grounds, watering the garden, or organizing morning assembly, they cooperate with each other to accomplish different tasks. Not only do learners cooperate with each other in school, but also when they work with parents and communities in environmental activities like tree planting or cleaning their surroundings, they also cooperate with them. Enhancing cooperation among learners is important in Tanzania because it helps them develop social skills which are needed to lead a cooperative way of life as envisaged by the idea of education for self-reliance, which aimed at preparing individuals for rural life in the villages (Nyerere, 1967a).

Within the category of teachers who said that they used less participatory methods, two categories of teachers could be identified: *content coverage* and *suitability for large classes.* With regard to content coverage, the teachers admitted that they use less participatory methods so that they can cover the syllabus despite the fact that they know that they are required to use participatory methods. As a result, the dominant teaching methods which they use are "talk and chalk" methods (Mahenge, 2004) or according to Stambarch (1994), "we teach, students listen". These findings are in line with the findings from a survey done in Tanzania (Emsheimer & Mtana, 2004) and in other countries in Africa like Botswana (Tabulawa, 2003), Ghana (Coe, 2005) and Nigeria (Hardman et al., 2008) where less participatory methods are used. For example, teachers in Tanzania expressed that the use of less participatory methods enables them to cover the subject content, because the curriculum prescribes what topics have to be covered in different periods (Emsheimer & Mtana, 2004) in the different subjects. These results are also in line with a survey made among science teachers in Hong Kong, where environmental education is integrated. It was found that the most popular methods used were traditional methods like lectures and experiments, and there was very little use of fieldwork and outdoor activities (Chi-chung-Ko & Chi-kin-Lee, 2003). Some of the teachers claim that they used these methods because they want to cover the topics they have to teach as outlined by the Curriculum Development Council.

It is argued that teachers use less participatory methods because they find them to be convenient given the conditions under which they operate. It is believed that usually teachers use those methods which they know and which serve their purpose (Guthrie, 1990; Johnson et al., 2000). For example, teachers would not use methods that do not help their learners to pass exams (Barrett, 2007). As a result, they would use methods that are likely to ensure coverage of the syllabus and ensure that their pupils pass their exams because quality teaching is measured through examination performance (Kyando, 2007). This focus on exams makes teachers teach children the skills needed to answer examination questions (Mosha, 2000).

The Tanzanian government's recent initiative to improve the quality of education through the improvement of teaching and learning has led to a shift from the formalistic teacher-centered teaching typical of Tanzanian schools towards the use of active, inquiry based methods (Vavrus, 2008). Another reason for the shift towards more active methods is the shift from content-based curriculum to competency based curriculum, which calls for the use of participatory teaching methods (Woods, 2008). Although participatory methods are considered to be good teaching practice (Barrett, 2007; Vavrus, 2008) compared to the less participatory methods, governments in developing countries need to adopt them with caution, because they were developed in the culture of developed countries, which is different from that in developing countries. To make them work in developing countries cultures like Tanzania, they need to be modified or localized to fit the country's cultural and economic conditions. But what actually happened is that teachers adopted them as they were, and as a result, they encounter problems in using them, or reduce them to question and answer method or group discussion.

Apart from coverage of content, the teachers pointed out that, less participatory methods like lectures are suitable for large classes. When teachers talk about large classes, they refer to the big number of pupils in the classroom. The Education and Training Policy (MoEC, 1995) states that a primary school class should have a maximum of 45 pupils. But due to the expansion of enrolment, experience shows that it is common to find a class with up to 120 pupils. For example, in the schools in which the study was conducted, the number of pupils in a class ranged from 33 to 105. Although one of the classes had pupils below the recommended number by the ministry, the number is still big for one teacher to teach and still too big to use participatory methods. So the teachers argue that only way teachers can teach such big classes is through less participatory methods like the lecture method. This suggests that there is a need to train more teachers and build more classrooms to match the enrolment rate (Emsheimer & Mtana, 2004).

Although teachers gave various reasons for using less participatory methods in teaching, one of the reasons could be that the change from one way of practice to another is not easy. Some teachers may use less participatory methods just because they are used to teaching that way. However, scholars like Tabulawa (2003) and O'Sullivan (2004) argue that the use of teacher-centered or less participatory methods does not mean that learners are passive. This observation is true because the difference lies in the extent to which the pupils participate in

the teaching and learning process. However, less participatory teaching methods learner participation is generally less than when participatory methods are used. But the use of less participatory teaching methods cannot be dismissed because there are times when the teacher is compelled to use them.

5.4 Barriers to the teaching of environmental education

The barriers which teachers faced in the teaching of environmental education in primary schools included unclear syllabus, short periods, lack of teaching and learning resources, lack of training in environmental education on the part of the teachers, hence lack of expertise and lack of collegial and administrative support. These findings support observations made by Appel, Dankelman and Kuipers (2004), who pointed out that the integration of environmental education poses a number of challenges to teachers. For example, they have to relate the subject content to environmental education content, a process which requires integration skills on the part of the teacher. In a similar way, studies done in England, Wales and Hong Kong also reported that teachers faced problems in the teaching of environmental education (Chi-chung Ko & Chi-kin Lee, 2003; Grace & Sharp, 2000). For example, teachers in Hong Kong, like teachers in Tanzania, were mostly concerned with coverage of the syllabus because of examinations, which may explain why they do not have time to teach environmental education. Analysis of the teachers' responses on the barriers facing them in teaching environmental education revealed three core categories. These categories are curriculum-related, teaching and learning and teacher related factors. In the curriculum related factors, the teachers concerns focused on *unclear syllabus* and *period time.*

The sub-category of *unclear syllabus* included teachers who felt that although they are told to teach environmental education, the syllabi of the subjects that they teach have not stated clearly what they have to teach as environmental education. The teachers claimed that apart from science and social studies syllabi where environmental educations topics are shown clearly, the other subjects do not state specifically what is to be taught as environmental education. This seems to be a common problem of the integrated curriculum, because in Hong Kong, primary schools teachers found that the curriculum design of environmental education through integrating with science was not clear and directive enough for teachers to actually teach it (Chi-chung Ko & Chi-kin Lee, 2003). The issue of clarity of the syllabus as raised by the teachers is a critical one, because the syllabi they use are "prescriptive", thus if what is to be taught as environmental education is not prescribed in the syllabus, then it will not be taught.

As discussed previously, the teaching of environmental education involves active learning. The school timetable is divided into time slots of 40 minute periods. The teachers therefore suggested that the time allocated for a period is not enough in teaching environmental education and particularly the use of participatory teaching methods. They claim that before they finish organizing the pupils into task groups, the time is over. I tend to agree with the teachers that 40 minutes allocated for one period is not enough. I also commend those teachers who borrow periods from their colleagues to solve the problem. To avoid these

time inconveniences, the timetable needs to be revised and more time be allocated. However, something can still be done within the 40 minutes. For example, environmental education as integrated content into subject content can be taught through stories, critical reading of passages concerning environmental education, debating on controversial issues concerning the environment, writing essays about environmental aspects and many other activities. It all depends on the initiative of the individual teacher.

Apart from curriculum-related factors, the teachers face *teaching and learning barriers*. In this category, teachers discussed the constraints facing them in terms of *class size* and *lack of teaching and learning materials.* The discussion here will focus on lack of teaching and learning materials only because the issue of class size has been discussed in the section on teaching methods. Nearly all the teachers in the study talked about lack of teaching and learning materials. The materials which they cited were books, teachers' guides, and equipment for gardening. The issue of teaching and learning materials has been persistent from the 1980s, as reported by Ishumi and Malyamkono (1995), and to date the problem is still there (MoEVT, 2006; 2007). The teachers attribute this problem to lack of funds. The fact that learners need resources and social structures to enable them to participate in "communities of practice" from an early stage in their learning process cannot be denied (Koskinen & Paloniemi, 2010). Therefore, the lack of teaching and learning materials in schools is a critical issue which needs to be solved.

Embedded in the teachers' responses are views that teaching and learning materials are ready-made ones provided by the government or bought from shops. Apart from being provided by the government, teaching and learning materials can be developed by teachers, even in collaboration with pupils, from locally available materials. As a result, the problem of teaching and learning materials could be minimized by teachers being innovative and using materials from their environment or developing their own materials. But the issue here is that the problem of lack of teaching and learning materials is so acute because teachers lack the knowledge, skills and commitment to look for or develop or search for their own materials using the available resources in their environment. These can be used as alternatives to the ready-made ones suggested in the syllabus and sometimes provided by the ministry (Emsheimer & Mtana, 2004). Therefore, teachers need to be trained to develop teaching and learning materials from the resources which are available in their environment to facilitate learning. However, it was encouraging to see that two teachers from one of the schools involved in the study were very innovative and developed small readers for their pupils. The readers were titled, "It is possible to learn through our environment", which can be used in teaching English, and "Miti na Wanyama" meaning Trees and Animals, which can be used for teaching learners about trees and animals in the environment and their uses. These readers were put in a reading corner in the classroom for the pupils to read. Also from the lesson observations I could see some of the vocational skills teachers using locally available materials like banana leaves, clay soil, and paint made from flowers to teach the pupils the various skills stated in the syllabus. Similarly, in England and Wales, it was found that some teachers were creative and imaginative in creating their own teaching and learning resources to support particular learning goals. An example

of one of these resources was "a tiger land" board game which aimed at simulating the encroachment of human population into tiger habitats to help the learners develop the idea of carrying capacity (Summers et al., 2003).

The third category focuses on teacher-related factors. This category is characterized by the sub-categories described in terms of *lack of expertise* on the part of the teacher and *lack of collegial support*. The teachers mentioned lack of expertise as one of the constraints in the teaching of environmental education. Concerning lack of expertise, they admitted that they cannot teach environmental education because they lack the knowledge and skills. This shows that the issue of teachers' content knowledge base and skills remains very important (Palonsky, 1993; Shulman, 1986). The teachers claim that they were not taught environmental education and how to teach it when they were being trained as teachers. Worse still, they have not attended any in-service course or seminar in environmental education. The results found in this study are parallel to a study in the USA on middle school teachers (Ernst, 2009). The results support the view that teachers' limited knowledge base is a result of lack of training in their initial training as teachers (Spiropoulou et al., 2007). The issue of lack of expertise could have been minimized by the teachers learning from each other. But some teachers said that they lack collegial and administration support, which is discussed in the following paragraph.

Referring to lack of collegial and administration support, some teachers said that although they are ready to teach environmental education, they do not get help from their fellow teachers or the school administration. Sometimes they approach their colleagues to ask about things that they have to teach but do not have enough knowledge. In most cases the teachers who are approached are not ready to help, claiming that they do not know or that they are busy. Since environmental education is considered to be a new area of teaching, some teachers may genuinely not be knowledgeable so they cannot help their colleagues. In a survey done by May (2000) on teachers teaching environmental education, it was found that, one of the elements which leads to successful environmental education was collegial support and administrative recognition. Some of the teachers in the study claimed that they do not get support from the administration, particularly when they ask for funds to buy teaching and learning resources or to go on a field trip. The claims of these teachers may be genuine, as from experience primary schools are not allocated funds: they mostly depend on pupils' contributions. These results from the study are similar to findings from an earlier study done in the USA on middle school teachers where among the barriers which teachers face in teaching environmental education are lack of administrative support and funding (Ernst, 2009). However, collegial and administration support is needed if environmental education is to be taught effectively. Since environmental education seems to be something to be integrated into the existing subjects, teachers might need the consent of the head teacher to teach it. For example, in the study done in England and Wales, one of the teachers explained that if teachers want to teach a topic on sustainable education, they have to convince the head teacher of its benefits with regard to the other topics in the curriculum (Summers et al., 2003).

5.5 Teachers' suggestions on improving environmental education primary schools

The fifth theme focused on the teachers' suggestions on how the teaching of environmental education can be improved. From the data analysis, two core categories could be identified. These categories included suggestions on *training needs* and on *teaching and learning materials needs*.

In the category of training needs, the teachers' suggestions could be put into two sub-categories, namely *pre- service training* and *further training*.

In the sub-category of pre-service training, many of the teachers suggested that if they are supposed to teach environmental education, they should be taught the content and the methodology of teaching it in their pre-service training, just as they are taught the other subjects which they teach. Most of them did not receive any training during pre-service. Teachers have the responsibility to help learners develop the knowledge and skills needed to enable them to understand the complex environmental issues and problems facing society and also how to address them (Hungerford, 2010). As teachers they are also expected to help the pupils understand the relations between socio-economic development and development of the environment (UNESCO, 1978). If this is what is expected of teachers, and they are not trained in environmental education, it seems that they are being asked to do things beyond their capacity. Similarly, Chatzfotiou (2006) expresses her concern about teachers' lack of training by saying that since many teachers did not receive any training in environmental education, it is difficult to see how they can teach environmental education effectively when they do not know why, where and how it came into being, and I would add when they do not know what to teach. As a result, the teaching of environmental education should be taught in pre-service training in terms of content and teaching methods so that teachers can teach it effectively.

Apart from pre-service training in environmental education, teachers also suggested that they should go for further training to upgrade their knowledge. This is important because it is argued that quality teaching depends much on the quality of the teachers. Therefore, environmental education teachers need to have the necessary and relevant environmentally related content knowledge and skills (May, 2000). This suggests that teachers should be provided with the opportunity to undergo further training through training programs, seminars and workshops in environmental education. On this aspect, teachers in Hong Kong revealed moderate to strong needs for in-service training in order to accomplish the environmental education goals set in the curriculum guidelines (Chi-kin Lee 1996). Referring to the teaching of education for sustainable development, Esa (2010) emphasizes that teachers should be trained in how to integrate it into their teaching to enhance their content and pedagogical knowledge for successful integration into their teaching. This also applies to environmental education.

On teaching and learning materials needs, the teachers focused on the need for textbooks and teaching guidelines. The teachers concerns mirror the situation that exists in schools. There is high dependency on books as the core teaching and learning materials. As a result, the lack of textbooks and even teachers guides make teachers the major source of knowledge (Komba & Nkumbi, 2008).

This has implications for quality education because it will depend on the quality of the teacher.

The resource provision which is the responsibility of the Ministry of Education and Vocational Training is confined to the provision of subject syllabi, text books and teacher's guides for the traditional subjects. Similar findings have been found in Hong Kong in the teaching of environmental education, where the Department of Education's support for teachers is limited to the provision and dissemination of guidelines for teaching environmental education and a few in-service training activities for a few teachers (Chi-kin Lee, 1996).

The teachers' concern about need for textbooks is genuine because primary schools have no books on environmental education. Even the subject textbooks are not enough. Although one of the objectives of the Primary Education Development Plan was to ensure that each pupil had his/her own book by the year 2006, the aim has not been realized, as a study by Baganda (2008) in Mbeya district revealed that the national book ratio was 1:2. But in the regions and districts it was higher and it differed between subjects. For example in mathematics, the book ratio was 1:8, while in science it was 1: 12. This situation is not very different from the situation in the schools where I conducted the study. In the English class, the pupil-book ratio was 1:10 and in science was 1:12.

Although the teachers suggest that there is need for text-books, these would only be useful if the content addresses the pupils' contexts, and also if teachers know how to use them both in class and for individual assignments. For example, the environmental content that may be included in the textbooks can be relevant to just a few areas. Experience has shown that textbook illustrations, for example, mostly show life situations in urban areas. This can be irrelevant to children from rural areas who have not been to towns and most of the time work with their parents on the farm or looking after the animals (Mtana & Kavishe, 2004).

Apart from the need for textbooks, teachers talked about the need for teaching guidelines. They considered them to be useful in helping them understand what to teach and how to teach. The teachers seem to connect this to the modules which are used in teacher training colleges. The modules comprise a combination of pupils' textbook and teacher's guide and follow the structure of the syllabus. They are very prescriptive because they instruct the teacher what to teach and how to teach.

Although teachers' guides may be very useful, sometimes they do not leave room for teacher innovation. Another thing is that teachers can rely on them as the only source of teaching materials. However, if teacher's guides are written in a way that will guide the teachers to develop learning tasks that will help learners carry our investigations, think critically in their environment, while integrating the subject content, then they can indeed be useful.

To sum up, the results of the study suggest that there is a gap between what the policy statements and the curriculum expects to be taught in primary schools with regard to environmental education, and what is actually being done in schools. Although some of the teachers try to integrate environmental education into the subjects they teach, most them are still not clear on how to link the

subject content with environmental education content. The critical issues are that the syllabi of most subjects are not clear on what is to be integrated as environmental education into the subject content. Also, the teachers' knowledge base in environmental education is not broad. As a result, some teachers believe that environmental education is not related to their subjects, so they do not teach it in their subjects. Similar findings have been found in a study in the state of Wisconsin, where teachers claimed that they do not teach environmental education in their subjects because it is unrelated to the disciplines that they teach (Lane et al., 1994). This suggests that if teachers have a broad knowledge base in environmental education, they would not find it difficult to relate environmental education to what they teach.

5.6 Discussion of methodology

This study did not focus on investigating teachers' perceptions only but also on teachers teaching practices. The study is descriptive in character, using phenomenographic and phenomenological research approaches. Since the aim was to find out how teachers perceive the integration of environmental education into primary education and teachers' teaching experiences, the research is ambitious in obtaining different perceptions and experiences and practices as much as possible from the primary school teachers.

Interviews were used as the main instrument for data collection from 31 primary school teachers. Another method used for data collection was lesson observation, whereby six lessons were observed. The teachers were purposefully selected from four primary schools in Morogoro region in order to capture teachers' perceptions and experiences from different subjects taught in the primary schools and in different settings. I chose interviews and lesson observations as my data collection instruments in order to gather rich data.

The interviews were conducted in two phases. In the first phase, the teachers provided a general picture of the teachers' perceptions and teaching practices, while in the second phase the teachers' perceptions were deepened to obtain an in-depth insight of the study. To make the teachers feel at ease during the interview, the researcher asked them to choose where they wanted to hold the interview. Some of the teachers chose their offices for the interviews, while others chose to be outside under a shady tree. During the interviews, the teachers talked about how they perceived environmental education, how it is integrated into primary school education and how the teachers teach it. In conducting interviews, there is a risk that the respondents may not tell the truth but tell the interviewer what they think he/she expects to hear. To minimize this risk, the interviews started with an informal discussion concerning the interviewees' education and their work as primary school teachers. Also, the fact that the teachers knew that I was not a school inspector, nor an education officer from the municipality made them free to express their feelings and experiences. In addition, the fact that they were assured on the issue of confidentiality further increased their freedom of expression.

After an introductory discussion, the interview then moved on to how the teachers perceived environmental education as an integrated component in the subjects that they teach and how they implement it. The researcher asked

questions which precisely focused on the research questions. This ensured that the responses given by the teachers were not inconsistent. Also the researcher asked for more clarification or examples on responses which were not clear or needed to be clarified more. Given the way the interviews were conducted and complemented with lesson observations, it can be claimed that the teachers' perceptions and teaching practices in environmental education reveal what they actually do, and this enriched the results.

The interviews were transcribed and analyzed to get the results. In analyzing the interviews the researcher's task was to interpret and try to understand what the teachers said correctly. One can question whether it can be ensured that the interpretation of the teachers' utterances was done correctly. First, being a teacher helped me to understand what the teachers said during the interview and as a teacher I was also used to the way teachers express themselves. Secondly, during the interview, I asked probing questions to get more clarification of the statements which I did not understand. Thirdly, since the interviews were tape-recorded if I was not clear about what the teachers said, I simply replayed the tape when transcribing the interviews.

Another method used for data collection was lesson observation. In all, six different lessons were observed. The researcher sought the consent of the teachers to come into their classrooms and observe how they taught. The teachers were willing, so they taught as they normally did. One may wonder if the presence of the researcher in the classroom interfered with the normal teaching. In order not to do this, the researcher became a nonparticipant observer. Also the teachers and pupils are used to inspectors coming to the school and observing teaching in the classroom. After the lesson observation, the teacher, together with the researcher, reflected on the lesson which was observed.

One can also ask why both interviews and lesson observations were used. The question here is not the reliability of the teachers' utterances. The essence of using both interviews and observations is that observations are used to see how what is said is put into practice. Also observations are used to verify what is said because sometimes people do not practice what they say. Furthermore, the study sought both perceptions and practices. Therefore, in order to understand a certain practice, the best way is to see or observe how it is done.

Interpretation of the data was organized and presented in categories and aspects/sub-categories. The question is, does the presentation of the results represent the content contained in the empirical data? The researcher can confirm that efforts were made to present the description of the data using the categories and aspects/subcategories which were generated from the data and supported them with extracts from the interviews to show the teachers utterances as they were expressed in the interviews.

Concerning the research methods used, one can ask if the use of phenomenography and phenomenology as points of departure for the study was successful in yielding rich data for the study. Based on how I carried out the study and on the results, I believe that the data collected through interviews and observations is quite rich. To a large extent it has exposed what teachers actually

perceive and how they actually teach environmental education in primary schools.

Another question may be whether the results can be generalized and applied to other areas. Generalizations and replication of study results usually apply to quantitative studies. But as a researcher my intention was to get as many different qualitative perceptions and teaching practices as possible. As a result, the respondents in the study covered a wide range of teachers with different characteristics. Therefore, I think that the findings of the study can be used to shed light on how environmental education is taught in primary schools in Tanzania more generally because the teacher education and the primary school curriculum are both centralized.

5.7 Contribution of the study and suggestions for further research

The study results reveal that teachers have different perceptions concerning environmental education and its integration into primary school education. Also the teachers' practices in teaching environmental education differ. The results confirm that there is a problem in the teaching of environmental education as an integrated component in primary school education and this situation has resulted in teachers experiencing problems in teaching environmental education. In general, the teaching of environmental education has been facing problems and sometimes it has been neglected.

The findings of this study may shed light on how teachers perceive environmental education and its integration into the curriculum and how these perceptions influence their teaching. The findings can also be useful to various key players in education in the implementation of environmental education in schools. Some of the key players who can benefit from the findings of this study include curriculum developers and teacher education.

Curriculum development

Teachers in Tanzania are used to detailed curricula, so if what they are expected to teach is not stated clearly in the curriculum, it will not be taught according to the intended goals of the curriculum. Since the results of the study revealed that teachers experience problems in integrating environmental education into the various subjects, curriculum developers need to rethink their approach in integrating environmental education into the school curriculum. If environmental education is to be integrated into the primary school curriculum, I would suggest that core areas to be covered need to be stated clearly. Examples of such areas include ecology, the built environment, environmental issues and problems, environmental management, sustainable development, amongst others. Then relevant topics and issues should be structured into performance objectives, content to be taught, teachers' activities including teaching methods, learners' activities, teaching materials, and assessment guidelines should be stated clearly in each subject syllabus for easy implementation.

Teacher education

The study identified teachers who do not perceive themselves as competent in the teaching of environmental education due to lack of training. This indicates that the extent to which teacher education institutions are addressing the issue of enabling teachers to teach environmental education is low. As a result, the study results also show that teachers face problems in teaching environmental education because they lack pedagogical content knowledge and even teaching methods. Most teachers claim that they have not been taught environmental education while training as teachers in teacher training colleges and also they have not received any in-service training. This is a setback in the implementation of environmental education. Because of their potential multiplier effect, teachers, and particularly pre-service teachers, are considered to be very important in the dissemination and implementation of environmental education (Powers, 2004; Van Petegem et al., 2005). Even when they are in the field, teachers need in-service training in environmental education. Emphasizing the need for in-service training, Sanera (1998) suggests that teachers need to be helped to keep in pace with the constantly changing science which involves environmental issues.

According to UNESCO, environmental education and education for sustainable development should be incorporated into ordinary educational activities and curricula have to be reoriented for all educational levels from preschool to university level (UNESCO, 2005). Teacher education should integrate environmental education into its curriculum. This implies that teacher educators should be trained to enable them to facilitate student teachers in the teaching and learning of environmental education. Like teachers, teacher educators have a big multiplier effect because each teacher educator educates many student teachers, who in turn will educate a large number of pupils who will then share the knowledge with others at home and in the community (Mathies-Lindermann et al., 2009).

For effective implementation of environmental education, the existing organs responsible for Teacher Education in Tanzania should make sure that environmental education is integrated into the teacher education curriculum. For in-service training, teacher education can make use of existing in-service training programmes like the Teacher Educators' Programme (TEP) as a vehicle to enhance the implementation of capacity building for teacher educators in environmental education and education for sustainable development.

Suggestions for further research

Integrating environmental education into the primary school curriculum could make learning more meaningful to learners because most have to go back into society after finishing primary education. Since most of their livelihoods will depend on the environment, the knowledge which they obtain will help them cope with life situations. The study focused on two broad areas, which are teachers' perceptions of environmental education and its integration into the primary school curriculum and teachers' teaching practices. All the areas have

potential for interesting topics for research. Although several issues have been touched upon and discussed briefly in this thesis, they can be explored further.

In this study the focus was on the voices of primary school teachers only. Valuable findings can be gained if other stakeholders' voices can also be explored. These may include teacher educators, student teachers and pupils. For example, studies among teacher educators concerning the teaching of environmental education in teacher education can shed light on how teachers are trained to enable them to teach environmental education. For example, there can be investigation into how the training of teachers can contribute to the effective teaching of environmental education. Also, studies in environmental education learning among the pupils can identify gaps between what is intended in the curriculum and what the learners actually learn.

Another area of research could be teachers' knowledge base, which is very important in teaching. The findings of this study revealed that some teachers do not feel competent in teaching environmental education because they lack the knowledge base. Research on teachers' environmental literacy level can be made to find out if they have the knowledge to teach environmental education. The results of such a study can be a good basis for planning both pre-service and in-service courses for teachers.

Concluding remarks

Integrating environmental education into the school curriculum could make learning more meaningful and relevant to learners because most of them will go back into society after finishing primary education. The majority of them will engage in various activities like farming, mining, business, forestry work and fishing, to mention just a few. These activities may have an impact on the environment if not performed appropriately. Therefore, it is important to ensure that environmental education is taught efficiently at primary school level. Its content needs to be integrated into the curriculum in a manner that teachers can understand it. Also the way environmental education is implemented in schools and taught to the learners is very important.

As was noted in the study, most teachers admit that it is important to teach environmental education in primary education. Although it was also noted that some teachers already integrate environmental education content into their teaching, most of them perceive it as a difficult task and sometimes impossible to implement in some subjects. Therefore, teachers need to be trained and oriented on how to implement the integrated curriculum into their teaching. As some of the teachers indicated, collegial support can help them in the teaching of environmental education. Therefore, teachers need to be sensitized to create opportunities to meet and share ideas in teaching in general and on the teaching of environmental education in particular.

Lack of teaching and learning materials have continued to be a barrier to the proper teaching of environmental education. To overcome this, there is need to develop and disseminate environmental education materials for schools, not only at primary level but for all levels of education. Alternatively, there are environmental education books which were prepared by WWF which can be reproduced and distributed to schools. Also teachers can be sensitized to develop

a culture of writing and write books that can be used in teaching environmental education.

Finally, in order to make sure that environmental education is taught efficiently in primary education, the curriculum needs to be adjusted. It is important that the curriculum spells out clearly what and how environmental education is to be taught in schools. Since teachers are the main implementers of environmental education, they need to receive adequate training during pre-service and also in-service. This implies that environmental education has to be included in the teacher education curriculum and also an in-service program for teachers should be put in place, implemented and monitored.

Summary of the study

Introduction

Tanzania has responded to the global and local concerns about the environment by including environmental education in the school curriculum at all levels from the 1990s (MoEC, 1995; MoEVT, 2005; MoEVT 2007; URT, 2004). To facilitate its implementation, curriculum revision was done in the 1990s and in 2005 to integrate environmental education into the primary school curriculum (Lindhe, 1999; URT, 2004; MoEVT, 2007; Mtaita, 2007). Despite all these efforts environmental education is not taught as intended by the Education and Training Policy and also the curriculum.

Since integration is a new approach to teaching, the implementation of teaching environmental education as an integrated component in the various subjects, seems to be a challenge to teachers. Among the challenges that teachers face in implementing environmental education are unclear syllabi, lack of training in environmental education, lack of time, and lack of teaching and learning resources.

Generally, the teaching of environmental education in schools at different levels seems to pose similar challenges to teachers, hence there is a gap between what is intended and what is implemented in the classroom. It is anticipated that the existing curriculum culture and structures of schooling do not match with the principles and the goals of teaching and learning environmental education (Chankook & Fortner; Palmer, 1998; Powers, 2004, Stevenson, 1987; Tilbury, 1999). For example, Stevenson (1987) points out that while the traditional way of organizing the curriculum is subject-based, environmental education is interdisciplinary, a situation which creates challenges to teachers in teaching environmental education.

Motives for the study

The motives for the study emerged from my growing interest in the environment and my experience in teaching environmental education to teachers, teacher educators and communities. My experience of teaching environmental education has revealed that teachers and even teacher educators in Tanzania experience difficulties in integrating environmental education into the subjects that they teach.

My second motive is the need for research in the teaching environmental education in Tanzania. For its effective implementation there is need for research to improve practice (Creswell, 2008). Previous studies in Tanzania in environmental education (Hogan, 2007; Lindhe, 1999; Mtaita, 2007 & O-Saki, 1995) have mainly focused on secondary education, complementary basic education and on other stakeholders' participation in environmental education. Although these studies can be related to the teaching and learning of environmental education in primary school, there is still need to specifically focus on primary education, in order to develop a strong environmental education base among the learners at an early age.

My third motive arises from my concern for teachers' knowledge base in environmental education. Teachers need a good knowledge base, pedagogical content knowledge (Shulman, 1986), to be able to teach environmental education. The question is, however, do they have it?

Aim of the study

The aim of the study is to explore how primary school teachers perceive the integration of environmental education into primary school education and teachers' teaching practices. Perceptions may influence the teaching practices (Chi-chung Ko & Chi-kin Lee, 2003), and the results could therefore be useful in curriculum development and in designing teacher education pre-service and in-service programs, but also for other environmental education stakeholders and teachers in schools in general.

Theoretical considerations

Since environmental education has been considered as education about, in, and for the environment (Fien, 1993; Gough, 1992; Palmer, 1998; Palmer & Neal, 1994; Tilbury, 1995), the components of the curriculum should include these elements (Palmer, 1998). This classification of environmental education was Lucas' (1979) attempt to categorize the different meanings which have been given to environmental education. Education for sustainable development, on the other hand, is defined as education that enables people to develop the knowledge, values and skills to participate in decision-making for improving the quality of life without damaging the planet in the future (CEE, 1998, p. 3).

Different approaches can be used to integrate environmental education into the school curriculum, for example as an independent subject, as a cross-curricular issue or as a theme organized around significant issues. Each of these approaches has its strengths and weaknesses. Because in Tanzania, the approach is a traditional one, the new approach to integrate environmental education into the existing subjects (MoEC, 1995, URT, 2004) poses challenges to teachers.

Teaching and learning of environmental education

The teaching process aims to develop environmental literacy, concern for the environment and action competence among the learners. The focus is shifting from teaching to learning, meaning that the learners are the central focus of the learning process, instead of focusing on the teacher and the content. From this view, the learning of environmental education demands the use of active methods where learners are involved in hands-on activities. Therefore, the aspect of teaching methods and the need for critical thinking and teaching in environmental education is discussed and related to Nyerere's philosophy of education for self-reliance (Nyerere, 1967a). Since teachers' knowledge base is at the core of teaching and learning, the teachers' pedagogical content knowledge (Shulman, 1987) is analyzed. Finally, the constraints facing teachers in the teaching of environmental education, like the lack of time, funds, teaching and learning materials, lack of knowledge, and the issue of safety for the learners

during outdoor activities, are elaborated (Chi-chung Ko & Chi-kin Lee, 2003; Pulkkinen, 2006).

Methodological approach

Both phenomenography and phenomenology were adopted as the research methods. The choice of the two methods as points of departure for this study is based on the fact that it seeks to investigate both teachers' perceptions and teaching practices. Three research questions guide the study. The first research question aimed at finding out how teachers perceive environmental education and education for sustainable development. Although the study focuses on environmental education, teachers' perceptions of education for sustainable development have been investigated because sometimes teachers use the terms interchangeably, and they also imply the same goal, which is a sustainable future.

The second research question concentrated on how teachers perceive the integration of environmental education into primary school education. This question reveals the teachers' thinking concerning the importance of teaching environmental education, teachers' awareness of the presence of environmental education in the subjects that they teach and the suggestions of approaches that can be used in integrating environmental education into the primary school curriculum.

The third research question explores the teachers' teaching practices in teaching environmental education. To approach this question, the key issues dealt with here include teachers' feelings of competence in teaching environmental education, teachers' classroom practices in teaching environmental education in different subjects and the teaching methods used in teaching environmental education. Barriers facing teachers in the teaching of environmental education and suggestions on how the teaching of environmental education can be improved in the primary schools are also addressed.

The data collection processes included semi-structured interviews and observations. A total of 31 teachers from four primary schools in Morogoro region were interviewed. The interviews were conducted in two phases. In phase one, all 31 teachers were interviewed. The aim was to get an overview of the teachers' perceptions of environmental education as an integrated component in the primary school curriculum and teaching practices. In phase two, eight out of the initial 31 teachers were interviewed again to get in-depth information on what was obtained in phase one.

The interviews were followed by lesson observations, where six different lessons were observed. The lesson observations were done to gain insight into how the teachers actually integrate environmental education into the teaching of different subjects. The lesson observations were done to complement what the teachers said in the interview.

The data for research question one was analyzed according to the phenomenographical approach, where categories and aspects were generated from the data. The data for questions two and three were analyzed following the

phenomenological approach, where themes, categories and sub-categories were generated.

Results

The results for the study were presented according to the three research questions. The teachers' perceptions of environmental education and education for sustainable development focused mostly on getting knowledge about the environment and sustainable development, while some focused on the development of skills on how to take care of the environment and how to achieve sustainable development.

All the teachers admitted that it was important to teach environmental education in primary schools. They based their views on enabling learners to develop knowledge, skills and attitudes for the environment, and being role models both at home and in the community at large. Some teachers were aware of the integration of environmental education in the subjects they teach, while others were not.

Concerning how environmental education could be integrated into primary school curriculum, the teachers' suggestions were put into three categories, namely, integrated as an independent subject, integrated into the subjects as topics, and integrated into a few subjects. Some teachers were of the opinion that environmental education should be accorded the status of *an independent subject*, just as the other traditional subjects in the curriculum, or because it is of vital importance to the learners, or so that its content would be covered adequately. According to other teachers, environmental education should be *integrated into the subjects as topics* for effective teaching and to avoid overloading the timetable. If it is a topic within a subject, its teaching will be ensured, because all the topics in the syllabus are taught effectively to make the pupils pass their final examination. On the other hand, some teachers were worried about the timetable being overloaded if a new subject were to be created. Teachers who suggested environmental education to be *integrated into a few subjects*, did it according to how the content matches or mismatches with the subject content or is related to the content of environmental education.

The investigation of teachers' teaching practices in environmental education focused on teachers' competences, their actual teaching in different subjects, the teaching methods and barriers facing them, as well as on their suggestions on how the teaching of environmental education can be improved in primary schools.

Teachers' competence in the teaching of environmental education is of great importance if it is to be implemented effectively. Some teachers admitted that they were competent attributing their ability to elementary knowledge, self-learning and in-service training. However, the changing nature of the environment and inadequate training were the factors which made other teachers feel that they were insufficiently competent to teach environmental education in primary schools.

Teachers integrated environmental education as a subject *content* or as a *learning resource*. It was taught as specific topics, as integrated content, or as content to develop specific skills in a subject. When, on the other hand, it was taught through its use as a teaching and learning resource, the teachers used teaching and learning materials from the environment and they used the environment as a learning context. This kind of practice among the teachers is an indication that the teachers have a wide scope of environmental education.

The teaching methods were described in terms of *participatory* and *less participatory* methods. The teachers who claimed that they use participatory methods emphasized facilitation of learner participation, enhancing thinking skills and enhancing cooperation among the learners, whereas the teachers, who used less participatory methods, focused on teaching. They used less participatory teaching methods to cover the content in the syllabus but also because they are suitable for large classes.

Although teachers emphasized the importance of teaching environmental education in primary education, some barriers dissuaded them from implementing it in their teaching. As barriers they named *curriculum related factors*, *teaching and learning related factors* and *teacher related factors*. The teachers claimed that the syllabi are not clear, because they do not show exactly what environmental education content is to be taught in the subjects they teach. It is therefore left upon the individual teacher to decide what to teach. The time allocated for one period is also too short to plan any activities that the learners could do in the environment. Among teaching and learning factors some teachers raised their concern about large class size and lack of teaching materials. When the class size is big it is difficult to manage, especially if you plan to take them outdoors. It is also difficult to teach environmental education in absence of teaching and learning materials, particularly textbooks. Among the teacher related factors they pointed out the lack of expertise and the lack of collegial and administration support, as well as the lack of training in environmental education. Some teachers suggested that the lack of expertise could be minimized if collegial and administration support existed. They pointed out that, in order to improve their teaching, they need training as well as teaching and learning materials. They emphasized the need for guidelines and textbooks, which would advise them on how and what to teach. There were also proposals to encourage teachers to make their own teaching materials as a means of enhancing the teaching of environmental education in primary schools.

Discussion of research methods and the results

In this study I used phenomenography and phenomenology because the study sought how a phenomenon is perceived by the teachers and their experiences in putting it into classroom practice. Therefore, the use of one method was not enough to answer all the research questions (Creswell, 2008). What then can be learnt from the research methods used in this study? The combination of the two methods has helped to generate rich data on how teachers perceived the integration of environmental education in primary school education and how they actually taught in the classroom. Concerning the validity and reliability of the results, the researcher ensured that in-depth interviews were carried out and

that triangulation was ensured by using more than one method of data collection, whereby observation was also used.

What can be said about the teachers' perceptions on the integration of environmental education into primary school education and their teaching practices? Most of the teachers focused on the acquisition of knowledge and skills about the environmental education and sustainable development. This reflects the teachers' expectations of education and the purpose of schooling (Chatzifotiou, 2006). However, some teachers focused on the development of skills which are needed to solve environmental problems and to attain sustainable development. None of them focused on the aspect of environmental education as education in the environment. This was expected, because the methods which they used are teacher-centred, whereby the teachers disseminate knowledge. Since the teachers' perceptions of environmental education may influence their practice it is important that teachers develop clear concepts of environment and environmental education, sustainable development and education for sustainable development.

The teachers appreciated the importance of teaching environmental education in the primary school, but they saw it as a challenging task. They suggested that better approaches of integrating it into the school curriculum should be investigated and employed. Environmental education should be included into the curriculum as an independent subject or as topics in the different subjects, or integrated into a few subjects only. The curriculum in Tanzania is subject-based and the syllabi are made up of topics to be covered. Suggestions of being integrated into the other subjects as topics support the views of Flaws and Meredith (2007) that integration is used as a strategy to cope with an overcrowded timetable. The suggestions that environmental education should be integrated into a few subjects only emphasize that environmental education has a science orientation, so it has to be included in the sciences or geography (van Petegem, 2007).

The findings also indicated that teachers are not well-trained in the teaching of environmental education in schools (Lindhe, 1999), nor did they undergo any professional development courses in the teaching of environment. Therefore there is a need for the teacher education curriculum to address the teaching of environmental education. However, teacher education programs should not be prescriptive and specific. They should prepare teachers to be analytical and capable of thinking critically so that they can adapt themselves to the changing nature of the environment.

With regard to teaching methods some teachers admitted that they use participatory methods whereas others admitted that they still use traditional teacher-centred methods in teaching environmental education. The change from teacher-centred to learner-centred methods is a recent educational reform in Tanzania, and it requires time and practice. In addition, also Valvus (2009) wonders how teachers can use learner-centred or participatory methods in overcrowded and undersupplied classrooms. Traditional approaches to teaching are effective in schools where resources are limited (Guthrie, 1990). Therefore, in order to make teachers adopt participatory teaching methods, teachers should be helped to localize the methods and apply them to fit their different contexts.

The rhetoric–reality gap that exists in the implementation of environmental education in primary schools is a result of the barriers facing teachers in the implementation of environmental education. Some of the barriers include unclear syllabi, time, large class sizes, inadequate teaching and learning materials, lack of training and lack of collegial support. Taking the example of lack of collegial support, the teachers show that collegial support is important because it enables teachers to share ideas and learn from each other as part of professional development. Schools could plan and provide opportunities where teachers can share both academic and professional ideas.

How can the teaching of environmental education in primary schools be improved? Regarding training needs, the teachers felt that it is important for teachers to have adequate knowledge to be able to teach environmental education. This can be achieved through pre-service and in-service training. Unfortunately, it is assumed that teachers can implement new innovations without being trained or even receiving any orientation. In a centralized curriculum, how can this be possible when each individual teacher is left to decide what to integrate as environmental education? Concerning teachers' suggestions for the need for teaching and learning materials, the teachers suggest that they need to be provided with teaching guidelines and textbooks. The problem of shortage and even absence of teaching materials, particularly textbooks, is a critical issue in most Tanzanian schools, because teachers see textbooks as sources of approved knowledge which will help the learners pass final examinations. So without textbooks, teachers feel that they are helpless.

Contributions of the study results

Research is carried out to generate information that can be used to improve the teaching and learning of environmental education in primary schools. Although the results of the study can contribute to a number of areas, two areas will be focused on. These are curriculum development and teacher education. The results seem to confirm that the integration of environmental education into the primary education curriculum is not clear to the teachers. Teachers in Tanzania are used to a detailed curriculum, and if not so, the chances of implementing environmental education according to the intended goals of the curriculum are small. Therefore, curriculum developers should need to rethink the approach which they use in integrating environmental education into the school curriculum. The future of environmental education depends on teachers who can translate the intended curriculum into classroom practice.

Teachers, and particularly pre-service teachers, are considered to be very important in the dissemination and implementation of environmental education because of their potential multiplier effect (Powers, 2004; van Petegem et al., 2005). But the study has indicated that most of the teachers do not possess the knowledge to teach environmental education as an integrated component in the subjects that they teach. How can they disseminate and implement knowledge that they do not have? This situation suggests that there is a need for teacher education to design appropriate training programs, both pre-service and in-service, that can help teachers in the teaching of environmental education.

Concluding thoughts

A meaningful environmental education needs to include education about, in/through, and for the environment. The focus is to help the learners develop knowledge, skills and positive attitudes towards the environment. In Tanzania, the approach which has been used to include environmental education into the school curriculum is to integrate it into the existing subjects. This implies that environmental education is to be taught in every subject.

Despite the importance of the teaching and learning of environmental education, the approach used to integrate environmental education in primary school education seems to marginalize it, because environmental education content and skills are not stated explicitly in the syllabus of different subjects. Furthermore, teachers are not trained in teaching environmental education. As a result, teachers do not know what to teach and how to teach. To ensure that environmental education is taught effectively in primary schools, I would suggest that the results of this study need to be reflected upon seriously by environmental education stakeholders, particularly curriculum developers, teacher educators and teachers in general.

Sammanfattning

Introduktion

Tanzania har reagerat på den globala och lokala oron för miljöns tillstånd genom att sedan 1990-talet inkludera miljöfostran (eng. ”environmental education”) i läroplanerna på alla nivåer (MoEC, 1995; MoEVT, 2005; MoEVT 2007; URT, 2004). För att underlätta implementeringen av miljöfostran reviderades läroplansgrunderna på 1990-talet och år 2005 i syfte att integrera miljöfostran i lågstadiets undervisning (URT, 2004, MoEVT, 2007; Lindhe, 1999; Mtaita, 2007). Trots all möda som lagts ner på detta fungerar inte undervisningen i miljöfostran som den var tänkt enligt utbildningspolicyn och läroplansgrunderna. Eftersom integrering är ett nytt angreppssätt i undervisningen verkar det vara en utmaning för lärarna att integrera miljöfostran i de olika ämnena. Oklara kursplaner samt brist på miljöpedagogisk utbildning, tid, läromedel och undervisningsmaterial är några av de utmaningar lärarna möter i sina försök att genomföra miljöfostran.

Miljöfostran i skolan verkar generellt skapa liknande utmaningar för lärare i olika årskurser, eftersom det finns en klyfta mellan vad som avses i planerna och det som sker i klassrummet. Man antar att den aktuella läroplanskulturen och struktureringen av arbetet i skolorna inte överensstämmer med principerna och målen för miljöfostran (Chankook & Fortner; Palmer, 1998; Powers, 2004, Stevenson, 1987; Tilbury, 1999). Till exempel Stevenson (1987) påpekar att det traditionella sättet på vilket man strukturerat upp läroplansgrunderna är ämnesindelat, medan miljöundervisningen är ämnesövergripande, vilket förorsakar svårigheter för lärarna när de ska förverkliga den.

Bakgrund till undersökningen

Motiven för undersökningen tog sin början i mitt växande intresse för miljön och mina erfarenheter av att undervisa lärare, lärarutbildare och olika grupper i samhället i miljöfostran. Min egen erfarenhet av att undervisa i miljöfostran har avslöjat att lärare, till och med lärarutbildare, i Tanzania upplever svårigheter i att integrera miljöfostran i de ämnen de undervisar.

Mitt andra motiv är behovet av forskning i hur miljöfostran förverkligas i Tanzania. Forskning behövs för att man effektivt ska kunna genomföra miljöfostran i praktiken (Creswell, 2008). Tidigare forskning i miljöfostran i Tanzania (Hogan, 2007; Lindhe, 1999; Mtaita, 2007 & O-Saki, 1995) har huvudsakligen koncentrerats till högstadiet (eng. ”secondary school”), fortbildning och andra intressenters deltagande i miljöfostran. Även om dessa undersökningar kan relateras till miljöfostran i lågstadiet (eng. ”primary scool”) finns det behov av forskning som fokuserar speciellt på lågstadiet, för att kunna utveckla en stark grund för miljöfostran bland elever i de yngre åldrarna.

Mitt tredje motiv har uppstått till följd av min oro för lärares kunskapsnivå i miljöfostran. Lärare behöver en gedigen kunskapsbas, ämnesdidaktisk kunskap (Shulman, 1986), för att vara kapabla att undervisa i miljöfostran. Frågan är dock: Har de det?

Undersökningens syfte

Syftet med undersökningen är att utforska hur lärare på lågstadiet uppfattar integreringen av miljöfostran och hur undervisningen går till i praktiken. Uppfattningarna kan påverka hur undervisningen sker i praktiken (Chi-chung Ko & Chi-kin Lee, 2003), och resultaten kan därför vara användbara när man utvecklar läroplansgrunderna och bygger upp lärarutbildning och lärarfortbildning. Andra instanser involverade i miljöfostran och lärare i skolor i allmänhet kan också ha nytta av resultaten.

Teoretiska överväganden

Eftersom miljöfostran har ansetts vara undervisning *om*, *i* och *för* miljön (Fien, 1993; Gough, 1992; Palmer, 1998; Palmer & Neal, 1994; Tilbury, 1995), borde läroplansgrundernas olika delar omfatta dessa element (Palmer, 1998). Den här definitionen av miljöfostran var Lucas (1979) försök att kategorisera de olika betydelserna man har tillskrivit miljöfostran. Undervisning för hållbar utveckling, å andra sidan, definieras som en utbildning som gör det möjligt för människor att utveckla kunskap, värderingar och färdigheter för att ta del i beslutsfattande för en bättre livskvalitet utan att i framtiden skada vår planet (CEE, 1998, s. 3).

Det finns olika angreppssätt för att integrera miljöfostran i skolans läroplan, t.ex. som ett eget skolämne, som ett ämnesintegrerande tema eller som en tematisk undervisning kring vissa specifika frågor. Vart och ett av dessa angreppssätt har styrkor och svagheter. Eftersom synen på undervisning är traditionell i Tanzania har det nya angreppssättet att integrera miljöfostran i de existerande skolämnena (MoEC, 1995, URT, 2004) blivit en utmaning för lärarna.

Undervisning och lärande i miljöfostran

Undervisningsprocessen har som mål att hos eleverna utveckla förmågan att kunna avläsa och tolka miljön, förstärka deras omsorg för miljön och utveckla deras handlingskompetens. Fokus håller på att förflyttas från undervisning till lärande, vilket innebär att eleverna placeras i centrum för lärandeprocessen, istället för läraren eller ämnet. Lärande i miljöfostran kräver med andra ord att man använder aktiverande metoder, där eleverna involveras i praktiska aktiviteter. Därför diskuteras undervisningsmetoderna och behovet av kritiskt tänkande i miljöfostran i relation till Nyereres filosofi om undervisning för att utveckla självtillit (Nyerere, 1967a). Eftersom lärares kunskapsbas ligger i centrum för undervisning och lärande, analyseras också lärarnas ämnesdidaktiska kunskap. Slutligen studeras de begränsningar lärare möter, när de ska förverkliga miljöfostran, till exempel brist på tid samt brist på finansiella tillgångar, undervisningsmaterial, läromedel och kunskap, men också säkerhetsfrågor i anslutning till utomhusaktiviteter (Chi-chung Ko & Chi-kin Lee, 2003; Pulkkinen, 2006).

Metodiskt angreppssätt

Både fenomenografi och fenomenologi antogs som forskningsmetoder. Valet av två metoder som utgångspunkter för undersökningen baserar sig på faktum att både lärares uppfattningar och lärares praktiska arbete står i fokus. Tre forskningsfrågor utgör riktlinjer för undersökningen. Den första forskningsfrågan syftar till att ta reda på hur lärare uppfattar miljöfostran och lärande för hållbar utveckling. Även om undersökningen fokuserar på miljöfostran har lärarnas uppfattningar av undervisning för hållbar utveckling undersökts, eftersom lärare ibland använder begreppen parallellt, och de också har samma mål, det vill säga en hållbar framtid.

Den andra forskningsfrågan fokuserar på hur lärare uppfattar integreringen av miljöfostran i undervisningen på lågstadiet. Frågan är tänkt att avslöja hur lärarna tanker i fråga om vikten av miljöfostran, lärarnas medvetenhet om aspekter av miljöfostran i de ämnen de undervisar, samt deras förslag till angreppssätt som kan användas för att integrera miljöfostran i skolans läroplan för lågstadiet.

Den tredje forskningsfrågan utforskar lärarnas undervisningspraktik i miljöfostran. Närmare bestämt berör nyckelfrågorna här hur lärarna uppfattar sin egen miljöpedagogiska kompetens och sin undervisningspraktik när det gäller att integrera miljöfostran i olika läroämnen, samt vilka metoder de använder i sin miljöundervisning. De hinder som lärarna möter i sin undervisning i miljöfostran och de förslag på hur miljöundervisningen på lågstadiet kan förbättras, behandlas också.

Datainsamlingsprocessen omfattade semistrukturerade intervjuer och observationer. Totalt 31 lärare från fyra lågstadier i Morogororegionen intervjuades. Intervjuerna utfördes i två faser. Under fas ett blev alla 31 lärare intervjuade. Målet var att få en överblick av lärarnas uppfattningar av miljöfostran som en integrerad del av läroplanerna för lågstadiet och förverkligandet av undervisningen i praktiken. Under fas två fördjupades svaren från åtta av de ursprungliga 31 intervjuerna.

Intervjuerna följdes upp av lektionsobservationer, där sex lektioner observerades. Observationerna gjordes för att få insikt i hur lärarna faktiskt integrerar miljöfostran i sin undervisning av olika ämnen, som komplement till utsagorna i intervjuerna.

Data tillhörande den första forskningsfrågan analyserades enligt den fenomenografiska ansatsen, där kategorier och aspekter framställdes ur data. Dataunderlaget för forskningsfråga två och tre analyserades enligt den fenomenologiska ansatsen, så att teman, kategorier och underkategorier skapades.

Resultat

Resultaten från undersökningen presenterades enligt de tre forskningsfrågorna. Lärarnas uppfattningar av undervisning i miljöfostran och för hållbar utveckling fokuserade i första hand på att ge kunskap om miljö och hållbar utveckling,

medan några fokuserade på utvecklingen av färdigheter för att ta hand om miljön och uppnå en hållbar utveckling.

Alla lärare medgav att miljöfostran var viktig på lågstadiet. De baserade sitt synsätt på åsikten att det var viktigt att göra det möjligt för eleverna att utveckla kunskaper, färdigheter och attityder för miljön, och att bli förebilder både hemma och ute i samhället. Några lärare var medvetna om vikten av att integrera miljöfostran i de ämnen de undervisade, andra inte.

Angående hur miljöfostran skulle integreras i undervisningen infördes lärarnas förslag i tre kategorier, det vill säga integrerad som ett självständigt ämne, integrerad i skolämnena som speciella teman, och integrerad i ett fåtal skolämnen. Några lärare var av den åsikten att miljöfostran skulle få status som *eget skolämne*, som vilket annat traditionellt skolämne som helst, eller just för att det är livsviktigt för eleverna, eller för att dess innehåll skulle kunna täckas på ett uttömmande sätt. Enligt andra lärare borde miljöfostran *integreras i de olika skolämnena* som teman för att göra undervisningen effektiv och undvika en tidsmässig överbelastning. Om det rör sig om ett tema inom ett skolämne försäkrar man sig om att det faktiskt undervisas, eftersom alla teman i kursplanerna effektivt undervisas för att se till att eleverna klarar slutexamineringen. De lärare som föreslog att miljöfostran skulle *integreras enbart i ett fåtal skolämnen* gjorde det på basis av hur innehållet överensstämmer eller skiljer sig från ämnesinnehåll eller är relaterat till innehållet i miljöfostran.

Undersökningen av lärarnas undervisningspraktik i miljöfostran fokuserade på lärarnas kompetenser, deras faktiska undervisning i olika ämnen, de undervisningsmetoder och hinder för undervisningen de möter, liksom på deras förslag till hur undervisningen i miljöfostran skulle kunna förbättras.

Lärarnas kompetens i undervisning av miljöfostran är en mycket viktig faktor för ett effektivt genomförande av miljöfostran i skolan. Några lärare medgav att de var kompetenta när det gällde grundkunskaper eller att de självständigt lärt sig nya saker eller fått kunskap genom fortbildning på arbetsplatsen. Andra lärare upplevde ändå att miljöns ständigt föränderliga natur samt en olämplig utbildning var faktorer som gjorde att de inte kände sig kompetenta att genomföra miljöfostran i skolan.

Lärarna integrerade miljöfostran som ett *ämnesinnehåll* eller som en *resurs för lärande*. Det undervisades som separata teman, som ett integrerat innehåll eller som innehåll för att utveckla speciella färdigheter i ett ämne. När det å andra sidan användes som en resurs för undervisning och lärande, använde lärarna material från omgivningen samt miljön som en kontext för lärande. Det här sättet att arbeta visade att lärarna hade ett bredare perspektiv på miljöfostran.

Undervisningsmetoderna beskrevs med begrepp som *metoder där eleven är delaktig* och *metoder där eleven är mindre delaktig*. De lärare som angav att de använde metoder där eleverna var delaktiga betonade vikten av att underlätta elevdeltagande, förstärka elevernas tankeförmåga och förstärka samarbetet mellan eleverna, medan de lärare som använde sig av metoder med lägre elevdelaktighet fokuserade på själva undervisningen. De använde metoder med

lägre elevdelaktighet för att täcka allt innehåll i kursplanerna, men också för att metoderna är mera lämpliga för stora undervisningsgrupper.

Även om lärarna betonade vikten av att undervisa miljöfostran i skolan, framkom några aspekter som hindrade dem från att inkludera det i undervisningen. Hinder de nämnde var faktorer som var *relaterade till läroplansgrunderna* och *undervisnings- och lärandeprocesser* samt *lärarrelaterade faktorer*. Lärarna menade att kursplanerna är oklara, eftersom de inte visar exakt vilket innehåll miljöfostran ska medföra till de ämnen i vilka de undervisar. Det är följaktligen upp till den enskilda läraren att bestämma. Tiden som avsatts för varje period är också för kort för att planera in sådana aktiviteter som eleverna skulle kunna göra ute i närmiljön. Bland undervisnings- och lärandefaktorerna bekymrades en del lärare av de stora gruppstorlekarna och bristen på undervisningsmaterial. När undervisningsgruppen är stor är den svår att kontrollera, speciellt om man planerar att undervisa utomhus. Det är också svårt att syssla med miljöundervisning i frånvaro av undervisningsmaterial och läromedel, i synnerhet textböcker. Bland de lärarrelaterade faktorerna betonades bristen på sakkunskap och bristande stöd från kolleger och administrationspersonal, liksom avsaknaden av utbildning i miljöfostran. Några lärare menade att bristen på sakkunskap skulle kunna avhjälpas med stöd av kolleger och administrationspersonal. De poängterade att de behövde fortbildning och undervisningsmaterial för att förbättra sin undervisning. Det fanns också förslag om att uppmuntra lärare att tillverka sitt eget undervisningsmaterial i ett led att förbättra undervisningen i miljöfostran.

Diskussion av forskningsmetoder och resultat

Jag använde mig av fenomenografi och fenomenologi i undersökningen eftersom den eftersträvade att visa både hur ett fenomen uppfattas av lärarna och vilken erfarenhet de hade av att förverkliga det i klassrummet. Därför var en metod inte tillräcklig för att besvara alla forskningsfrågor (Creswell, 2008). Vad kan man lära sig av forskningsmetoderna i den här undersökningen? Kombinationen av de båda metoderna har gjort det möjligt att erhålla omfattande data kring hur lärare uppfattade integreringen av miljöfostran i skolans undervisning och hur de faktiskt undervisade i klassrummet. För att försäkra validiteten och reliabiliteten i resultaten användes även djupintervjuer. Metodtriangulering garanterades genom att använda observationer i klassrum som ytterligare en metod för datainsamling.

Vad kan sägas om lärarnas uppfattningar av integreringen av miljöfostran i undervisningen och deras förverkligande av den? De flesta av lärarna fokuserade på tillägnandet av kunskap och färdigheter när det gällde miljöfostran och hållbar utveckling. Det här avspeglar lärarnas förväntningar på utbildningen och syftet med skolan (Chatzifotiou, 2006). En del lärare fokuserade dock på utvecklingen av färdigheter som behövs för att lösa miljöproblem och uppnå en hållbar utveckling. Ingen av dem koncentrerade sig på miljöfostran som lärande *i* miljön. Detta var förväntat eftersom de metoder de använde var lärarcentrerade, vilket placerar läraren som förmedlare av kunskap. Eftersom lärares uppfattningar av miljöfostran kan påverka deras sätt att genomföra den i

praktiken, är det viktigt att lärare utvecklar klara begrepp för miljö och miljöfostran, hållbar utveckling och undervisning för hållbar utveckling.

Lärarna insåg vikten av miljöfostran i skolan, men uppfattade den samtidigt som en utmaning. De föreslog att man genom forskning borde få fram ett bättre sätt att kunna tillämpa integreringen av miljöfostran i skolans läroplan. Miljöfostran borde inkluderas i läroplansgrunderna som ett eget ämne, eller som ämnesinnehåll i de olika skolämnena, alternativt i ett fåtal ämnen. Läroplansgrunderna i Tanzania är ämnesindelade och kursplanerna utgörs av ämnesinnehåll som ska behandlas i undervisningen. Förslag om att integrera miljöfostran i de olika ämnena som nytt ämnesinnehåll stöder Flaw och Merdiths (2007) syn på integrering som en strategi för att klara av ett överfullt tidsschema. Förslagen om att miljöfostran endast skulle integreras i ett fåtal ämnen betonar det faktum att miljöfostran anses ha en naturvetenskaplig inriktning, och skulle därför inkluderas i naturvetenskap och geografi (van Petegem, 2007).

Resultaten tyder också på att lärarna varken är speciellt välutbildade i miljöfostran (Lindhe, 1999) eller deltog i kurser av professionell utveckling i undervisning av miljöfostran. Därför bör undervisningen av miljöfostran inkluderas i styrdokumenten för lärarutbildningen. Lärarutbildningsprogrammen bör ändå inte vara normativa eller specifika. De borde förbereda lärare att bli analytiska och kapabla att tänka kritiskt, och därmed kunna anpassa sig till olika typer av ändringar i miljö och skola.

När det gäller undervisningsmetoder framhöll en del lärare att de använder sig av metoder där eleverna är delaktiga, medan andra medgav att de fortfarande använder traditionella, lärarcentrerade metoder i sin undervisning av miljöfostran. Ändringen från lärarcentrerade till elevcentrerade metoder är en nyligen tillkommen utbildningsreform i Tanzania och den kräver tid och övning. Dessutom, undrar också Valvus (2009), hur lärare kan använda elevcentrerade och aktiverande metoder i överfulla och otillräckligt utrustade klassrum. Traditionella sätt att undervisa är effektiva i skolor med begränsade resurser (Guthrie 1990). För att få lärare att ta till sig metoder med större elevdelaktighet, borde lärarna få hjälp med att hitta metoder och anpassa dem till olika kontext.

Klyftan mellan ord och handling, som finns när det gäller genomförandet av miljöfostran i skolan, är ett resultat av de hinder lärarna möter på vägen. Några av hindren innefattade oklara kursplaner, tid, stora grupper, otillräckliga undervisningsmaterial och läromedel, brist på utbildning och bristande stöd från kollegiet. För att ta bristande kollegialt stöd som exempel visar lärarna hur viktiga kollegerna är, eftersom de gör det möjligt för lärare att dela idéer och lära av varandra som ett led i sin professionella utveckling. Skolorna kunde planera in och ordna möjligheter för lärare att dela med sig av både teoretiska och professionella idéer.

Hur kan man förbättra undervisningen i miljöfostran i skolan? Beträffande behovet av fortbildning ansåg lärarna att det var viktigt för dem att ha användbar kunskap för att kunna genomföra undervisningen i miljöfostran. Det här kan uppnås genom lärarutbildning och lärarfortbildning, Tyvärr utgår man från att lärare kan förverkliga nya innovationer i klassrummet utan att ha fått någon utbildning eller ens handledning. Hur kan det ens vara möjligt, eftersom

läroplansgrunderna är centralt fastslagna, men beslutet om vad miljöfostran innehållsmässigt ska innebära lämnas dock över på den enskilda läraren? Vad gäller behovet av undervisningsmaterial och läromedel förespråkar lärarna att de behöver tillgång till lärarhandledningar och textböcker. Problemet med brist på, eller total avsaknad av undervisningsmaterial, i synnerhet böcker för eleverna, är en kritisk fråga i de flesta tanzaniska skolor, eftersom lärarna ser textböckerna som källor till den godtagna kunskap som ska hjälpa eleverna klara av de avslutande examensproven. Så utan dessa böcker känner sig lärarna hjälplösa.

Resultatens betydelse i bredare kontext

Forskning har utförts för att skapa information som kan användas för att förbättra undervisning och lärande i miljöfostran på lågstadiet. Även om resultaten av föreliggande undersökning kan bidra till diskussionen på ett flertal områden, kommer två av dem att ligga i fokus. De är läroplansutveckling och lärarutbildning.

Resultaten verkar bekräfta att integreringen av miljöfostran på lågstadiet inte är något lärarna har klart för sig hur den ska göras. Lärarna i Tanzania är vana vid detaljerade läroplansgrunder, och om de inte är sådana blir chanserna små för att miljöfostran ska kunna förverkligas på det sätt man avsett. Därför borde de involverade i läroplansutvecklingen omarbeta det angreppssätt de använder för integreringen av miljöfostran i läroplansgrunderna för skolan. Framtiden för miljöfostran är beroende av de lärare som kan omsätta i praktiken det som står i läroplansgrunder.

Lärare, och i synnerhet blivande lärare, anses vara mycket viktiga för spridningen och genomförandet av miljöfostran på grund av den möjlighet de kan ha att sprida sitt kunnande (Powers, 2004; van Petegem et al., 2005). Men undersökningen har visat att största delen av lärarna saknar den kunskap som behövs för att undervisa miljöfostran på ett integrerat sätt i de ämnen de undervisar. Hur kan de sprida och förverkliga en kunskap de inte besitter? Den här situationen föranleder ett krav på lärarutbildningen att utarbeta sakliga utbildningsprogram, både för lärarstuderande och verksamma lärare, som kan hjälpa dem i deras arbete med miljöfostran.

Sammanfattande tankar

En meningsfull undervisning i miljöfostran behöver inkludera undervisning *om*, *i* och *för* miljön. Fokus ligger på att hjälpa eleverna att utveckla kunskaper, färdigheter och positiva attityder till miljön. I Tanzania har det angreppssätt man använt sig av för att inkludera miljöfostran i läroplanerna inneburit en integrering i de existerande skolämnena. Det här innebär att miljöfostran ska undervisas i alla skolämnen.

Trots vikten av undervisning och lärande i miljöfostran verkar det använda angreppssättet marginalisera miljöfostran på lågstadiet, eftersom kunskaper om och färdigheter i relation till miljöaspekter inte finns explicit utskrivna i kursplanerna för de olika ämnena. Vidare är lärarna inte utbildade för att praktiskt konkretisera den planerade miljöfostran i skolorna. Resultatet av detta är att de inte vet vad de ska undervisa om, och hur. För att garantera en effektiv

miljöfostran i skolan, föreslår jag att resultaten av denna undersökning noga begrundas av intressenterna i miljöfostran, och då i synnerhet av dem som arbetar med läroplansutveckling, men också av lärarutbildare och lärare i allmänhet.

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Appendix 1. A Profile of the participants in the study

School	Teachers	Professional qualification	Sex: M/ F	Teaching experience in years	Subject(s) Teaching	Class
A Rural	Kyeku	Gr A	F	20	Pre-School	Pre-School
	Manka	Gr A	F	20	Science	VI
	Aziz	Gr. A	M	17	Social Studies	VII
	Meya	Gr. A	M	10	Geography	IV
	Kinara	Gr. A	M	15	Science	VII
	Ksheru	Gr. A	F	21	Kiswahili Language	VII
	Klenga	Gr. A	F	14	Science	II
	Sina	Gr. A	M	13	English Language	VII
	Mapia	Gr. A	F	07	English Language	III
	Shani	Gr. A	M	06	Vocational Skills	VII
B Rural	Mangowi	Gr. A	F	05	Geography	V
	Mark	Gr. A	M	07	Maths	VII
	Hai	Dip.	F	12	Personality and Games	IV
	Heri	Gr. A	M	06	Mathematics	VI
	Furaha	Gr. A	F	03	English Language	V
	Chaka	Gr. A	M	30	Science	V
	Wamo	Gr. A	F	04	Kiswahili Language	III

Urban	Bite	Gr. A	F	30	Mathematics	III
	Mwasu	Gr. A	F	03	Vocational Skills	IV
	Muso	Gr. A	M	01.5	Science	VII
	Kaji	Gr. A	M	05	Maths	VII
	Kasi	Gr. A	F	03	Geography	V
	Salase	Gr. A	F	05	Science	IV
	Retha	Gr. A	F	29	Maths	IV
	Subira	Dip.	F	15	English	V
	Tunu	Gr. A	F	18	Vocational Skills	II
D Urban	Pai	Gr. A	M	07	Mathematics	IV
	Pesa	Gr. A	F	06	English Language.	IV
	Fremo	Gr. A	M	17	Mathematics	VII
	Pazi	Gr. A	M	26	English Language.	VI
	Sinta	Gr. A	F	31	Science	I & II

Appendix 2

Examples of environmental education components in different subjects

Subject	**Standard/ Grade**	**Subject Topics**	**EE Content that can be taught in the topic**
Social Studies	III	–Basic needs of the Family –Roles of the family and how they contribute to environmental conservation –Our culture –Serving the community –Our school and its environment	• Sources of water, fuel wood, building materials • Caring for family resources like land, sustainable ways of cultivation and animal keeping • Cultural practices that enhance or inhibit environmental conservation • Taking care of community resources • The school environment and how to green it
Science	III	–Living things –The gases –Electricity	• Living things that can be found in our environment and their interrelationships and interdependence • Importance of the different gases in the atmosphere, air pollution and its effects. • Alternative sources of en-

			ergy and energy conservation.
Vocational Skills	IV VII	–Basketry –Theatre arts and music (Drama and traditional dances)	• Sustainable use and harvesting of basketry materials. • Alternative materials for basketry • Significance of baskets in environmental conservation. • Composing plays and traditional dances for environmental awareness raising and environmental conservation.
Mathematics	I & II IV	–Whole numbers	• Using things in the environment to learn about whole numbers. • Measuring and calculating areas or perimeter of different areas
English and Kiswahili	VI &VII I, II & III VII	–Reading and comprehension –Structure –Composition	• Environmental education passages for teaching language skills • Teaching structure using the environment – naming things, comparisons, sentence building • Environmental education topics for composition writing

Source: Primary School Syllabi for Social Studies, Science and Vocational Skills, English, Maths (2005)

Appendix 3

Interview Guide for Teachers

A Personal Data of Teachers

School:……. Subject Teaching: …… Class: ……..

Gender: …… Teaching experience…….. Educ. Level……

Previous training in the Teaching of EE:

……

B Interview Guide Questions

Research Question 1: What are teachers' perceptions of environmental education and education for sustainable development?

1. What do you understand by environment?
2. What do you understand by environmental education?
3. What is sustainable development?
4. What do you understand by the concept of education for sustainable development?

Research Question 2: What are teachers' perceptions on the integration of environmental education into primary school education?

1. Do you think the teaching of environmental education is important in Tanzania? Give reasons for your answer.
2. What things do you think learners need to know about their environment?
3. Are there any environmental education topics in your subject? Do you think there is adequate coverage of EE in the subject that you teach?
4. Are the environmental education topics stated as separate topics in your subjects? If not, how do you identify them from the syllabus?

5. Do you find it easy to identify them in every topic? If no, give reasons.
6. What do you perceive as the ideal way of including EE into the school curriculum?

Research question 3: What are teachers' practices in integrating environmental education into their teaching?

1. Do you think that you are competent in teaching environmental education? Do you have adequate knowledge and skills of teaching EE in your subject?
2. How do you include environmental education content in your daily teaching?
3. What methods do you use in teaching EE in your subject? Why do you use them?
4. Apart from classroom teaching, how else do you involve your pupils in learning EE?
5. What barriers do you face in implementing EE in your subject?
6. How do you think the teaching of EE in the primary schools can be improved?

Appendix 4

Lesson Observation Guide

A. Teachers' personal information

Subject……. Class…….. No. of Pupils…….

Gender: …… Age: …….Teacher's experience: ……. Educ. Level …

Previous training in the Teaching of EE:

……

B. Details of the lesson

Topic:

Was the topic related to environmental education? Yes/no…

If not, how were environmental aspects addressed in the topic?

Environmental education content:

What was the environmental education content brought up in the lesson?

Knowledge of subject matter:

How knowledgeable was the teacher about the environmental education content which he/she taught?

Involvement of pupils:

How did the teacher involve the pupils in the lesson?

Teaching/learning materials:

What kind of teaching/learning materials did the teacher use?

Assignments:

What kind of assignments did the teacher give to the pupils?

Were they related to environmental aspects?

Post-observation questions

a. To what extent do you think you have been successful in integrating EE components in your lesson?
b. Do you use outdoor experiences to teach your lessons? Yes/No Give reasons for your answer.
c. Do you use the school environment in teaching the content of your subject? Give some examples.
d. What challenges do you face in your day to day classroom practice in teaching environmental education?

Environmental education has been considered a vehicle for facing a situation of increasing environmental challenges. In Tanzania, environmental education has been integrated into primary education from the 1990s. However, teaching environmental education in the classroom has not been a success because it has not been an easy task for teachers to implement it. This raises questions such as what are teachers' perceptions of environmental education, how do teachers perceive the way environmental education has been integrated into the primary school curriculum, and what are the teaching practices in the teaching of environmental education?

This study has attempted to answer these questions by carrying out investigations among primary school teachers. The findings of the study reveal that teachers have different perceptions of environmental education. In addition, the approach which has been used to integrate environmental education into the curriculum is not clear to most teachers. Above all, when it comes to the actual teaching of environmental education, they fail to employ the methods which are appropriate for teaching environmental education due to a number of barriers.

It is anticipated that the study findings can contribute to curriculum development in terms of rethinking how best environmental education can be integrated into the curriculum, and to teacher education in terms of planning both pre-service and in-service teacher training.

Åbo Akademi University Press
ISBN 978-951-765-560-6

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2011