PRIMARY SCHOOL PUPILS' ACHIEVEMENT OF KENYA'S ENVIRONMENTAL EDUCATION OBJECTIVES AND EFFECTS OF PUPILS' ATTITUDES ON ACHIEVEMENT IN ENVIRONMENTAL EDUCATION IN CENTRAL DIVISION, NAROK NORTH DISTRICT

EGERTON UNIVERSITY LIBRARY

BY

SAMMY M. MUTISYA

A Thesis

Submitted to the Graduate School in Partial fulfilment of the Requirements for the Award of the Degree of Master of Education (Science Education) of Egerton University.

EGERTON UNIVERSITY

EULIB
036 763

2013/94836

November 2008

DECLARATION AND RECOMMENDATION

DECLARATION

I hereby declare that this is my original work and has not been submitted or published for any award of a degree or diploma in this or any other university.

Sign..... Date 26/11/2008

Sammy M. Mutisya (EM14/0966/03)

RECOMMENDATIONS

This work has been submitted for examination with our recommendation as University supervisors.

Sign..... Date 26th November 2008

Prof. J. G. Mwangi

Sign..... Date 2/12/08

Prof. F. N. Keraro

EGERTON UNIVERSITY LIBRARY

2013/94836

EGERTON UNIVERSITY LIBRARY
- 1 APR 2 1
P.O. BOX 536, EGERTON
AFRICANA SECTION

COPYRIGHT

© 2008

Sammy Muteti Mutisya

All rights are reserved. No part of this thesis may be reproduced or transmitted in any form by any means or mechanical, including photocopying, recording or any information storage or retrieval system, without express permission in writing from the author or Egerton University.

DEDICATION

I dedicate this work to my wife Sarah and children Olive, Millie and Carson.

ACKNOWLEDGEMENTS

I am grateful to God who has given me energy to carry out this study. I also extend my gratitude to the Teachers Service Commission for granting me the study leave and Higher Education Loans Board for paying for my studies. I acknowledge authorization by the Ministry of Education to carry out this study in Central Division, Narok North District.

I am indeed indebted to Professor John Gowland Mwangi and Prof. Fred Keraro both of Egerton University who were my supervisors. I would like to thank them for their support, guidance and counsel during the study. I also wish to thank head teachers of the 16 primary schools in Central Division, Narok North District for allowing me to carry out the study in their schools. I do wish to thank the pupils who participated in this study.

I also acknowledge the assistance of Godfrey Nato and Joseph Misati who introduced me to Statistical Package for Social Sciences (SPSS) computer package. I extend my gratitude to colleagues and students from Egerton University who gave me moral support. I am deeply indebted to my entire family members for their support and encouragement throughout the period of carrying out this study. Finally, I take full responsibility for any errors or omissions in this thesis.

ABSTRACT

Kenya's survival as a nation depends on how well we manage our natural resources. Young people should be educated on environmental management and hence the need to evaluate their understanding of what they are expected to know and their attitudes towards the environment. The study evaluated the achievement of Kenya's Environmental Education (EE) objectives by primary schools and determined the effects of pupils' attitudes on their achievement in EE. Descriptive and correlational research designs were used. Simple random sampling procedures were used to select 276 pupils. Pupils' Environmental Education Achievement Test (PEEAT), Pupils' Environmental Education Questionnaire (PEEQ) and Pupils' Environmental Education Attitude Questionnaire (PEEAQ) were used for data collection. The instruments were validated by 5 experts. Reliability co-efficient of 0.82 and 0.81 were obtained for PEEAT and PEEAQ respectively. Pearson product moment correlation was used to analyze quantitative data while content analysis was applied on qualitative data. Statistical significance was tested at alpha is equal to 0.05. The study concluded that most of the EE objectives stated in the primary school curriculum were achieved. Pupils were aware of environmental degradation going on in their environment and the causes of some of the environmental problems. Pupils were also aware of the effects of the environmental problems and the solutions to some of them. The study further concluded that pupils' attitude towards the environment was positive. It was also concluded that the relationship between pupils' attitude towards the environment and achievement in EE was positive and significant at the 0.05 level. It is recommended that teachers approach EE interdisciplinary and focus on local environmental issues. It is further recommended that teachers encourage learners to participate in social action that address local environmental issues. Teachers should also help learners develop positive attitudes towards the environment. Since pupils are aware of some of the environmental degradation and have positive attitude towards the environment, they should be used to solve environmental problems and in management of natural resources. Education authorities should also monitor implementation of EE and in-service teachers on interdisciplinary approaches in teaching of EE. KNEC officials should further give EE more weight in examinations.

EGERTON UNIVERSITY LIBRARY

TABLE OF CONTENTS

DECLARATION AND RECOMMENDATION ii
COPYRIGHT iii
DEDICATION iv
ACKNOWLEDGEMENTS v
ABSTRACT vi
TABLE OF CONTENTS vii
LIST OF TABLES xi
LIST OF FIGURES xii
LIST OF ACRONYMS AND ABBREVIATIONS xiii

CHAPTER ONE 1
INTRODUCTION 1
1.1 Background of the Study 1
1.2 Statement of the Problem 2
1.3 Purpose of the Study 3
1.4 Objectives of the Study 3
1.5 Hypothesis 3
1.6 Significance of the Study 3
1.7 Scope of the Study 4
1.8 Assumption of the Study 4
1.9 Definitions of Terms 5

CHAPTER TWO 8
LITERATURE REVIEW 8
2.1 introduction 8
2.2 Environmental Education in Pre-colonial Era in Kenya 8
2.3 Origin of Environmental Education 9
2.3.1 The Tbilisi Declaration 10
2.3.2 The 1992 Rio Earth Summit 11

2.4 The Orientation of Environmental Education in Formal Education Sector 13
2.5 Challenges for Curriculum and Pedagogy in Environmental Education 13
2.6 Competences in Environmental Education 15
2.7 Pluralistic Views in Environmental Education 16
2.8 Rationale for Environmental Education 17
2.9 Approaches to Teaching Environmental Education 20
2.10 Environmental Education Teaching Learning Process 25
2.11 Issue-Based Learning in Environmental Education 26
2.12 Concept of Environmental Education 29
2.13 Sustainable Development 31
2.14 Education for Sustainable Development 32
2.15 Environmental Management Policies in USA 33
2.16 Environmental Management Policies in Kenya 34
2.17 Development and Environment 36
2.18 Theoretical Framework 39
2.19 Conceptual Framework 41

CHAPTER THREE 42
RESEARCH METHODOLOGY 42
3.1 Introduction 42
3.2 The Research Design 42
3.3 Population 42
3.4 Sampling Procedures and Sample Size 43
3.5 Instrumentation 45
3.5.1 Validation 46
3.5.2 Estimation of Reliability 47
3.6 Data Collection Procedures 48
3.7 Data Analysis 48

CHAPTER FOUR 50
RESULTS AND DISCUSSION 50

4.1. Introduction....50
4.2 Awareness of Environmental Degradation....50
4.2.1 Interpretation and Discussion of Results....53
4.3 Awareness of Causes of Environmental Degradation....54
4.3.1 Interpretation and Discussion of Results....58
4.4 Identification of Effects of Environmental Degradation....60
4.4.1 Interpretation and Discussion of Results....63
4.5 Pupils Solutions to Environmental Degradation....66
4.5.1 Interpretation and Discussion of Results....68
4.6 Primary School Pupils Attitudes Towards the Environment....69
4.6.1 Interpretation and Discussion of Results....69
4.7 Relationship between Pupils' Attitudes Towards the Environment and their Achievement in Environmental Education Test....70
4.7.1 Interpretation and Discussion of Results....70

CHAPTER FIVE....72
SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS....72
5.1. Introduction....72
5.2 Summary....72
5.3. Conclusions....72
5.4 Implications on Current Practice....73
5.5 Recommendations....73
5.5.1 Recommendations for further research....74

REFERENCES....75

APPENDIX A: PUPILS' ENVIRONMENTAL EDUCATION QUESTIONAIRRE (PEEQ)....82
APPENDIX B: PUPILS' ENVIRONMENTAL EDUCATION ACHIEVEMENT TEST (PEEAT)....87

APPENDIX C: PUPILS' ENVIRONMENTAL EDUCATION ATTITUDE QUESTIONNAIRE (PEEAT) 93
APPENDIX D: RESEARCH AUTHORIZATION APPENDIX E 100
APPENDIX E: PERMISSION TO CONDUCT RESEARCH 101
APPENDIX F: 102
STANDARD 8: ENROLMENT CENTRAL DIVISION PUBLIC PRIMARY SCHOOLS 102

LIST OF TABLES

Table 1: Tbilisi Objectives for Environmental Education 10
Table 2: Key Trends in EE. 28
Table 3: Accessible Population 43
Table 4: Accssible School Populatin 43
Table 5: Sampled Schools 44
Table 6: Sample Size 45
Table 7: Item Difficulty Index and Discrimination Index 47
Table 8: Method Used to Test the Null Hypothesis 49
Table 9: Wanton Destruction of Forest 51
Table 10:Main Sources of Water Used in Homes 51
Table 11: Quality of Water Used in Homes 52
Table 12: Standard of Cleanliness of Narok Town 52
Table 13: Human Activities Destroying Forest 55
Table 14: Human Activities Polluting Water Sources 56
Table 15: Human Activities Lowering standards of Cleanliness of Narok Town 57
Table 16: Common Solid Wastes Found In Narok Town 57
Table 17: Effects of Forest Destruction 61
Table 18: Problems Associated With Poor Solid Waste 62
Table 19: Diseases Associated With Lack of Clean Drinking Water 63
Table 20: Solutions to Forest Destruction 66
Table 21: Solutions to Poor Waste Disposal 67
Table 22: Correlation between Pupils Achievement in Environmental Education Concept Test and Pupils Attitudes Towards the Environment 70

LIST OF FIGURES

Figure 1: Interdisciplinary approach.....22
Figure 2: Multidisciplinary approach 23
Figure 3: Problems arising from the development Process 37
Figure 4: The poverty cycle.....38
Figure 5: Environmental education as a process of active learning 40

EGERTON UNIVERSITY LIBRARY

LIST OF ACRONYMS AND ABBREVIATIONS

AFEW	African Fund for Endangered Wildlife
ARCPS	Action Research and Community Problem Solving
CBO	Community Based Organisation
CEE	Council for Environmental Education
CITES	Convention on International Trade on Endangered Species
EE	Environmental Education
ESD	Education for Sustainable Development
DESD	Decade of Education for Sustainable Development
EMCA	Environmental Management and Coordination Act
ENSDA	Ewasongiro South Development Authority
KIE	Kenya Institute of Education
IEEP	International Environmental Education Programme
IUCN	International Union for Conservation of Nature
KNEC	Kenya National Examination Council
MDG	Millennium Development Goals
MOE	Ministry of Education
NEAP	National Environmental Action Plan
NEMA	National Environment Management Authority
NGO	Non Governmental Organisation
PEEAT	Pupils Environmental Education Achievement Test
PEEAQ	Pupils Environmental Education Attitude Questionnaire
PEEQ	Pupils Environnemental Education Questionnaire
PIC	Prior Informed Consent
POP	Persistence Organic Pollution
SCAA	Schools Curriculum and Assessment Authority
UNCCD	United Nation Convention to Combat Desertification
UNCOD	United Nation Conference on Desertification
UNEP	United Nation Environmental Programme

UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNCED	United Nation Conference on Environment and Development
WCED	World Commission on the Environment and Development
WCOP	World Conference of Organizations of the Teaching Profession
WWF	World Wide Fund for Nature ConservationS

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Environmental problems have tremendously increased at the global, regional and local levels during the last few decades. Issues related to environmental problems have become a major concern for the international community particularly for educational policy makers and curriculum developers. Several measures and strategies have been considered for intervention. Among these is the use of the school curriculum to create public awareness on the need for environmental preservation and protection.

One of the most challenging objectives of education is to produce people who are aware of their environment (Tsuma, 1998). Tsuma indicates that man's environment includes the abiotic factors such as land, water, atmosphere, climate and the biotic factors such as animals, micro organisms as well as social factors. He further observes that we need environmental education so that our actions do not spoil the environment for others.

Tsuma (1998) further argues that EE is an important tool for solving various environmental problems caused by human activities. He adds that EE creates environmental awareness among communities since it is conducted in both formal and informal settings. Tsuma suggests that EE contributes towards increased appreciation about value of all resources and the need to manage these resources sustainably and rationally. Korir (1987) notes that without environmental education people would continue to mismanage and destroy the environment on which their existence depends. According to Laddawan and Joan (1987), primary school children are at an age when important attitudes can be formed and encouraged thus EE is expected to have more impact in primary schools.

The Koech Commission of Inquiry into the Education System of Kenya recommended teaching of environmental education in both primary and secondary schools (Republic of Kenya, 1999). KIE (2002) states that the objectives of environmental education in Kenya's primary schools should be to develop positive attitudes about the environment, to manage and conserve available resources, and to develop awareness and appreciation of the environment.

To this end, environmental education (EE) has been integrated and infused interdisciplinary at all levels of education in the 8-4-4 system of education in Kenya. This includes primary school education where environmental education has been infused in science and social studies. Environmental values have also been integrated in english, mathematics and creative art. In the Kenyan context, the importance of creating environmental awareness at the primary school level is emphasised by the fact that for a greater majority of citizens, primary school education is terminal. Therefore, primary education would help in creating environmental awareness, which would go along way in reducing threats to human survival.

Environmental education has also been strengthened in schools through co-curricular activities such as wildlife clubs, Boys Scouts and Girl Guides (NEAP, 1994). Despite the inclusion of environmental education in subjects taught at schools and in co-curricular activities, no evaluation has been undertaken to assess whether primary school pupils were achieving the EE objectives in the curriculum. This study sought to evaluate the achievement of primary schools EE objectives and effects of pupils' attitudes on achievement in EE.

1.2 Statement of the Problem

The earth's resources have supported life for thousands of years. Nevertheless, today the earth's resources face serious environmental challenges which are created by human beings struggling to meet basic needs namely food, water, clothing and shelter (Muthoka, Rego & Rimbui 1998). The United Nations Millennium Development Goal (MDG) number 7 states that United Nation member states should integrate principals of sustainable development into their policies and programmes to ensure environmental sustainability (Wikipedia, 2008c). Without environmental education people will not look for solutions to environmental degradation and conserve their environments and hence no likelihood of achieving this MDG. Children must acquire knowledge, skills and attitudes on environment in the early years of development or be at risk of never developing them (Wilson 1994). The objectives of EE in primary schools in Kenya are to acquire knowledge, skills, attitude and commitment to actively participate in solving environmental problems (KIE, 2002). Kenya's survival as a nation depends largely on how well we manage our natural resources in a sustainable manner. It is important for the young people to have the necessary environmental education and hence the need to evaluate their understanding of what they are expected to know and their attitude towards the environment. The study evaluated the achievement of Kenya's EE objectives by

primary schools in the target area and determined the effects of pupils' attitudes on their achievement in EE.

1.3 Purpose of the Study

The purpose of this study was to evaluate achievement of environmental education objectives by primary schools in Central Division Narok North District. The study also determined the effects of primary school pupils' attitudes on achievement in environmental education

1.4 Objectives of the Study

The study was guided by the following objectives:

a) To determine whether primary school pupils can identify environmental degradation taking place in their environment.

b) To determine primary school pupils' awareness of causes, effects and solutions to environmental degradation taking place in their environment.

c) To determine primary school pupils' attitudes towards the environment.

d) To determine the relationship between primary school pupils' attitudes and achievement in environmental education.

1.5 Hypothesis

$H_0$1 Primary school pupils' attitudes towards the environment are not significantly related to their achievement in environmental education.

1.6 Significance of the Study

The study generated information on the level of achievement of Kenya's environmental education objectives by primary schools in the target area. It further generated information on the effects of primary school pupils' attitudes on their achievement in EE. The findings may assist primary school teachers to evaluate their teaching methods and come up with effective and innovative interdisciplinary approaches in teaching of EE. Primary school teachers may also use these findings to encourage learners to actively participate in relevant social action to address local environmental issues. Teachers may further use these findings to assist pupils develop positive attitude towards management of natural resources. The findings may also

assist the MOE quality assurance officials in making decisions on monitoring implementation of EE in primary schools and also in-servicing of primary school teachers aimed at strengthening achievement of EE objectives by Kenya's primary schools. KNEC officials may also use the findings of the study to make decisions on whether to give EE more weight in examinations.

1.7 Scope of the Study

The study involved primary school pupils in Central Division of Narok North District. Standard 8 pupils were chosen for this study because they had been exposed to the entire primary school curriculum and had covered content in environmental education. Environmental education in Kenya's primary schools is interdisciplinary and has been infused in subjects like science and social studies and integrated in mathematics, english and kiswahili. The study evaluated pupils' awareness of environmental degradation in their environments and pupils' attitudes towards the environment. Muthoka, Rego and Rimbui (1998) argue that knowledge about the environment and positive attitude towards environment provide a foundation to bring about development of desired environmental skills. The environmental problems covered by this study are deforestation, water pollution and garbage mismanagement. Pupils' awareness of causes, effects and solutions to these problems were also studied. Pupils were expected to have interacted with these environmental problems in their environments. The study also covered effects of primary school pupils' attitudes towards the environment on achievement in environmental education.

1.8 Assumption of the Study

In this study, it was assumed that the pupils were to be honest and co-operative in providing the required information when filling in the questionnaires. It was also assumed that all the pupils had been exposed to the entire primary school curriculum.

1.9 Definitions of Terms

For the purpose of this study the following terms were defined:

Achievement: Refers to attainment of planned or intended activities (Macmillan English Dictionary, 2002). In this study it refers to attainment of primary schools' environmental education objectives. It will be measured using Pupils Environmental Education Concept Achievement Test (PEEAT).

Afforestation: Refers to converting an area into a forest through planting of trees (AFEW, 2006). The same meaning is applied in this study.

Agroforestry: Refers to a farming practice involving growing of trees and crops together (AFEW, 2006). The same meaning is applied in this study.

Approach: Refers to a set of very broad guidelines on how to plan action or process in education (Muthoka, Rego & Rimbui, 1998). In this study it refers to the teaching methods used in teaching EE.

Biodiversity: Refers to total diversity of life forms on earth includes diversity of ecosystems, plants and animals (AFEW, 2006). In this study it refers to the different varieties of plant.

Carrier subjects: Refers to subjects that have environmental education topics in the syllabus (KIE, 1997). In this study it refers to science subject and social studies.

Conservation: Refers to the protection and sustainable use of the earth's resources without jeopardizing the ability of future generations to meet their needs (AFEW, 2006). In this study it refers to controlled use of natural resources by man.

Desertification: Refers to degrading a once fertile land and initiating a desert (AFEW, 2006). In this study it refers to the process of creating a desert through destruction of forests by man.

Deforestation: Refers to converting an area that was once covered by forest into a bare land by cutting down of many trees (AFEW, 2006). In this study it refers to destruction of forests cutting by man.

Environmental Education: Refers to the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relationships among man, his culture and his biophysical surroundings (UNESCO, 1983). In this study it refers to the process of acquiring knowledge, skills and attitudes that will enable pupils conserve their environment.

Environment: Refers to the natural world, including the land, water, air, plants and animals and considered as something that is affected by human activity (UNESCO, 1983). In this study it refers to the immediate surroundings of the learners.

Environmental policy: Refers to guidelines that govern environmental matters that are prescribed by the governing authorities of a state (Kabeberi, 1991). In this study it refers to laws that control misuse of the environment and its resources.

Environmental degradation: Refers to reduction in quality of the environment caused by effects of human activities in the environment (AFEW, 2006). In this study it refers to destruction of the environment and its resources.

Indigenous: Refers to existing naturally in a particular country, region or environment (AFEW, 2006). In this study it refers to plant and animals that have existed in Kenya and whose origin is Kenya.

Leachate: Refers to toxic waste water usually created when garbage is compacted and sits in land fill for many years (Wikipedia, 2007). In this study it refers to pollutant generated by garbage.

Non-carrier subjects: Refers to subjects that do not have environmental education topics in the syllabus (KIE, 1997). In this study it refers to subjects like English, Kiswahili, Music, Art and Craft.

Perception: Refers to a particular way of understanding or thinking about something (Macmillan English Dictionary, 2002). In this study it refers to the way pupils understood meaning of environmental issues.

Skills: Refers to the ability to do something well as a result of experience or training (KIE, 1997). In this study it refers to the ability to identify and solve an environmental problem.

Sustainable development: Refers to development that meets the needs of the present without compromising the ability of future generation to meet their needs (WCED, 1987). In this study it refers to human activities in the environment which do not lower the ability of environment to meet the needs of the future generation.

CHAPTER TWO

LITERATURE REVIEW

2.1 introduction

This chapter reviews the literature on environmental education. It covers environmental education in pre-colonial era in Kenya, origin of environmental education, the Tbilisi declaration, the orientation of environmental education in formal education sector, the 1992 Rio Earth Summit, challenges for curriculum and pedagogy in environmental education and competences in environmental education. This section also covers the pluralistic views in environmental education, rationale for environmental education, approaches to teaching environmental education and environmental education teaching learning process. This section further covers issue-based learning in environmental education, sustainable development, education for sustainable development, and environmental management policies in USA, environmental management policies in Kenya and development and environment. The theoretical framework and conceptual framework adopted in this study concludes the chapter.

2.2 Environmental Education in Pre-colonial Era in Kenya

According to Otim (1992), African cultural and religious traditions promoted a system that allowed mutual co-existence between human being and nature. Otim further argues that game hunting was very selective, over-cultivated land and overgrazed areas were periodically abandoned to allow regeneration of natural vegetation and rebuild soil fertility before re-use. He concludes that these practices promoted soil and vegetation conservation. Otim also suggests that the use of animal manure and vegetable waste as a source of organic fertilizers promote organic farming. He adds that the use of nitrogen fixing plants in mixed cropping, the growing of plants of different growth patterns and maturity duration helped to stabilize soil fertility and to prevent soil erosion. Otim also indicates that besides indigenous Africans being environmentally conscious and following environmentally friendly agriculture and game cropping practices, they also had a wealth of knowledge about plant characteristics. He observes that peoples' traditional food, norms, cultural and religious belief and taboos played a part in environmental protection and conservation of biodiversity. He adds that traditional practices ensured sustainability and preservation of species. Otim further suggests that African leaders and elites of post-independence are to blame for the destruction of environment because of adopting unsustainable development models, consumerism mentality and greed for wealth from the colonialists. He argues that the introduction of Western

models of land use, neglect and replacement of traditional systems and assimilation of the African elites into the western life-styles had played part in shaping the environmental crisis.

Anderson and Johnson, (1988) state that forces of colonialism disrupted the natural balance which African societies had maintained. In Kenya, European settlers disrupted the ecological balance which Kenyans had maintained for centuries (Otiende, Ezaza & Boisvert, 1991). Otiende, Ezaza and Boisvert suggest that in analyzing the current environmental problems and finding solutions to them, there is need to look back to the past and discover how the environment has been polluted and conserved.

According to Otiende, Ezaza and Boisvert (1991), the use and misuse of the environment created concern in almost all African communities. They argue that African societies would have perished had they not been concerned about environmental conservation. Otiende, Ezaza and Boisvert further state that the concept of environmental awareness was being replaced by environmental education and that this approach was yet to be integrated into everyday thinking and activities of African people. They further argue there were several questions which would still be raised in connection with environmental education. Firstly, what does environmental education represent with respect to managing the environment? Secondly, what must environmental education teachers know and do in order to disseminate the needed knowledge about the environment? Thirdly, how does man adjust himself meaningfully to the ever-changing environment of which he is part? They conclude that Africa should adopt the content of environmental education to focus on their local environment and threats to the local environment.

2.3 Origin of Environmental Education

The origins of environmental education are traced back to the emergence of concerns about global environmental degradation during the 1960s and 1970s. The movement was given a boost when the 1972 United Nations Conference on the Human Environment in Stockholm recommended that environmental education be recognised and promoted in all countries (UNESCO, 1997). In 1975, UNESCO and the United Nations Environment Programme (UNEP) launched the International Environmental Education Programme (IEEP). The programme eventually led to the world's first Intergovernmental Conference on Environmental Education in Tbilisi (USSR) in 1977 (UNESCO, 1978).

2.3.1 The Tbilisi Declaration

The Tbilisi Declaration gave a framework, principles, and guidelines for environmental education at local, national, and international levels, for all age groups, both inside and outside the formal education sector. The three goals of environmental education adopted by 66 member states at Tbilisi were:

- To foster clear awareness of, and concern about, economic, social, political, and ecological interdependence in urban and rural areas.
- To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment.
- To create new patterns of behaviour of individuals, groups, and society as a whole towards the environment.

Source: UNESCO (1978), p. 25.

These goals were supported by five educational objectives: awareness, knowledge, attitudes, skills, and participation (see Table 1).

Table 1

Tbilisi objectives for environmental education

Awareness:	To help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied problems.
Knowledge:	To help social groups and individuals gain a variety of experience in, and acquire a basic understanding of, the environment and its associated problems.
Attitudes:	To help social groups and individuals acquire a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection.
Skills:	To help social groups and individuals acquire the skills for identifying and solving environmental problems.
Participation:	To provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems.

Source: UNESCO (1978), p. 25.

EGERTON UNIVERSITY LIBRARY

The Tbilisi Declaration also referred to the complex interrelationships between human social, cultural, and economic development, and the environment. The aim of environmental education is to make individuals and communities understand the complex nature of the natural and the built environments resulting from the interaction of their biological, physical, social, economic, and cultural aspects. A further basic aim of environmental education is to show the economic, political, and ecological interdependence of the modern world (UNESCO, 1978).

Although these interrelationships were recognized, the Tbilisi statements suggested that protection and improvement of the environment was the ultimate purpose of environmental education. Education was a means to advance environmental goals. The Tbilisi Declaration also suggested that environmental education could facilitate changes to existing methods and practices of education. Environmental education must look outward to the community. It should involve the individual in an active problem-solving process within the context of specific realities, and it should encourage initiative, a sense of responsibility and commitment to build a better tomorrow. By its very nature, environmental education can make a powerful contribution to the renovation of the educational process (UNESCO, 1978).

The Tbilisi Declaration was well-received by many governmental policymakers, academics and environmentalists in member states. However, the immediate impact of Tbilisi on policy and practice in the formal education sectors of most countries was below expectation. Environmental education was seen as a high scientific, social, and political priority by scientists, environmentalists, and academics. Nevertheless, Environmental education was not seen as an educational priority by those responsible for determining policy and curriculum within the formal education sector (Gough, 1977).

2.3.2 The 1992 Rio Earth Summit

The most significant landmark in redirecting the international agenda for environmental education was the 1992 Earth Summit (UN conference on Environment and Development) in Rio de Janeiro (UNESCO, 1992). Building on the recommendations of the Tbilisi Declaration and the Brundtland report, Agenda 21 of the summit called for the re-orientation of environmental education towards sustainable development. The summit proposed that governments in co-operation with all sectors of society prepare strategies aimed at integrating environment and development as a cross-cutting issue into education at all levels. The

summit also proposed that curricula be thoroughly reviewed to ensure a multidisciplinary approach. The summit further proposed that every school be assisted in designing environmental activity work plans, with the participation of students and staff. The summit concluded that governments should affirm the rights of indigenous peoples by legislation and use indigenous people experiences and understanding of sustainable development to play a part in education and training (UNESCO, 1992).

Influenced by international summits and meetings and the release of documents like Agenda 21, the global literature on environmental education began to embrace the reorientation of environmental education towards education for sustainability (Tilbury, 1995). Agenda 21 had major policy impacts in many countries, including within the education sector, as governments sought to respond to their Earth Summit obligations. References to sustainable development became increasingly common in the national curricula of countries where governments had direct influence over curriculum (Gough & Scott, 2001).

The mid to late 1990s saw high-level policy and curriculum changes in many countries which seemed to acknowledge a global re-orientation towards environmental education for sustainability. However, concerns were raised that the implications of these changes for policy, curriculum, and practice in the school sector were still not well-articulated (Tilbury, 1995). According to Tilbury four key components of the reoriented environmental education are sustainable development issues, socially critical education, participatory processes and partnerships for change.

There is a widespread view that these concepts have generally failed to take root in most environmental education in schools (Rauch, 2002, Starling, 2001 and Tilbury, 2001b). It has been argued that the goals and aims of environmental education are irreconcilable with existing structures of schooling (Stevenson, 1987), or at the least, challenge deep-seated concepts of knowledge, learning, and the disciplines (Benedict, 1999). By the same token, environmental education has been identified as a potential breeding ground for innovation and educational reform in schools (Elliot, 1999; Rauch, 2002).

2.4 The Orientation of Environmental Education in Formal Education Sector

While environmental education continued to struggle to secure a place in formal education systems, the attentions of UNESCO and other international drivers of environmental education policy turned during the 1980s and 1990s towards issues of human poverty, economic and social development, and sustainability. In 1980, the Strategy for World Conservation was published (IUCN/UNEP/WWF, 1980). This document added to the view that environmental education would need to be reconceptualised to give greater prominence to the root social, political, and economic causes of environmental problems. It was also the first document to give fluency to the term "sustainability" (Tilbury, 1995).

The World Commission on Environment and Development (Brundtland report) focused specifically on the needs and interests of humans, asserting that all humans should be able to achieve their basic needs (WCED, 1987). The report asserted that with appropriate technological and social changes, it was possible to achieve social equity, economic growth, and environmental maintenance. The Brundtland report provided a key statement on sustainable development which was defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. However, sustainable development has been critised as a theoretical concept by some authors (Turner, 1997)

2.5 Challenges for Curriculum and Pedagogy in Environmental Education

The re-oriented environmental education poses significant challenges to curriculum and pedagogy in schools. Tilbury (1995) defines environmental education for a sustainable future as being, relevant, holistic, values-orientated, issues-based, action-orientated and critical education. The action-orientated aspect is the most widely accepted of these six characteristics.

It is often stated that environmental education comprises three dimensions, namely education in the environment, education about the environment, and education for the environment (Lucas, 1979 & Alberg, 2003). The (in, about and for) classification was attempt to categorize the different meanings that had been given to the term environmental education. The concept was picked up readily within the environmental education literature, and it is

often asserted that genuine environmental education only takes place when the real intention is education for the environment

Education for the environment denotes an action-oriented approach where students work towards the resolution of environmental questions, issues, and problems (Fien & Greenall, 1996). Fien (1994) locates this kind of environmental education within the critical theory tradition of education. Critical theory directs (Fien & Greenall Gough, 1996) analysis of environmental problems towards identifying social interests and forces which contribute to, or sustain the degradation of the environment. Critical theory seeks to enable teachers and students to identify and critique the social structures which influence their own and others' thoughts and actions, so that they might make choices that are not constrained by these influences.

A socially critical approach sees environmental education as having a transformative function. Through socially critical environmental education practice, students and teachers may begin to identify and challenge existing structures which contribute to the creation or perpetuation of environmental problems. The critical theory or critical pedagogy approach has wide support in the environmental education literature, although it is not without its critics. Walker (1997) argues that, in the case of environmental education, critical theory is more useful as a way of critiquing practice than changing practice.

Educational researchers have carefully portrayed cases of exemplary practice, theorized about how practice could be improved, and worked with practitioners to implement environmental education in their schools. The key issue, then, is why has research in environmental education had so little influence on the learning and teaching of environmental education in schools? (Walker, 1997). Walker contends that critical theory research approaches in environmental education are inadequate as tools for changing teaching practice because they do not take teachers' own theories about teaching, learning, and curriculum into account, nor do they adequately recognize and accommodate the conditions and constraints of teaching practice. Walker suggests that socially critical environmental education will only be implemented in schools where there is already a coherence between practitioners' constraint structures (including their theories about learning and curriculum), and socially critical environmental education theory. Where there is no such coherence, Walker predicts that

socially critical environmental education will fail to be implemented, because socially critical theory does not provide a mechanism for practitioners to change their theories and practice.

Whether or not Walker's argument is valid, the literature certainly supports the claim that implementing environmental education in schools requires significant changes for teachers, learners, and other partners in the school education. Before reviewing some models that have been proposed to support these changes, it is useful to look further at how contemporary theorists have defined the educational goals of environmental education. Two areas to be noted are the concept of action competence in EE and the growing emphasis on pluralistic views in environmental education.

2.6 Competences in Environmental Education

The Royal Danish School of Educational Studies has articulated a widely influential concept of environmental education to include action competence. This means that students' are able to act with reference to environmental concerns (Breiting & Mogensen, 1999; Jensen & Schnack, 1997). The action competence approach is underpinned by the view that environmental problems are structurally anchored in society, and therefore have to be understood as community issues with conflicting interests at individual, social, and structural levels. Thus, environmental education must help students to identify, expose, and analyze all three levels of conflicting interest, and how they affect the environment, so that they might take actions which address the root causes of environmental issues (Breiting & Mogensen, 1999).

Action competence promotes the idea that the purpose of environmental education is not simply to modify students' behaviour (Jensen & Schnack, 1997). Behaviour-modification approaches are those which seek to influence the behaviour of students in a previously determined direction, without necessarily allowing students to consciously choose whether or how to make a behavioural change. Jensen and Schnack argue that it is not the task of the school to improve the world with the help of pupils' activities.

Environmental education activities must be judged in terms of their educational value, according to educational criteria and not purely environmental criteria. The approach is underpinned by a democratic view of education which argues that its members are not

spectators but participants though not active participants in everything but participants who decide for themselves in what and when they will be involved (Jensen and Schnack 1997).

The action competence approach emphasizes that environmental education must aim at involve students as active participants in all aspects of the environmental education experience. Students must be supported to identify problems, determine solutions, and take action in a way that empowers them to become competent and willing participants in future actions that contribute to the solution or avoidance of environmental problems (Wals, 1994). This means that learners develop an action readiness, ability and willingness to act on any environmental problem at the right time. Wals, Arjen and Albas, (1997) have developed the action research and community problem-solving (AR&CPS) model to support the implementation of action-taking environmental education. This model involves students, teachers, and environmental educators. Each group engages in a process of inquiry and reflection, revolving around an issue that is considered to be relevant by members of the school community.

This means that students investigate a local environmental issue of their own interest (e.g. water quality, school beautification, soil erosion near the school). Teachers investigate ways to improve their own teaching (e.g. working in groups, utilizing community resources, environmental audits) while environmental facilitators who co-ordinate the research investigate contemporary issues in environmental education (e.g. students' perceptions of nature, student empowerment, curriculum design) (Wals, 1994).Trials of the AR&CPS model in schools in the United States and the Netherlands show that the model can be successful, but the process requires much time, energy, and commitment from those involved.

2.7 Pluralistic Views in Environmental Education

A common theme throughout much of the contemporary literature on environmental education is the notion that all those involved in environmental education should be empowered to participate in discussions, voice their opinions, and reflect on their roles throughout the environmental education process. Many authors believe that environmental education itself must be seen as an evolving process, rather than a fixed goal (Tilbury, 2001a), which requires local interpretation and debate (Sauvè, 2002, Scott *et al.*, 1998).

Responsible decision-making in a pluralistic society implies that learners must be capable of interacting with individuals and groups who think or act differently than they do (Lijmbach *et al.*, 2002), and there is a growing focus in environmental education literature on the acceptance and recognition of pluralistic views of both the environment and education .Gough (1997) describes environmental education as not only marginalized within formal education systems, but also an historically marginalizing discourse which has been dominated by western conceptions of the environment. Sauvé (2002) asserts that there are many ways that the environment can be viewed, for example, the environment as nature, as a problem to be solved, or a resource to be managed, or a system to understand, or a community project, and so on.

Environmental education is therefore neither a form of education nor a tool for environmental problem-solving or management. It is an essential dimension of basic education focused on a sphere of interaction that lies at the root of personal and social development (Sauvè, 2002). These multiple ways of viewing the environment each hold implications for education.

2.8 Rationale for Environmental Education

Wilson (1994) indicates that the rationale for environmental education during early childhood years is based on two major premises. The first premise is that children must develop a sense of respect and caring for the natural environment during their first few years of life or be at risk of never developing such attitudes. The second premise is that positive interactions with the natural environment is an important part of a healthy child's development and that such interactions enhance learning and quality of life over the span of one's life time. Wilson further argues that children who are close to nature tend to relate to it as a source of wonder, joy and awe and that their spirits are nurtured by nature and they discover through it sources of human sensibility.

Beaz (1987) argues that lack of awareness of the benefits of conservation and its relevance to everyday concerns prevents the general public from seeing the urgent need to achieve environmental conservation objectives. According to Beaz, ecosystems and species are being destroyed because people do not quite understand the consequences of this behaviour. He states that we are in a period of crisis and that EE must take some bold new steps otherwise man will continue to destroy the environment risking his own existence.

According to Muthoka, Rego and Rimbui (1998), natural resources are finite and capable of being destroyed by wrong use. They observe that although the earth has continued to support life for thousands of years, today it is facing serious environmental challenges which are created by human being struggling to meet daily needs for food, water, clothing and shelter. They further argue that the future of life support systems is threatened by careless human activities which result in pollution of resources, pressure from increasing human population and unrestrained destruction of wildlife habitats.

Muthoka, Rego and Rimbui (1998) blame education for the dilemma the world has found itself in since it perpetuates development, and so it should take up the challenge and help evolve a new type of development that is sustainable by the environment. According to Swaminathan (1987), EE holds the key to sustainable development. He suggested that without educating people on problems facing the environment they will not look for solutions and take action which can have an enduring impact on environmental conservation. He concludes that educational institutions should take the lead in the launching and guiding the management of natural resources.

According to Otim (1992), management of solid waste poses one of the greatest challenges to urban authorities in Africa. Otim states that the major type of solid waste generated in urban areas include household wastes and commercial refuses. According to Muthoka, Rego and Rimbui (1998), Kenya's high potential districts are under stress due to human pressure. They observe that soil erosion has led to diminished agricultural yields. They further indicate that use of fertilizers and pesticides had various negative impacts on the environment and that destruction of water catchment areas has resulted in high rate of surface run-off, increased soil erosion, river floods and land slides.

Muthoka, Rego and Rimbui (1998) argue that human recklessness has rendered the earth incapable of supporting life due to mismanagement of natural resources. They observe that resources are diminishing very fast or rendered useless due to wide-spread environmental degradation. They site extinction of species, deforestation, and pollution of land, oceans, rivers, seas and lakes as some of the environmental problems requiring immediate action. They add that conservation of natural resources seeks to avoid undesired changes and loses of natural resources while advocating sustainable use and accountability on the part of all the users of available natural resources. They further suggest that if conservation is achieved and

maintained, it would ensure that resources continue to serve the users for a long time without threat of depletion, degradation and extinction. Muthoka, Rego and Rimbui conclude that natural resource conservation could be achieved through responsible human behaviour and change of attitude towards the available natural resources. This can be realized through environmental education.

Muthoka, Rego and Rimbui (1998) observe that misuse of natural resources warn of a possible ecological disaster and decline in life support resource base. They recommend that there is an urgent need to create the necessary awareness that would indicate and strongly emphasize the sustainable use of the available resources. They add that poverty, famine, natural disasters, diseases, abuse of the natural resources have serious repercussion on the environment. They conclude that lack of environmental awareness, human greed and unfavorable attitudes are threatening the natural resources to their extinction. However, since natural resources are very crucial to any form of socio-economic development, the call is to develop modes of behaviour that will ensure sustainable utilization of all the available resources for now and for future need. Thus the need for environmental education.

Akumu (2005) observes that climate change is the greatest environmental challenge facing human beings today. Akumu further states that the earth is becoming warmer due to the green house gas effect and that if the current trend of green house gas emissions continues unabated, the results are likely to be catastrophic. According to Akumu climate change will be experienced more in semi-arid regions which will become hotter and drier with less predictable rainfall. Kenya is one such region with semi arid conditions. Akumu observes that diseases like coughs, conjunctivitis, pneumonia, diarrhea are related to drought. Akumu further states that floods are responsible for infrastructure damage, lose of lives and property and increase in diseases such as malaria, typhoid and cholera.

Wikipedia (2007) observes that the immediate and long-term consequences of deforestation are loss of biodiversity and climatic disruption. Wikipedia observes that because of deforestation the world is losing 100 plant species daily. Wikipedia further argue that because of deforestation there is increase in carbon levels and other greenhouse gases in the atmosphere which has led to increase in temperature and change in climate and weather.

According to Tsuma (1998), pollution is largely caused by human activities such as industries, Agriculture, constructions and mining among others. Tsuma observes that chemicals used in Agriculture are carried by rain water to the rivers, lakes and seas affecting the water. Tsuma further argues that most fertilizers that are used on farms are non-biodegradable and stay in soil for a long time. He adds that these fertilizers are normally washed into water sources causing pollution. He further states that this pollution results in death of aquatic animals, over growth of water plants which leads to disappearance of water masses. Tsuma also sites disposal of organic waste, oils and chemicals from industries as a serious source of local pollution. He concludes that gases such as carbon monoxide and sulphur oxide from motor vehicles and industries also contributed to environmental degradation.

Akumu (2005) observes that forests are a vital resource for our development and their destruction spells doom for Kenya's plan to industrialize by the year 2020. She observes that poor and low income people depend on forests for their fuel needs and to hunters and gatherers, forests are a source of food while to forest dwellers forests provides shelter. According to Akumu, indigenous forests protect water catchment areas and conservation of biodiversity. She further states that Kenya's forests have been degraded and reduced from 3.0 percent to 1.7 percent of total land area since 1963. Akumu concludes that these situations paint a bleak picture for developing countries such as Kenya because extra financial resources will be required in order to cope with impacts of climate change. To stop these environmental problems from going on, environmental education should be the way forward for all countries.

2.9 Approaches to Teaching Environmental Education

Muthoka, Rego and Rimbui (1998) states that an approach is a set of very broad guidelines on how to plan action or a process in education. Wilson (1994) explained that EE should begin with focus on learners' own experiences in the environment. He further observes that teachers should provide frequent positive experiences outdoors because children learn best through concrete experiences. They should, he adds, focus on experiencing versus teaching because young children learn through their interaction with the environment and self-initiated activities, hence the role of the teacher should be that of a facilitator. He suggests that teachers should demonstrate a personal interest in and enjoyment of natural world and that should model caring and respect for the natural environment.

According to Hines, Hungerford and Tomera, (1986) many curriculum documents and journal articles begin with assumption that the goal of EE is to inculcate environmentally responsible behaviour. They further argue that although responsible environmental behaviour is necessary, it is insufficient as a purpose of environmental education. They suggest alternative approaches based on developing the critical thinking, reflection and environmental skills should be emphasized.

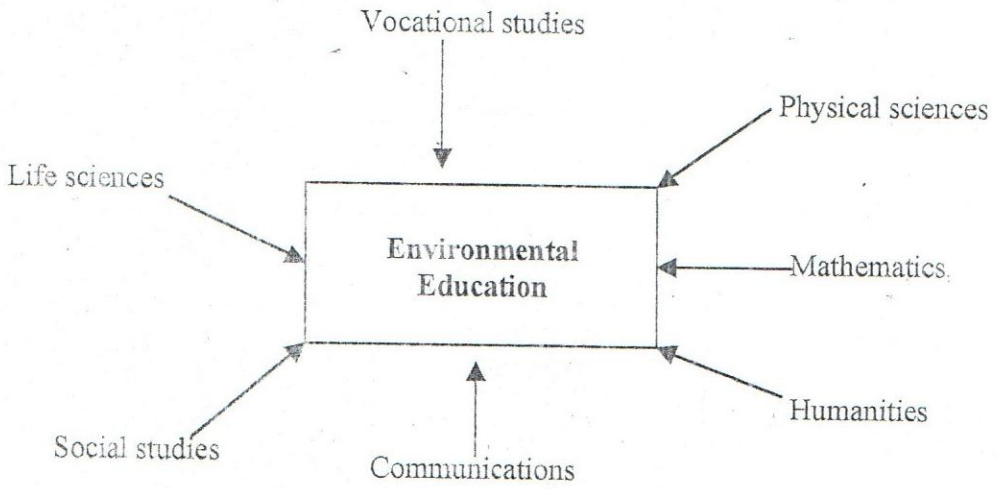
Greenall (1991), observe that most schools are not involved in transformative EE and instead are incorporating environmental content into their existing curriculum without considering environmental problems in learners' local environment. Greenall argue that much of what seems to be going on in schools under the guise of environmental education appears as current affairs topics such as the green-house effect and the depletion of the ozone layer. Little is done to empower the students to address the issues and resolve the problems. Greenal states that schools should engage themselves in social actions that are being undertaken by other community agencies in a particular environment. Greenall conclude that, in general, the emphasis given to EE in schools has been on the environment rather than education. Much Australian and international literature concerning environmental education asserts that it should adopt a critical approach to encourage awareness of the local environment and the environmental problems affecting the communities (UNESCO, 1980).

According to Ngumy (2001), selection and use of teaching methods are aimed at creating awareness, enhancement of knowledge and development of attitudes and skills as well as making education learner-centred. Since EE is a practical subject, it should inculcate knowledge, skills and attitudes that will help improve the quality of the environment (Ombech, 1991). Otiende, Ezaza and Boisvert (1991) suggest that the approach to environmental education must differ in content when it is taught in developed and developing countries. They observed that EE in Africa ought to determine the role played by traditional education in environmental management. They add that this calls for restructuring of the school curricula so that the role of cultural and social-economic conditions can be taken into account. The Kenyan primary school curriculum has made attempts to contextualise content of EE cover Kenya's environmental problems. Nevertheless the role played by traditional education in environmental management is incorporated.

EGERTON UNIVERSITY LIBRARY

Otiende, Ezaza and Boisvert (1991) observe that in Kenya, attempts have been made to introduce two approaches to environmental education. One is based on integrating environmental education in the existing curriculum and the other involves teaching environmental education as separate course especially at the University level. Ombech (1991) argues that the interdisciplinary approach presupposes a thorough knowledge of the various concepts in the disciplines being linked. Ombech further indicates that in interdisciplinary approach two or more disciplines are expressed in terms of their interrelationships. He adds that this method requires re-orientation and re-articulation of the various disciplines and subjects involved.

Bennaars, Otiende and Bosvert (1994) point out that an inter-disciplinary approach should be planned with a lot of emphasis on both theoretical and practical involvement of the learners. Bennaars, Otiende and Bosvert further argue that pupils should participate in solving environmental problems in their immediate environment. Students and teachers should actively seek to improve the (local) biophysical and social environment while engaged in an interdisciplinary process (DiChiros & Stapp, 1986). According Rugumayo (1987), environmental problems arise as a result of multi-faceted activities of man and nature. Hence EE must be based on an inter-disciplinary approach. Each school subject contributes in some way to the realization of the objectives of environmental education as figure 1, illustrates (UNESCO – UNEP 1986).



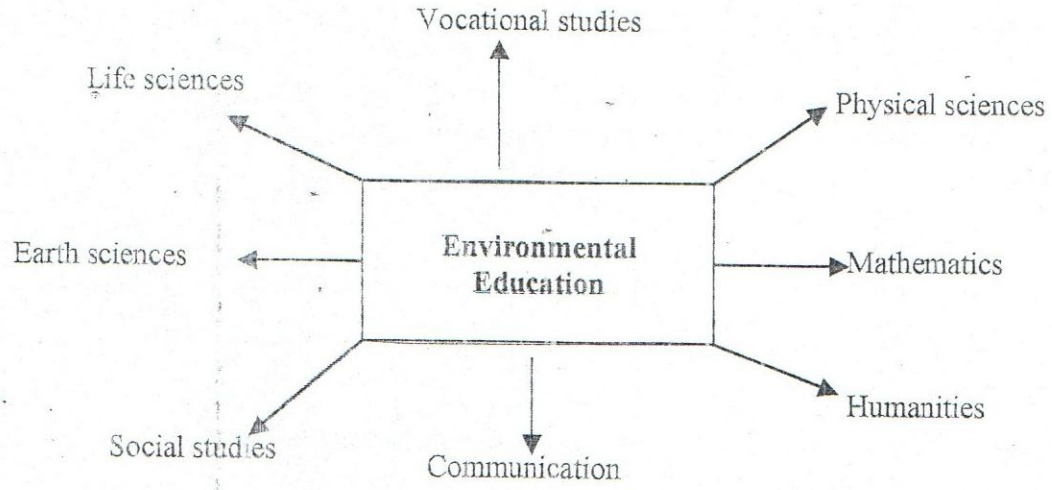
Source: UNESCO – UNEP 1986, EE Series

Figure 1: Interdisciplinary approach to EE.

EGERTON UNIVERSITY LIBRARY

The interdisciplinary approach implies that environmental components from various disciplines are brought together to form one subject. This approach is easy to implement because teachers are able to organize knowledge, concepts and principals systematically (WWF, 2001). WWF further states that with interdisciplinary approach evaluation is easy especially when examinations are used as instruments of measurement. Nevertheless, the necessary focus on local aspects may be lost in this approach since the approach may ignore learners' local environment. Moreover, a subject approach to EE fragments- learners' experience and knowledge and deprives them the opportunity to link one subject with another and apply their knowledge as a holistic unit. WWF argue that criticism of these approach includes overcrowded timetables and also that the teachers of EE face difficulties when incorporating purpose, content and approach from a number of subjects of various disciplines.

In the multi-disciplinary approach, EE components are infused or integrated into relevant disciplines (UNESCO-UNEP, 1986). Environmental concepts, skills and values are incorporated into the subjects taught at school. (Muthoka, Rego & Rimbui, 1998). In the Kenya's primary school curriculum environmental concepts and skills have been infused in carrier subjects like science and social studies while environmental values have been integrated in non-carrier subjects like languages, music, art and graft (Ngumy, 2001). According to Ombech (1991) in multidisciplinary approach, subjects use the environment as a resource for their teaching. All subjects are linked through EE as figure 2 illustrates (UNESCO – UNEP 1986).



Source: UNESCO – UNEP 1986, EE Series.

Figure 2: Multidisciplinary approach to EE.

Ombech (1991) observes that the appropriateness of the multidisciplinary approach depends on the nature of the learners and the learning resources available. Ombech concludes that teachers using this approach need to have a very wide background of general knowledge and some special training.

The multidisciplinary approach is where environmental education is infused into already existing subjects (mainstreaming) (WWF, 2001). This means that environmental aspects are given special attention without being isolated from the rest of the curriculum. One of the merits of this model is that it is flexible and adaptable because it allows overlaps between subjects and permits broad coverage across disciplines. What is taught can easily be adapted to local settings and in that way meaningful and relevant to the pupils. Moreover, it does not demand more room in the school timetables and curriculum. On the other hand, it requires well-trained teachers with skills in linking components of knowledge from various subjects. Nonetheless, teachers may not incorporate environmental issues if it means extra work on their part and EE aspects may not be included in the examinations of different subjects if it is regarded as having little importance by the subject teachers.

To this end, EE has been integrated in primary schools in Kenya through Kiswahili, English, Mathematics and Creative art subjects. According to Otiende Ezaza and Boisvert these approaches are strongly supported by the Kenyan government, United Nations Environmental Programme (UNEP), the International Union for Conservation of Nature (IUCN) and the World Conference of Organizations of the Teaching Profession (WCOP). EE should also involve learners in planning their learning experiences, utilizing diverse learning environments and a broad array of education approaches to teaching/learning and focus on current environmental situations (UNESCO, 1978).

Ngumy (2001), states that environmental education is so important that it cannot be left to a few teachers in schools. He suggests that EE topics or messages should be infused in every subject in school curriculum. Ngumy argues that infusion of EE topics or messages depends on the nature of the subject whether it is a carrier or a non-carrier subject. Ngumy obseves that carrier subjects are those subjects that have EE in the syllabus while non-carriers are subjects that do not have EE topics in the syllabus. Infusion is done in carrier subjects while integration is done in non-carrier subjects.

According to KIE (2002), primary school teachers should infuse and integrate EE in the subjects taught at primary schools. Nevertheless, the ability of the teachers to integrate and infuse EE into the curriculum is a major concern. Teachers are expected to be creative and incorporate EE messages in the lesson (Ngumy, 2001). Graham (1987) argues that attempts to innovate must take account of key features of the educational systems as a whole since if curricula are centralized and assessed by national examinations, infused or integrated subjects are likely to be rejected if they are not given same examinations status. Environmental education values are supposed to be integrated in non-carrier subjects in Kenya's primary schools. However, integrated EE is not assessed by KNEC and hence teachers may not be integrating EE into the non-carrier subjects.

2.10 Environmental Education Teaching Learning Process

Knamiller (1987) argues that in third world countries rural children study industrial air pollution rather than the effects of open fires in houses, electricity and gas as energy source instead of firewood and cow dung. These draw the learners away from their own local environment and their own everyday behaviours that influence their environment. He suggests that teachers should develop locally based learning units. He further states that localization of EE is affected by centralized education systems with their common syllabuses and examinations. Thus some teachers may not be teaching the environmental problems in learners' environment but the ones listed in the syllabus.

According to Knamiller (1987), in developing countries knowledge is emphasized at the expense of acquisition of environmental skills. This is due to pressure on the teachers to get through syllabuses that are knowledge based. Knamiller further argue that pupils do not carry out projects in schools, which places emphasis on learning of skills. Graham (1987) argues that questions asked in school examinations in developing countries test factual recall, rather than comprehension or application of skills. This encourages rote learning of factual information and places little emphasis on the relevance of such teaching to the students' own lives. Graham indicates that classroom teaching in developing countries tends to be characterized by a formalistic didactic style and that most teachers had limited education and training. Knamiller argues that teachers are unsure of the subject matter, hence are frightened of deviating from the syllabus or asking of questions by the students.

Muthoka, Rego and Rimbui (1998) argues that EE use lecture, excursion, project work and nature trail as the teaching methods. In lecture method learners are given facts by the regular teacher or guest speakers. Excursion or field trips are used for investigating the environment. Muthoka, Rego and Rimbui further argue that teachers should utilize the local environment to create meaningful learning encounters for their learners and emphasis for excursions should be on observation, measuring, analyzing and synthesizing information, while project work should relate to community problems, be action-oriented and relevant to environmental issues. The nature trail should be organized to raise interest in the local environment, as a result of development and modern technology. She outlines experiments, debates, simulation and games as other effective methods of EE, while films on specific topics, models, posters and slides as teaching aids to be used. She argues that in the problem solving approach, learners are made aware of existing environmental issue and they scrutinize the causes, effects, ways and means of resolving the problems associated with the issues and preventing new ones. Learners draw a plan of action to solve the particular environmental issue.

According to Kinyua et. al. (2002), there is a major problem in the integration of environmental education in primary school subject since it lacks well-implemented in-service training programmes for both primary school teacher educator and primary school teachers. They also argue that the primary teacher education syllabus does not guide the tutors on the methodology and resources to use when teaching EE. Kinyua et. al. states that the methodology used in teaching EE in primary school teacher education are ineffective in creating awareness and attitude change to achieve permanent behavioural changes. The primary school teacher educators are unable to use effective teaching methodologies due to congested curriculum, lack of awareness and exposure to EE, lack of tutor teaching guides, large classes and lack of learning resources. Thus the primary school teacher education is not equipping primary school teacher trainees with appropriate EE teaching skills that could enable them integrate and infuse EE in their teaching subjects.

2.11 Issue-Based Learning in Environmental Education

According to Graham (1987), there is wide spread agreement that environmental concerns should be taught in schools of developing countries to provide students with knowledge and understanding of environmental conservation and to influence their behaviour. However, unless educators have some understanding of the context of third world schooling, attempts to reform are likely to be frustrated. Graham argues that even if schools do effectively teach

about environmental issues, there is a likelihood of such teaching not influencing student's behaviour outside the school. He states that students do not perceive the relevance of school knowledge to their every day lives and even where the school environmental education knowledge is explicitly related to the local environment, it often conflicts with indigenous knowledge and felt needs hence the need for issue-based learning or socially critical EE.

In socially critical EE environmental education is a collaborative effort among local communities, schools, and other actors who reveal their interest in solving local environmental issues (Palmer 1998). Palmer suggests that socially critical education calls for critical construction of knowledge and concrete action at the local level through co-operative learning. Socially critical education appreciates the value of different systems of knowledge, including local knowledge systems in the critical construction of knowledge and also focuses on collaborative learning, which offers a wide spread spectrum of choices for collective decision-making and problem solving for a given environmental issue.

Walker (1997), Robbotom and Hart (1994) and Sauve (1996) have suggested that criteria for socially critical EE is that it should involve students, teachers, and community agencies in collaborative investigation of the real environmental issues in their immediate environment. According Walker, Robbotom and Sauve, schools should work with communities to develop a new critical awareness of the roles that communities play in influencing the course of such environmental issues and that investigations should make explicit the values and interests of various groups and should use local knowledge system. They further suggest that investigations should be driven more by the nature of the unfolding of the environmental issue rather than by prior commitment to teaching of a body of knowledge and skills.

According to Palmer (1998) recent trends in EE encourage collaborative and community based informal learning to tackle local environmental issues. Palmer has reviewed these trends in EE (see Table 2) and has concluded that the world's most successful programmes in the 21st century are those in which formal and informal elements of education are supported alongside each other, with the involvement of major stakeholders.

Table 2:

Key Trends in EE.

Decade	Focus	Areas of Interventions
1960s	Nature Study	Learning about plants and animals under the physical systems that support them.
	Fieldwork	Led by experts with a particular academic focus (biology, geography etc)
1970s	Outdoor/adventure education	Increasing use of the natural environment for first hand experiences.
	Field studies centres	Growth of field and environmental outdoor education centers for developing awareness through practical activity and investigation.
	Conservation education	Teaching about conservation issues.
1980s	Global education	A wider vision of environmental issues.
	Development education	The political dimension of EE
	Values education	The clarifying of values through personal experience.
	Action research	Community problem solving. Pupil-led problem solving, involving fieldwork.
1990s	Empowerment	Communication, capacity building, problem solving and action, aimed at the resolution of socio-environmental problems.
	Education for sustainable future.	Participatory action. Relevant approaches to changing behaviours and resolving ecological problems.
	Community of partners/ collaborative learning.	Students, teachers, NGOs and politicians working together to identify and resolve socio-ecological problems.

Source: Palmer, (1998).

This vision of collaborative learning is congruent with a socially critical approach to EE. Palmer (1998) also reviewed the inadequate impact of formal school-based EE programmes and concludes that other influences and experiences in peoples' lives are more powerful and significant and yet formal EE school programmes tend to ignore them. People often gain

these formative experiences informally during their interaction with environment and their societies. He indicates that local knowledge system is key in shaping significant life experiences particularly among rural communities. Palmer suggests that future EE programmes need to recognize and build upon prior knowledge and life experiences and that these programmes should recognize the importance of knowledge gained through living and interacting in communities for effective conservation and sustainability of natural resources.

Issue-based learning (IBL) is appropriate because every community has diverse environmental problems that should be investigated into the school curricula (Young and Maggs, 1987). According to Khensani (2000), issue-based learning is advantageous because it deals with real issues that are taking place in the learners' immediate environment. Hence both learners and teachers become aware that they can contribute to the environmental problems taking place in their immediate environment and can also solve the environmental problems. Nevertheless, Khenisani further argue that IBL can also have disadvantages such as teachers being seen to be imposing their views on the learners, some learners may feel uncomfortable when environmental problems which they or their family members directly contribute are discussed and that there is danger of teachers being seen as reactionaries, anti-development and insensitive to the poor.

This approach can be used effectively in non-formal and in adult education (Ombech, 1991). According to Ombech, IBL involves action by the entire community including the schools towards the solution of the environmental problem. At the national level, IBL approach involves identification of community problems, development of an appropriate curriculum, training of teachers and evaluation of the environmental education curriculum. However, national curriculums that are geared towards passing of examination are a major impediment to the implementation of IBL in Kenya's primary schools. Teachers only expose their learners to the contents of the syllabus which is tested in national examination ignoring learners and the community environmental concerns.

2.12 Concept of Environmental Education

Environmental Education is defined as the process through which learners are made aware of, and develop concern about the environment and its related problems. EE leads to acquisition of knowledge, attitude, skills, commitment, motivation and determination to individually and collectively solve environmental problems (Wals & Stapp, 1989). According to Fien (1993),

three broad, but overlapping conceptions of EE are education about the environment, education through the environment and education for the environment Education about the environment involves knowing about and understanding the natural and built environments, and also appreciating the key social, political, ecological and economic factors that influence decision making on local, national and global environmental issues. Nonetheless the integration of natural and social systems is often neglected in programmes of education about the environment (Fien, 1993). Robbotom (1982) and Huckle (1985) indicate that there has been a marked tendency for subjects traditionally associated with teaching about the environment, to focus on ecological concepts and technical solution to environmental problems at the expense of their human causes and of the changes in social systems necessary for solving them. Fien concludes that the effects of human life-style on environmental degradation have not been addressed.

Education through the environment gives learners the opportunity to develop skills in observation, data collection, practical inquiry and investigation, as well as social and cooperative skills, like communication skills and problem solving skills (Fien, 1993). Fien argues that education through the environmental uses students' experiences in the environment as a medium for learning. This approach adds reality, relevance and practical experiences to learning and provides students with an appreciation of the environment through direct interaction with it. It aims at engaging students in exploration and resolution of environmental issues in order to foster value of the new environmental paradigm and promote a lifestyle that is compatible with the sustainable and equitable use of resources. In so doing, it builds on education about and through the environment to help develop attitudes and values that reflect a feeling of a concern for the environment, a sensitive environmental ethic, and the skills for participating in environmental protection and improvement.

Education for the environment involves developing a sense of responsibility for natural and social environments. It deals with people's emotions and their willingness to make lifestyle choices that maintain and improve the quality of the environment. Many environmental educators argue that it is only when the overt intention of a program is education for the environment that effective environmental education is actually taking place (Fien, 1998).

EE has been integrated in the Kenya primary school science curriculum (KIE 2002). According to KIE, environmental education topics covered in the primary school syllabus

include water pollution, effects of water pollution, conservation of water, soil erosion, the environment and component of the environment. The Kenyan primary school teachers should emphasize the three concepts of education (for, about and through) environment when integrating and infusing EE in their teaching subjects. However majority of the primary school teachers may not be aware of these concepts and how to apply them in implementation of EE. In education for the environment, learners should be involved in diverse encounters, dialogue and reflective experiences to foster greater awareness of the environment and environmental conservation (AFEW, 2006).

2.13 Sustainable Development

Wikipedia (2008a) defines sustainable development as a pattern of resource use that aims at meeting human needs while preserving the environment so that these needs can be met in the present and in the indefinite future. According to Wikipedia the term was used by the Brundland Commission which coined the definition of sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Wikipedia further states that sustainable development ties together concern for the carrying capacity of natural systems with the social challenges facing humanity.

In the 1970s sustainability was employed to describe an economy in equilibrium with basic ecological support systems (Stivers, 1976). Wikipedia (2008a) argues that the field of sustainable development can be conceptually broken into three constituent parts, environmental sustainability, economic sustainability and social political sustainability. Fien, (1993) observe that the ecological view of sustainable development is a process which requires use of the environments and resources by one group of people. The use of the environment and resources should not jeopardizing the environments and well being of people in other parts of the world or destroy the capacities of future generation to satisfy their needs and wants. Fien further observes that there are great differences in the availability of resources and their uses around the world. Fien states that misuse and over consumption of resources, mismanagement of waste, poverty and overpopulation are the concerns of sustainable development. According to Fien population growth should be restrained to match the resources and sustainable use of the resources should be the way to go. Fien concludes that poverty should be eliminated because it makes people to over exploit the earth's resource just to survive.

According to Wikipedia (2008a), sustainable development does not focus solely on environmental issues but refers to the interdependent and mutually reinforcing pillars of sustainable development which are economic development, social development, and environmental protection. Nevertheless, Wikipedia observes that indigenous people have argued that there are four pillars of sustainable development the fourth being cultural. Thus cultural diversity is the fourth policy area of sustainable development.

According to Fien (1993), some economic activities by some companies do great harm to the environments, resources and communities. Such economic activities should be made to benefit both the company and the affected communities without damaging the environment. Resources used for manufacture of luxury items should be redirected to aid the poor or be conserved for future generation. Fien concludes that the most effective approach to sustainability is that local communities should organize themselves and collaborate with others locally, nationally and globally in aims of sustainable development.

2.14 Education for Sustainable Development

According to Wikipedia (2008b), Education for Sustainable Development (ESD) is a vision of education that seeks to empower people to assume responsibility for creating a sustainable future. Wikipedia observe that all stakeholders in ESD should understand the vision for sustainability. According to Wikipedia, there are many different stakeholders in sustainable development (i.e., governments, businesses, educational institutions, media, youth, etc). Wikipedia concludes that each of these sectors has a different vision of sustainable development. Some are interested in environmental preservation and protection while others in economic development and still others may be more interested in social development. In addition, how each nation, cultural group and individual views sustainable development will depend on its own values.

United Nations has declared a Decade of Education for Sustainable Development (DESD) starting in January 2005 to 2014 (Wikipedia 2008b). According to Wikipedia objectives of DESD are to facilitate networking linkages, exchange and interaction among stakeholders in ESD, foster increased quality of teaching and learning in ESD, help countries make progress towards and attain the Millennium Development Goals through ESD efforts and provide countries with new opportunities to incorporate ESD into education reform efforts.

The concept of ESD challenges the way most people think about the world today. Economic growth and increased consumption patterns tend to characterize the aspirations of a large proportion of people Wikipedia, 2008b). Wikipedia further observes that ESD aims at challenge these aspirations by encouraging people to imagine a different future and reflect on how their values, beliefs and current behavior might affect their collective ability to realize such a future. Wikipedia concludes that people need to change their view of the purpose of education and that this transformative aspect of ESD makes the concept difficult for many to grasp. Thus, there is a need for proponents of ESD to establish an understanding of the concept of ESD and decide on how they will communicate this to policy makers.

2.15 Environmental Management Policies in USA

According to Kabeberi (1991), the idea of environmental conservation for sustainable development was initially developed in industrialized nations and spread to the third world countries. Kabeberi states that environmental degradation caused by rapid industrialization was most evident in industrialized nations. Kabeberi cites United State of America's provisions for environmental protection that were first expressed in the 19th century with the enactment of the River and Harbour Act of 1889. This Act prohibited the damping of waste material into navigable waterways. However, until the middle of the 20th century, environmental concerns in USA were mostly limited to population control expressed through legislations or ordered by the court (Gad, 1985). Gad states that the Federal Water Pollution Control Act was enacted in 1948 to regulate water pollution in USA and its primary objective was to ensure that states undertook the regulation of water pollution. To strengthen this Act, in 1965, the Water Quality Control Act was enacted to provide for the establishment of water quality standards for inter-state waters. This Act was to be used for combating pollution by the federal agency.

According to Gad (1985), the 1977 Clean Water Act set uniform effluent standards to be met by dischargers of these effluents. The Act required that, first, all states to establish treatment management agencies, second, federal effluent standards be met and enforced and, third, states to set quality standards and provide for their enforcement. The last requirement indicated that before effluents are discharged, a permit should be granted. Gad states that in USA concern for air quality was given legal recognition in 1965 by the Clean Air Act. This Act required that all states were to set air quality standards and make their own plans for

implementing and enforcing them. The 1977 amended Clean Air Act provided for establishment of national primary and secondary air quality standards.

The growing concern over the problem of pollution from solid waste led to the 1965 Solid Waste Disposal Act in USA (Gad, 1985). Despite this enactment, solid waste was considered a lesser problem than air and water pollution but in 1976 the Resource Conservation and Recovery Act was enacted which require the safe disposal of hazardous waste materials and barred open dumping. Gad states that the Atomic Act of 1946 established an Atomic Energy Commission to set standards for radiation protection with regard to nuclear installations in USA. Gad argues that the need for a noise free environment led to the enactment of the Noise Control Act of 1972 which gave the USA Environmental Protection Administrators power to develop and publish criteria on noise, identify major sources of noise and formulate noise emission standards. Kabeberi (1991) concludes that USA, among other developed countries is very much concerned with the environment and has advanced technological means of addressing and managing existing and future environmental problems.

2.16 Environmental Management Policies in Kenya

Environmental governance policies and legislation in Kenya have evolved from global fora such as the UN Conference on Environment and Development (UNCED), held in Rio de Janeiro, Brazil in 1992 (NEMA, 2004). The conference adopted Agenda 21, a global plan of action to achieve sustainable development. NEMA states that at the national level, the National Environmental Action Plan (NEAP) was adopted in 1994, which led to the enactment of Environmental Management and Coordination Act (EMCA) of 1999. Kenya has seventy seven (77) statutes relating to conservation and management of the environment (AFEW, 2006). AFEW observes that despite this legislative framework, destruction of forests still continues. According to AFEW there is need for greater law enforcement and policies that provide sustainable options. According to NEMA (2004), Kenya environmental laws consist of legislations, standards, regulations, institutions and administration adopted to control activities on environmental management. NEMA further states that EMCA provided institutional framework for the management of the environment from the national to the district levels.

Kenya is a signatory to several multilateral environmental agreements that addresses several sectors of the environment (NEMA, 2004). According to NEMA Kenya has ratified the

following multilateral environmental agreements: - Convention on Biodiversity (CBD), UN Convention to Combat Desertification (UNCCD) and the UN Framework Convection on Climate Changes (UNFCCC). NEMA states that other important multilateral environmental agreements include Ramsar Convention, the Montreal Protocol on Substances that Deplete the Ozone Layer, Rotterdam Convection on Prior Informed Consent (PIC), Convention on International Trade on Endangered Species (CITES), and the Stockholm Convention on Persistence Organic Pollution (POPS).

Third world countries have more or less similar environmental problems but each country can only determine priorities after it has assessed the environmental problems as they express themselves in real life (Beaz, 1987). The Kenya government policy is that development should not be at the expense of the natural environment. The government has greatly encouraged the development of EE in the formal school system (KIE, 1997). Environmental management policies in Kenya address the question of environmental protection and socio-economic development as a measure of protecting the environment (Kabeberi, 1991). Kabeberi observes that since independence, Kenya has formulated her own environmental management policies and has established an effective institutional framework to implement these policies. However, forest cover and arable land in Kenya has been reducing since independence due to uncontrolled cutting of trees which has led to low annual rainfall turning arable land into deserts. Rainfall patterns have changed and there has been loss of animal and plant species and disappearance of the rain forests.

Government of Kenya sessional paper No. 10 of 1965 states that practices that harm the physical environment must be curbed through education and legislation (Republic of Kenya, 1965). The 1974 -78 government of Kenya development plan recognized the competing interests in land use as the population increased (Republic of Kenya, 1974). The 1979-83 development plan further stated that environmental consideration must motivate and influence development decisions taken at every level from family to government (Republic of Kenya, 1978). The 1984-88 development plan recognized that there is a need to control human behaviour in order to maintain a proper balance between the nation's development and the protection of the environment (Republic of Kenya, 1984). The 1989-93 development plan stated that there are development activities which, while conferring benefits to individuals and the nation, have the tendency of generating environmental degradation in the

form of soil erosion, gaseous emission, liquid effluent and toxic accumulation from industrial activities, all of which pollute the environment (Republic of Kenya, 1989).

According to Kabeberi (1991) environmental education must be offered at all levels of education within the society if Kenya is to have a conservation minded population. Kabeberi argues that there is no comprehensive law on the environment in Kenya and that what we have is scattered legislation which deals with what may affect the environment. Kabeberi states that the various Acts passed in Kenya were responses to competing interest in the use of natural resources such as forestry, agriculture, Land and water. Another characteristic of this legislation is that they were passed during the colonial period when the administration was primarily concerned with exploiting the environment. Kabeberi further observes that the more recent laws in Kenya provide rules and conditions to be met. They also provide institutional frameworks to enforce those rules and conditions. However, the functions of the administrative bodies sometimes overlap and in some cases the bodies do not agree on certain issues such as the use of a particular resource, for example water or land.

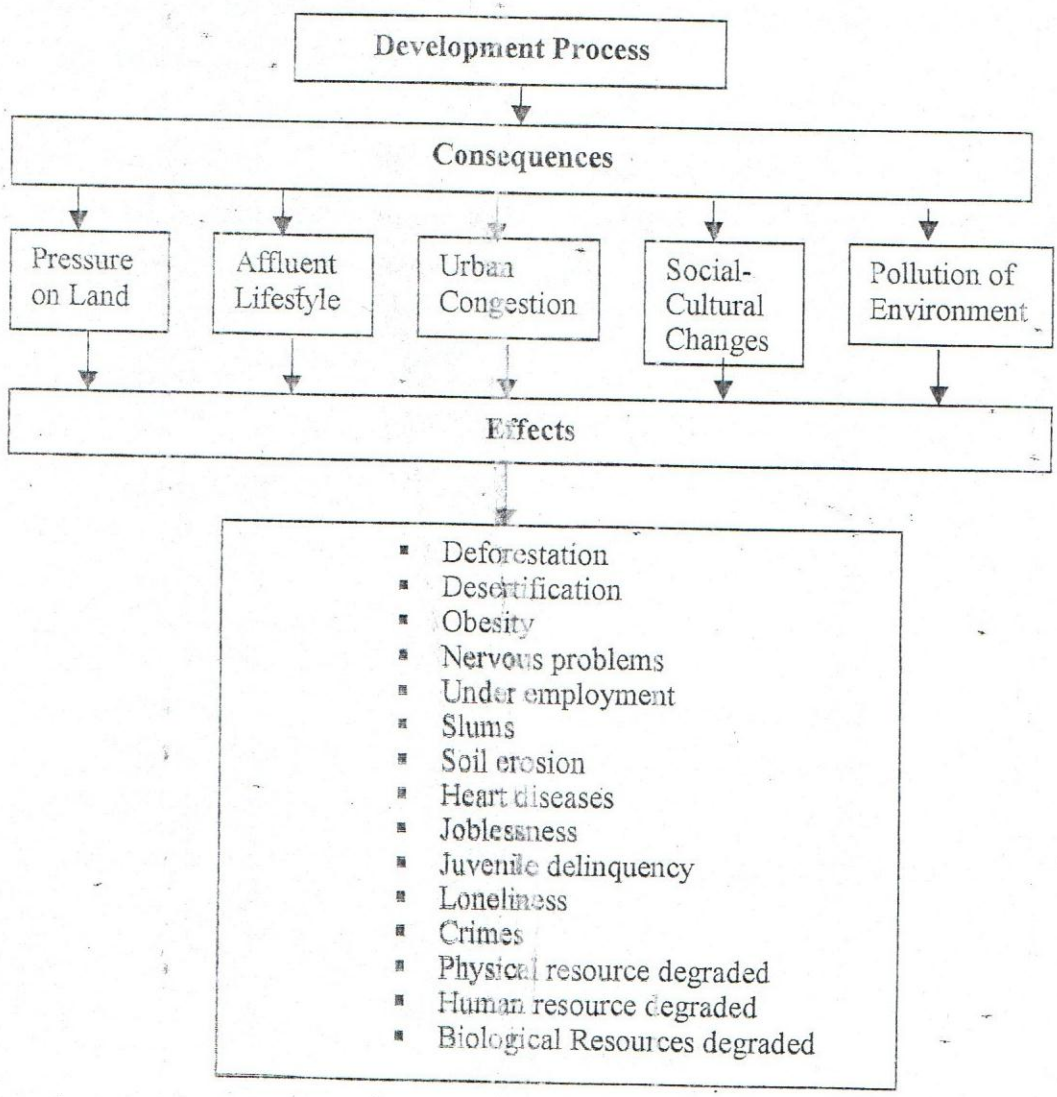
2.17 Development and Environment

According to Orodho (1991), environmental concerns arose in highly industrialized societies where the adverse consequences of many varied practices and technologies which had produced unprecedented affluence of those societies were first evident. He suggests that the problems experienced by the industrially advanced countries had brought about concern with environmental issues. Orodho observes that the creation of large productive capacities in industry and agriculture, the growth of complex systems of transportation and communication and the evolution of massive urban conglomerations have all been accompanied by damage and disruption to the human environment. He further states that those disruptions constitute serious hazards to human health and well-being.

Orodho (1991) identifies some of the negative side effects that can arise out of the process of development in several sectors of the economy as deterioration of mineral, soil and forest resources, biological pollution which is represented by agents of human diseases, animal and plant pests. He also identifies chemical pollution from air pollutants, industrial effluents, pesticides, metal and detergents. Other environmental problems associated with development sited by Orodho include physical disruption in form of thermal pollution, silting and noise and also social disruptions represented by congestion and loss of sense of community.

Orodho concludes that since the side effects of development manifest themselves in process of development, they should be assessed within a framework which helps to establish their relative importance.

The reality of environment and development are closely related (Muthoka, Rego & Rimbui, 1998). They state that environment provides the natural resources for the process of development while the development process modifies resources and environmental quality to meet human needs. Muthoka Rego and Rimbui observe that the goal of both environment and development is to improve human well being. However, the type of development adopted can cause problems that destroy the environment that sustains it and lower the quality of life which it endeavours to enhance as indicated in figure 3.

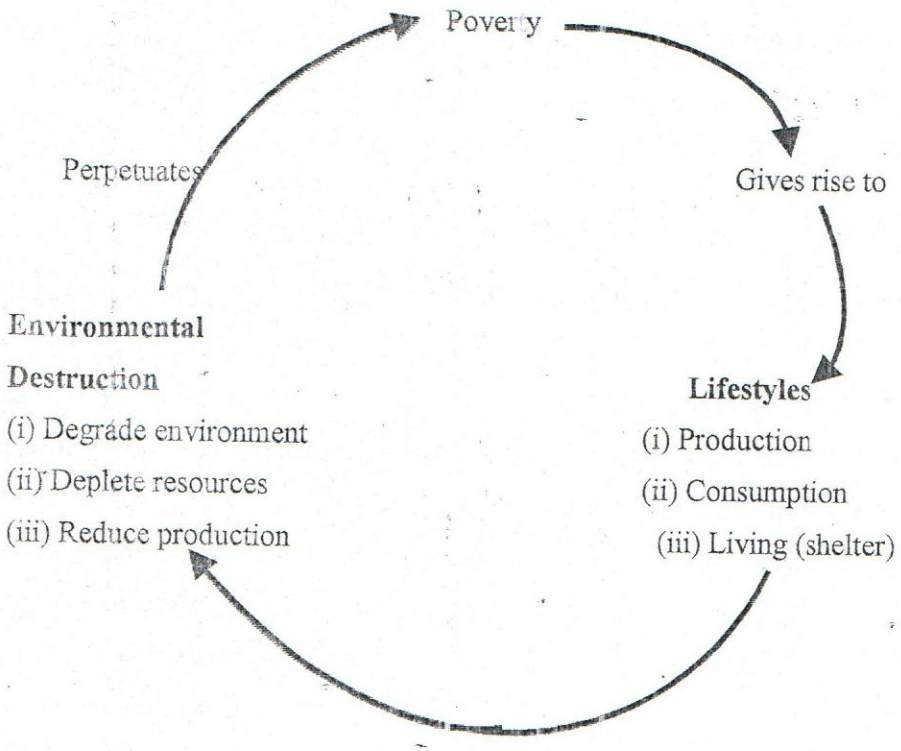


Source: Muthoka, Rego and Rimbui (1998 p. 323).

Figure 3: Problems arising from the development process

Muthoka, Rego and Rimbui (1998) concludes that if the present and future generations are to be assured of quality living, development must be sustained by the environment and must, in turn, not destroy environmental resources. According to Muthoka, Rego and Rimbui both development and lack of it have their own inherent problems. They observe that under-development could lead to environmental problems as a result of inappropriate production methods arising from lack of material resources and poor technical know-how. They suggest that these could cause resource destruction by overuse and misuse resulting in problems like overgrazing, deforestation, soil erosion and desertification. They further associate underdevelopment with in adequate provision of infrastructure and social services such as water supply and sewage disposal resulting in environmental diseased such as malaria, schistosomiasis and intestinal worms.

Muthoka, Rego and Rimbui (1998) observe that poor lifestyle as a result of poverty causes environmental degradation in terms of depletion of resources which eventually reduce production and perpetuate poverty. This is illustrated in figure 4.



Source: Muthoka, Rimbui and (Rego 1998 p.322).

Figure 4: The poverty cycle.

According to Muthoka, Rego and Rimbui, the mode of development adopted by industrialized nations has resulted in exhaustion of natural resources and environmental pollution. They site natural resources have been exhausted because countries are losing renewable resources faster than they are renewed and also using non-renewable resources faster than renewable substitutes could be found. Muthoka, Rego and Rimbui argue that pollutants are being released to the environment faster than the earth's ability to neutralize them. They conclude that the future development of each country depends on the type of development adopted by each country and that the future should be sustainable development. Muthoka, Rego and Rimbui conclude that unless a solution to poverty is found, environmental problems will escalate among poor communities and poor nations.

2.18 Theoretical Framework

The theoretical framework of the study is based on a socially critical approach (Kemmis, Cole & Sugget, 1983). Kemmis, Cole and Sugget states that socially critical approach, like EE concerns itself with a critical understanding of and an informed commitment to the improvement of society. Both EE and socially critical approach seek to empower students to participate in a democratic transformation of society. Recent studies on education for sustainable development reveal that most EE, policies and programmes tend to neglect local concerns and the significant life experiences that children bring to classrooms and suggest that in order to be successful, they should build upon this prior knowledge and experience (Palmer, 1998).

A socially critical approach is intended to provide students with a map of existing culture and society and a map of what a better society might be like (Kemmis, 1986). The orientation of EE concerns itself with a critical understanding of and an informed commitment to the improvement of society. Both EE and socially critical approach seek to empower students to participate in solving environmental problems in their society. Kemmis, Cole and Sugget, (1983) advocate for an education system that engages society's social structures and social issues immediately rather than merely preparing students for later participation. They believe that education must be seen to be addressing environment issues in pupils' immediate environment.

A socially critical approach as summarised in Kemmis, Cole and Sugget (1983) sees knowledge as being constructed through social interaction and hence this knowledge has

meaning to pupils since the process of learning has significance in their social context. In an active learning process, teacher designs activities that help learners develop understanding of environmental issues and ability to make judgement on how resources could be developed, managed and utilized. The activities designed are relevant to the learners' local environment. The learners are required to work in groups and are able to develop some of the skills needed for independent learning. Learners need to interact with each other and think critically about the environmental issues in their school surroundings. Based on this approach, EE learning process should be an active process where pupils encounter environmental issues in their immediate environment, think on how to resolve them, discuss the solutions with colleagues and take action to resolve the environmental problem. The teachers' role is to guide learning and act as a resource persons. The information can be presented diagrammatically as follows:

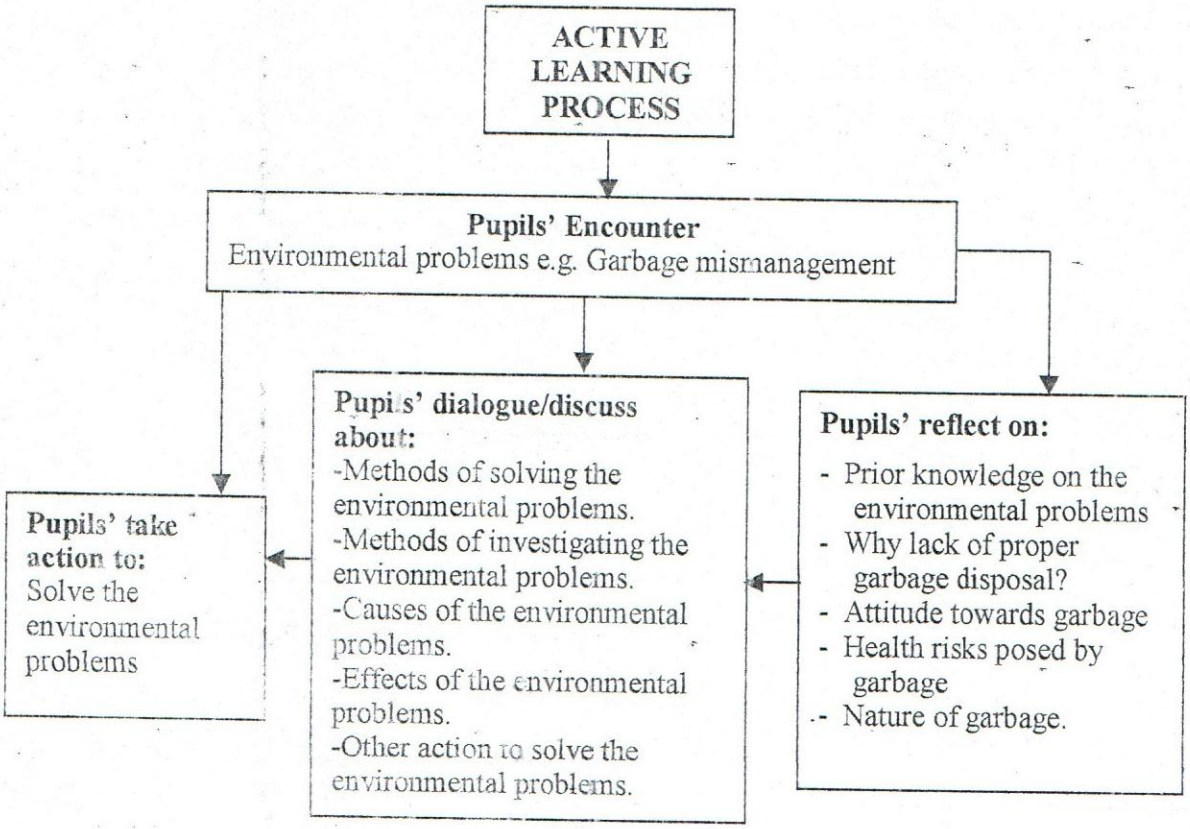


Figure 5: Environmental education as a process of active learning

In respect of this study it can be argued that when EE actively involves pupils in the learning process there will be transfer and application of what they learn. By engaging in these different kinds of teaching and learning methods in the context of a local environmental issue or environmental risk, learners can contribute to the discovery, uncovering and understanding of resource management through dialogue (talking), reflection (informed thinking about), and encounter (hands-on experience) (Roux, 2000).

2.19 Conceptual Framework

Active learning process was conceptualized to affect pupils' achievement in environmental education, and pupils' environmental attitude. School location (urban or rural), Teachers' gender and teaching/learning activities had moderating influence to achievement in environmental education and pupils' attitude towards environment. These were extraneous variables of the study which were controlled by simple random sampling. There is likelihood that if EE is presented as an active learning process pupils' achievement in EE will be high, pupils' attitude towards the environment will be favourable and they will be able to conserve their environments. The relationship between dependent and independent variables of the study is conceptualized as illustrated in Figure 6.

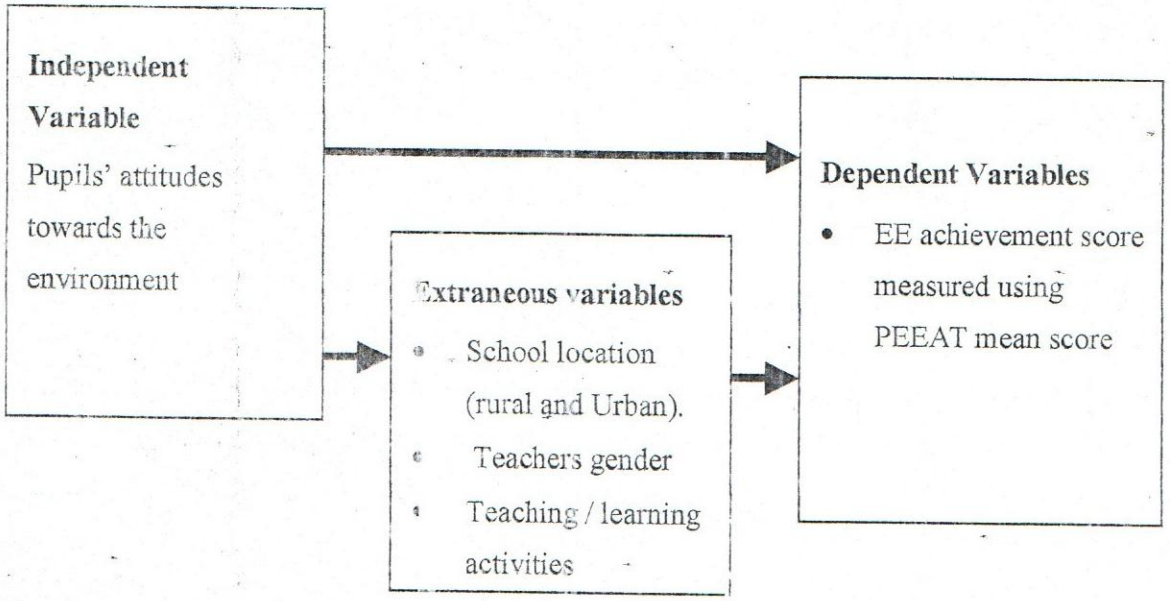


Figure 6: Representation of relationships among independent, dependent and extraneous variables.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the research design used for this study. It also describes the population, sample size, sampling procedures, instrumentation as well as data collection and analysis procedures.

3.2 The Research Design

Descriptive survey research design and correlational design were used in this study. Descriptive survey research design was used to evaluate the existing status of achievement of primary schools' EE objectives by primary schools pupils in Central Division of Narok North District. Descriptive design does not manipulate variables or arrange for events to happen. A corretional design was used to describe the relationship between pupils' attitudes towards environment and pupils' achievement in EE. According to Orodho, (2003), correlational design investigates the relationship between two or more variables. Fain, (1999), observes that in correlational studies no attempt is made to control or manipulate the variables under study. The above mentioned aspects of descriptive and correlational designs made these two designs relevant in providing the data needed to answer the research objectives and the hypothesis of this study.

3.3 Population

The target population was all the primary school pupils in Central Division of Narok North District. The accessible population were all the standard 8 pupils who had already been exposed to the whole primary school curriculum. The Division had 44 public primary schools with 964 standard eight pupils where the study sample was drawn from (MOE, 2007) (see Table 3 and 4).

Table 3:

Accessible Population

Zone	Total
Ngoben	139
Ole-sankale	407
Olchorro	134
Ilmacharani	284
Total	964

Source: MOE Nark North, (2007).

Table 4 :

Accssible School Populatin

Zone	Total
Ngoben	8
Ole-sankale	12
Olchorro	14
Ilmacharani	10
Total	44

Source: MOE Narok North, (2007).

3.4 Sampling Procedures and Sample Size

Proportional random sampling was used to select schools from each zone (see Table 5). Proportional random sampling was further used to select pupils from each sampled school. However, where the proposed sample size per school was more than the school accessible population of standard 8 pupils extra schools were randomly sampled within the same zone (see Appendix F).

Table 5:

Sampled Schools

Zone	Total
Ngoben	1
Ole-sankale	3
Olchorro	4
Ilmacharani	3
Total	11

According to Fraenkel and Wallen (2000), a simple random sample is one in which each and every member of the population has an equal and independent chance of being selected. According to MOE (2007), there were 964 standard eight pupils in Central Division of Narok North District. When the population is more than 10,000 individuals, 384 of them are recommended as the desired sample size (Mugenda & Mugenda, 1999). The accessible population in this study was 964 standard eight pupils. Due to constraints of time and resources, the whole population was not studied. Mugenda and Mugenda recommend the formula:

$nf = \frac{n}{1+\frac{n}{N}}$ to be used to calculate samples size.

According to the above formula:

nf= desired sample size when the population is less than 10,000,

n= desired sample when the population is more than 10,000,

N= estimate of the population size.

Using the above formula sample size is:

$nf = \frac{384}{1+\frac{384}{964}} = 274.29 = 274$ pupils.

To cater for those subjects that would decline to participate or dropped out during the process of investigation, the study proposed a sample size of 280 (see Table 6). However, a total of 276 standard 8 pupils were finally sampled and participated in the study.

Table 6:

Sampled Size

Zone	Total
Ngoben	51
Ole-sankale	76
Olchorro	89
Ilmacharani	64
Total	280

3.5 Instrumentation

The research developed three instruments for data collection. Pupils Environmental Education Questionnaire (PEEQ) (see Appendix A). Pupils Environmental Education Achievement Test (PEEAT) (see Appendix B) and Pupils Environmental Education Attitude Questionnaire (PEEAQ) (see Appendix C). PEEAT was used to measure pupils' achievement in environmental education. It consisted of 30 closed-ended items with a maximum score of 30. A scoring key developed by the research was used to score the test. Individual pupil sores were summed up and percentage score computed.

Pupils Environmental Education Attitude Questionnaire (PEEAQ) consisted of 30 items of a 5 point likert scale with a maximum score of 150 and a minimum of 30. It measured pupils' attitudes towards the environment. Six variables on environmental education, environmental conservation, interdependence between man and other organisms, conservation of natural resources, management of solid wastes and deforestation were used to gauge pupils' attitude toward environmental education. Five items were developed for each variable. A scoring key developed by the research was used to score the questionnaire. Individual pupil sores were summed up and percentage score computed.

Pupils' Environmental education Questionnaire (PEEQ) consisted of 13 structure questions. Several opinions on specified environmental problems were given for pupils to select. The items covered 3 selected environmental problems in Narok North District namely, deforestation, water pollution and land pollution. Pupils' identification of these environmental problems in their immediate environments, the causes, effects and solutions to these environmental problems were captured by this instrument. Pupils' opinions were

categorized according to the responses they selected. These categories were coded and frequencies and percentages for each category were calculated. This instrument generated qualitative data.

3.5.1 Validation

Validity is the degree to which results obtained from the analysis of the data represent the phenomenon under study (Mugenda & Mugenda, 1999). Mugenda and Mugenda state that there are five types of validity construct validity, content validity, face validity, predictive validity and criterion related validity. Content validity was considered in this study. To enhance content validity the instruments (PEEQ, PEEAT and PEEAQ) were validated by 2 experts from the Faculty of Education and Community Studies, Egerton University and 3 primary school teachers. The instruments were also pilot tested on 28 pupils outside the study area. This was 10% of the sample size. Mugenda and Mugenda recommend a pilot sample of 1% to 10% of the sampled size. This was done in Ololulunga Division to ensure that the target population had no prior knowledge of the study hence avoiding contamination and threat to validity. Ololulunga Division had similar characteristics with the study area and was not included in the main study. The pilot data was used to calculate difficulty index and discrimination index of PEEAT (see table 7). The difficulty index and discrimination index was used to modify items to make them more appropriate and understandable to the pupils hence increasing their content validity. The items with difficulty level and discrimination index below 0.3 and above 0.7 were modified to maximize information provided by the test.

Table 7:

Item Difficulty Index and Discrimination Index

Item	Difficulty index	Discrimination index
1	0.83	.29
2	0.41	.57
3	0.58	.43
4	0.38	.42
5	0.59	.43
6	0.34	.57
7	0.59	.31
8	0.31	.43
9	0.45	.86
10	0.10	.37
11	0.17	.43
12	0.38	.57
13	0.48	.43
14	0.38	.71
15	0.38	.71
16	0.45	.57
17	0.24	.43
18	0.07	.29
19	0.31	.43
20	0.24	.14
21	0.14	.29
22	0.07	.29
23	0.10	.43
24	0.1(	.43
25	0.1[illegible]	.43
26	0.1(	.29
27	0.24	.57
28	0.31	.43
29	0.34	.57
30	0.31	.29

3.5.2 Estimation of Reliability

The reliability co-efficient reflects consistency with which an instrument measures whatever it is supposed to measure (Fain, 1999). The reliability co–efficient of PEEAT and PEEAQ were estimated using Kuder-Richardson 20 (KR-20) and Cronbach's alpha respectively. Fain indicates that KR-20 is used when items of an instrument are scored dichotomously and are summative. Fain further observes that Cronbach's alpha is used to asses internal consistency and it is more versatile than other procedures because it can be used with instruments composed of items that can be scored with three or more possible values. Reliability co-efficient of 0.82 and 0.81 were obtained for PEEAT and PEEAQ respectively. This was

considered acceptable as it was above 0.7. A reliability coefficient of 0.7 and above is considered suitable to make group inferences that are accurate enough (Mugenda & Mugenda, 1999).

3.6 Data Collection Procedures

The permit to conduct the research was sought from the Ministry of Education. Permit to carry out research 14th august 2006 (see Appendix D). The researcher sent letters to school managers of the sampled schools informing them about his visit to their schools and the purpose of the visit (see Appendix E) The researcher visited the schools and self administered the test and the questionnaires to the pupils in similar settings. This was to ensure a high return rate. The pupils responded to the three instruments after which the researcher collected them for analysis.

3.7 Data Analysis

Content analysis techniques were applied on the data generated by Pupils' Environmental Education Questionnaire (PEEQ). Content analysis is a multipurpose method for data collection, analysis and for investigating a variety of problems in which the communication serves as the basis for inference (Majumdar, 2005). Majumdar further states that content analysis involves formulation of rule or a criterion of selection as to what aspect of the content constitutes the information needed for study and restricts itself to the manifest attribute of the text. The researcher developed coded sets of categories according to the responses selected by the pupils. The data generated represented pupils' opinions on the given environmental problems and hence these data was qualitative. Descriptive statistics were used to describe the sets of categories formed from the data. The Statistical Package for Social Sciences (SPSS) computer programme was used to generate frequencies and percentages for each category of data. Descriptive statistics enable the researcher to meaningfully describe a distribution of measurements (Mugenda & Mugenda, 1999) and also describe, organize and summarize data (Fain 1999).

PEEAT and PEEAQ were scored and pupil's percentage score for each instrument was computed. Scores generated by PEEAT and PEEAQ were quantitative. Percentage score for each pupil in Pupils' Environmental Education Achievement Test (PEEAT) and Pupils Environmental Education Attitude Questionnaire (PEEAQ) were correlated. Pearson product-

moment correlation was used to test relationship between pupils' attitude towards environment and achievement in environmental education. Gall et. al. (2003) state that Pearson product-moment correlation coefficient (r) is calculated when both variables correlated are expressed as continuous scores such as intelligence score and achievement score and are measured at ratio or interval scales. According to them, Pearson product-moment correlation is the most widely used bivariate correlational technique because most educational measures yield continuous scores and because (r) has a small standard error. Statistical significance was tested at alpha is equal to 0.05. These data was tabulated to permit analysis and interpretation.

Table 8:

Summary of Method Used to Test the Null Hypothesis

Hypothesis	Independent Variable	Dependent Variable	Statistics Test
$H_0$1 Primary school pupils' attitudes towards environment are not significantly related to their achievement in environmental education.	Pupils' environmental attitude.	PEEAT mean score	Pearson Product moment Correlation Coefficient

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1. Introduction

The methodologies used in this chapter were detailed in the previous chapter. This chapter presents the results obtained. Qualitative data obtained from Pupils Environmental Education Questionnaire are presented and discussed in sections 4.2, 4.3, 4.4 and 4.5 while Quantitative data obtained from Pupils Environmental Education Achievement Test and Pupils Environmental Education Attitude Questionnaire are presented and discussed in sections 4.6 and 4.7. Results presented are also interpreted in sections 4.2.1, 4.3.1, 4.4.1, 4.5.1, 4.6.1 and 4.7.1.

The environmental problems presented to the pupils in this study are common in our environments and are also infused in carrier subjects like science and social studies in the primary school curriculum. Environmental education values have also been integrated in non-carrier subjects like english, kiswahili and creative arts. However sources such as peers, family and the media are acknowledged as relevant sources of environmental education. Therefore pupils who had been exposed to the formal primary school curriculum upto standard 8 would have been able to assess their environment and respond to the items.

4.2 Awareness of Environmental Degradation

Pupils Environmental Education Questionnaire (PEEQ) (see appendix A items 1a, 2a, 3a, and 3b) was used to investigate whether primary school pupils were aware of environmental degradation taking place in their environment. Deforestation, garbage mismanagement and water pollution were investigated. Pupils' responses on the specific environmental problem were categorised. Frequencies and percentages for each category were computed. The percentages of pupils giving a specific response have been given in brackets. The question and the pupils' responses are also given. Item 1a investigated whether pupils were awareness of deforestation taking place in their immediate environment. The results are shown in table 9 and discussed.

Q1 (a). Is there uncontrolled cutting down of trees in your environment?

Table 9:

Wanton Destruction of Forest (N=276)

Response	Number of pupils (%)
Yes	229 (83.6)
No	51 (16.4)
Total	276 (100)

The above results revealed that most pupils had observed uncontrolled cutting of trees in forests near their villages. The percentage of pupils who said there was wanton destruction of forest taking place near their village was 83.6 per cent. This observation by the pupil is supported by NEMA (2006). NEMA observes there has been uncontrolled forest destruction in Narok North District. Item 3a investigated pupils' main sources of water while item 3b investigated pupils' perception of the quality of water used in their homes. The results are shown in table 10 and 11 and discussed.

Q3 (a). What are the main source(s) of the water used in your home?

Table 10:

Main Sources of Water Used in Homes (N=276)

Response	Number of pupils (%)
River	245 (88.8)
Wells	51 (18.5)
Rain	231 (83.7)
Dams	68 (24.6)
Springs	35 (12.7)
Boreholes	153 (54.4)

Note: The responses are multiple and therefore do not add to 100%

Q3 (b). How would you consider the quality of water from your source(s)?

Table 11:

Quality of Water Used in Homes (N=264)

Response	Number of pupils (%)
Clean	151 (56.9)
Dirty	115 (43.1)
Total	276 (100)

The above results show that most homes in the study area used water from rivers, rain and boreholes. The percentage of pupils who gave these responses ranged from 55.4 to 88.8 per cent. Majority of the pupils (83.7 per cent) indicated rain as their main source of water. The other sources of water identified by a few pupils are dams, wells, and springs. The percentage of pupils who identified these other sources of water ranged from 12.7 to 24.6 per cent. A good number of the pupils (43.1 per cent) perceived the water used in most homes to be dirty (see Table 11). Majority of the pupils (56.9 per cent) considered water from their sources to be clean. According to NEMA (2006), it is only 10 per cent of the population in Central Division of Narok North District that has access to safe drinking water. The perception of majority of the pupils on quality of water from their sources does not agree with water quality status of many water sources in the area. Item 2a investigated pupils' perception of standards of cleanliness of Narok Town. The results are shown in Table 12 and discussed.

Q2 (a). How would you describe the standards of cleanliness of Narok town?

Table 12:

Standard of Cleanliness of Narok Town (N=276)

Response	Number of pupils (%)
Clean	83(30.5)
Dirty	189(69.5)
Total	276 (100)

The above results have revealed that most pupils (69.5 percent) considered Narok town to be dirty. Papers and plastics were identified as the most common solid wastes found in Narok Town. These responses were given by 68.5 and 64.1 per cent of all the pupils respectively

(see Table 16). Narok Town lacks sewerage system and specified dumping sites near residential areas and business areas. Poorly disposed wastes and sewage effluent are common in the town. Hence most pupils gave a correct observation of the standards of cleanliness of the town.

4.2.1 Interpretation and Discussion of Results

To determine whether pupils were aware of uncontrolled forest destruction taking place in their environment, pupils were required to state whether there was uncontrolled cutting down of trees in forests near their villages. The responses given by pupils have been put into two categories. These two categories are yes and no. The results show that most pupils had experienced wanton destruction of forest taking place in their immediate environment (see Table 9). ENSDA (2005) observes that from 2003 to 2005, 1,755 hectares of forest were destroyed inside and outside Mau Forest in Narok North District. These observations are therefore in agreement with pupils observations. This suggests that pupils are observant of what happens in their immediate environment and are aware of activities that are negatively affecting their forests.

To determine whether pupils were aware of water pollution taking place in their water sources, pupils were told to give their perception on quality of water from their sources. Pupils' responses on quality of water have been categorized into clean or dirty water. A good number of pupils considered water from their sources to be clean (see Table 10). According to ENSDA (2005), the key water sources in Central Division are boreholes, rain water and rivers. NEMA (2006) reports that most of the open water sources in Narok North District are polluted. NEMA further states that lack of clean drinking water is one of the problems facing residents of Narok North District. These observations differ with majority of the pupils' observation since they perceived water from their sources to be clean. This suggests that, despite the fact that pupils are observant of their environments, some environmental problems are not easily identifiable by pupils. Some water pollutants are not directly observable and require analysis of the quality of water so that they can be identified. Hence there are some environmental problems that may not be known to pupils because by their nature they are not directly observable. Pupils may perceive rain water as being clean because it appears to be clear and without visible solid materials in it. Nonetheless, it may be polluted during harvesting and storage by agrochemicals and microorganisms.

Pupils' awareness of garbage mismanagement was studied by asking pupils to give their perception of the standards of cleanliness of Narok Town. Pupils' responses have been categorized as either Narok Town is clean or dirty. Majority of the pupils perceived Narok Town to be dirty (see Table 12). Papers and plastics were identified as the most common solid wastes found in Narok Town dumping sites (see Table 16). Hence pupils associated them with the unclean state of the town. According to NEMA (2006), lack of specified nearby dumping site and poor dumping practices by the residents have caused land pollution in Narok Town. This observation therefore agrees with pupils' responses. This suggests that pupils have experienced land pollution and have knowledge of what makes an environment to be dirty or clean.

4.3 Awareness of Causes of Environmental Degradation

Pupils Environmental Education Questionnaire (PEEQ) (see appendix A items 1b, 2b, 2c and 3c) was used to study whether primary school pupils were aware of human activities causing environmental degradation in their environments. Causes of deforestation, land pollution by garbage and water pollution were investigated.

Pupils' responses on the human activities causing the specified environmental problem in their immediate environment were categorised. Frequencies and percentages for each category were calculated. The percentages of pupils giving a specific response have been given in brackets. The question and the pupils' responses are also given. Item 1b was used to study whether primary school pupils were aware of human activities causing wanton destruction of forest in their immediate environment. The results are shown in table 13 and discussed.

Q1 (b). Which of the following human activities have contributes toward uncontrolled destruction of forest near your home area?

Table 13:

Human Activities Destroying Forest (N=276)

Responses	Number of pupils (%)
Human settlement	85 (30.8)
Clearing land for farming	126 (46.7)
Wildfires	24 (8.7)
Cutting firewood	120 (43.5)
Sale of timber	120 (43.5)
Charcoal burning	211(76.4)

Note: The responses are multiple and therefore do not add to 100%

The above results revealed that charcoal burning was identified as the major human activity causing destruction of forests in the area. This response was given by 76.4 per cent of all the sampled pupils. The other human activities observed to be contributing significantly to forest destruction are clearing land for farming (46.7 per cent), sale of timber (43.5 per cent), cutting fire wood (43.5 per cent) and human settlement (30.8 per cent). Wild fires were reported to be causing minimal forest destruction (8.7 per cent). Reports by NEMA (2006) and ENSDA (2005) have also reported human settlement, sale of timber, clearing land for farming and charcoal burning as the main human activities causing forest destruction in the District. Though the other activities reported are also there, their impact is minimal. Hence pupils' are aware of the impact of human economic activities on their environment. Item 3c investigated whether pupils were aware of human activities polluting water from their sources. The results are shown in table 14 and discussed.

Q3 (c). Which human activities have led to the low quality of water from your source(s)?

Table 14:

Human Activities Polluting Water sources (N=276)

Responses	Number of pupils (%)
Sewage	79 (28.6)
Fertilizers	56 (20.3)
Soil	42 (15.2)
Chemicals	81 (29.3)
Human faeces	64 (23.2)

Note: The responses are multiple and therefore do not add to 100%

The results revealed that more than 70 per cent of the pupils are not aware of human activities polluting their water sources and hence many pupils considered the water used in their homes to be clean as revealed in Table 9. NEMA (2006) reports increasing pollution levels in all open water sources in Narok District. According to NEMA, fertilizers, soil and agro-chemicals are the major water pollutants in the District. Pollution by sewage is common in Narok town while water pollution by human faeces could not be ruled out since most rural homesteads lacks toilet. The percentage of pupils who identified the main human activities generating these pollutants ranged from 15.2 to 29.3. Water pollution by sewage and human faeces was identified by 28.6 and 23.2 percent respectively. These observations by the pupils are not correct since they do not agree with the Narok North District water quality findings by NEMA. Hence pupils are not aware of how their activities in the environment were affecting the quality of water from different sources.

Item 2b investigated whether pupils were aware of human activities that affect the scenic beauty of an environment while item 2c investigated pupils' awareness of common solid wastes affecting the scenic beauty of Narok town. The results are shown in table 16 and 15 and discussed.

Q2 (b). Which of the following human activities have contributed to the low standards of cleanliness of Narok town?

Table 15:

Human Activities Lowering Cleanliness Standards of Narok Town (N=276)

Responses	Number of pupils (%)
Oil spills	24 (8.7)
Poor sewage disposal	149 (54.0)
Straying of cows to town	37 (13.4)
Poor solid waste disposal	171 (62.0)
Congestion in town	33 (12.0)

Note: The responses are multiple and therefore do not add to 100%

Q2 (c). Which of the following solid wastes are commonly found in Narok town dumping sites?

Table 16:-

Common Solid Wastes Found In Narok Town (N=276)

Responses	Number of pupils (%)
Papers	189 (68.5)
Plastics	177 (64.1)
Bottles	76 (27.5)
Food remains	87 (31.5)
Tins	88 (32.0)

Note: The responses are multiple and therefore do not add to 100%

The results revealed that majority of the pupils identified solid waste disposal and poor sewage disposal as the main human activities lowering the standards of cleanliness of Narok Town. These responses were given by 62.0 and 54.0 percent of all the pupils respectively. A few pupils (8.7 per cent) identified oil spills, straying of livestock into the town (13.4 per

cent) and congestion in the town (12.0 per cent) as the other human activities lowering standards of cleanliness of Narok Town. Papers and plastics were identified as the most common solid wastes found in Narok Town. These responses were given by 68.5 and 64.1 per cent of all the pupils respectively (see Table 16). These solid wastes have also been identified by NEMA (2006) as common and poorly disposed within Narok Town. Narok town also lacks sewerage system and sewage is poorly disposed. Oil spills are rare and mostly happens in motor vehicle garages while livestock only access Narok Town as they go to River Narok for watering. Hence the pupils' observations of the pollutants lowering the scenic beauty of the town are correct.

4.3.1 Interpretation and Discussion of Results

To determine pupils' ability to identify human activities causing deforestation in the area, pupils were provided with human activities to identify the one that contributed most to wanton destruction of forests in their area. The responses given by pupils have been put into six categories. The categories are whether forests are being destroyed through creation of human settlements, clearing land for farming, wild fires, cutting firewood, sale of timber and charcoal burning.

The responses given by pupils have shown that pupils are aware of the human activities causing wanton destruction of forests in their area (see Table 13). Majority of the pupils identified charcoal burning to be the major cause of deforestation in the area. Other causes identified by the pupils are clearing of land for farming, cutting firewood and sale of timber. Wikipedia (2007) observes that growing worldwide demand for wood for firewood and constructions as well as clearing land for agricultural expansion are the principal human related activities causing deforestation. NEMA (2006) observes charcoal burning as a major cause of forest destruction in Narok North District. NEMA further argues there is clearing of land for farming taking place in the District and also logging especially in Mau Forest and that most rural homesteads use firewood as source of energy for cooking. According to ENSDA (2005), Mau Forest has lost close to one third of its forest cover due to human settlements. These arguments therefore support pupils' observation on causes of forest destruction in their environments. This suggests that pupils are aware of the consequences of human activities on their forests.

To determine pupils' ability to identify human activities polluting water sources in their area pupils were provided with a list of human activities to identify the human activities that had contributed most to the low water quality standards from their sources. The responses given by pupils have been put into five categories. These categories are whether water sources are being polluted by untreated sewage, fertilizers used in farming, soil due to poor farming methods, chemicals used in farming and contamination by human faeces.

The responses given by pupils revealed that more than 70 per cent of the pupils are not aware of the quality of the water used in their homes (see Table 14). Hence majority considered water from their sources to be clean (see Table 11). It is only a few pupils who identified water from their sources to be polluted by fertilizers, soil and agrochemicals. Sewage and human faeces were also reported to be water pollutants of in pupils' water sources (see Table 14). Physical and chemical analyses of water from different sources in the District have indicated that there is water pollution by soil, agro-chemicals and fertilizers (NEMA 2006). These findings are not agreeing with the pupils' perception of the quality of water from their sources. Water pollution through discharge of raw sewage has also been reported by NEMA in Narok Town. A good number of pupils also indicated that sewage was poorly disposed in Narok Town (see Table 15). Water pollution through human faeces was reported by a few pupils (see table 14). Nevertheless some rural homesteads lack toilets and so pollution of water through human faeces could not be ruled out entirely. This suggests that some pupils are not aware of how human activities affect their water sources.

To determine pupils' ability to identify human activities lowering the standards of cleanliness of Narok Town pupils were provided with a list of human activities to identify the ones contributing to the low standards of cleanliness of the town. Pupils were also requested to identify solid waste commonly found in Narok Town (see Tables 15 and 16). The responses given by pupils have been put into five categories. The categories are whether standards of cleanliness lowered by oil spills from motor vehicles, poor sewage disposal, straying of livestock to town, poor waste disposal by people and congestion in town.

Wastes commonly found in Narok Town has also been put into five categories namely papers, tins, bottles, plastics and waste foods. The responses given by pupils revealed that most pupils are aware of human activities lowering the standards of cleanliness of Narok Town. More than 50 per cent of the pupils identified poor solid waste disposal and poor

sewage disposal as the main human activities lowering the standards of cleanliness of the town (see Table 15). More than 60 per cent of the pupils also identified papers and plastics as the common solid wastes found in most dumping sites (see Table 16).

A few pupils identified straying of livestock to the town, congestion in town and oil spilling as other human activities lowering standards of cleanliness of Narok Town. Though these human activities have a potential to lower standards of cleanliness, they are rare and localized in certain designated areas of the town. Other solid wastes identified to be lowering standards of cleanliness of Narok Town are tins, waste foods and bottles. Tins and bottles which are used for packaging of things like cooking fats and other commercial products can be used again for other purposes while generation of waste foods into the environments is normally low hence these wastes are not in large quantities in the environment. This suggests that pupils are aware of the human behaviors that spoil the scenic beauty of an environment.

4.4 Identification of Effects of Environmental Degradation

Pupils Environmental Education Questionnaire (PEEQ) (see appendix A items 1d, 2e, and 3d) was used to evaluate whether primary school pupils were aware of effects of environmental degradation taking place in their environment. Pupils' responses on the specific effects of the mentioned environmental problem were categorised. Frequencies and percentages for each category were calculated. The percentages of pupils giving a specific response have been given in brackets. The question and responses given by pupils for each of the environmental problem are presented in Tables 17 to 19. Item 1d investigated pupils' awareness of effects of deforestation taking place in pupils' immediate environment. The results are shown in table 17 and discussed

Q1 (d). Which problems are people in your home area likely to face in future because of destroying their forest?

Table 17:

Effects of Forest Destruction (N=276)

Response	Number of pupils (%)
Floods during rainy season	162 (58.7)
Outbreak of diseases	88 (31.9)
Reduction in amount of rainfall	197 (71.4)
Human wildlife conflicts	122 (44.2)
Disappearance of plant species	143 (51.8)
Soil erosion	220 (79.7)
Inadequate water	185 (67.0)

Note: The responses are multiple and therefore do not add to 100%

The above results show that majority of the pupils identified soil erosion and reduction in amount of rainfall as the major effect of destroying forest. These responses were given by 79.7 and 71.4 per cent of all the sampled pupils respectively. The other effects of forest destruction given by the pupils were inadequate water, floods during rainy season and disappearance of plant species. The percentage of pupils who gave these responses ranged from 51.8 to 67.0 per cent (see Table 17). These pupils' responses are in agreement with findings by many scientists. Few pupils also identified outbreak of diseases and human wildlife conflict as effects of destruction of forest. The percentage of pupils who gave these responses was 31.9 and 44.2 respectively (see Table 17). Item 2e investigated pupils' awareness of effects of poor solid waste disposal. The results are shown in table 18 and discussed.

Q2 (e). Which of the following problems would you associated with poor solid waste disposal?

Table 18:

Problems Associated With Poor Solid Waste (N=276)

Response	Number of pupils (%)
Increase in water borne diseases	126 (45.7)
Breading ground for mosquitoes	146 (52.9)
Rusting of iron sheet roofs	77 (27.9)
Spoiling scenic beauty	162 (58.7)
Increased livestock diseases	105 (38.0)

Note: The responses are multiple and therefore do not add to 100%

The above results show that majority of the pupils identified spoiling of scenic beauty (58.7 per cent) and breading grounds for mosquitoes (52.9 per cent) as problems associated with poor disposal of garbage. A good number of the pupils (45.7 per cent) also identified increase in water borne diseases as an effect of poor disposal of solid wastes. These responses by the pupils are scientifically acceptable. Some pupils identified increase in livestock diseases (38.0 per cent) and rusting of iron sheet roofs (27.9 per cent) as the other problems associated with solid waste (see Table 18). Item 3d was used to determine whether primary school pupils were aware of effects of water pollution. The results are shown in Table 19 and discussed.

Q 3 (d). Which of the following diseases are associated with lack of clean drinking water?

Table 19:

Diseases Associated With Lack of Clean Drinking Water (N=276)

Response	Number of pupils (%)
Malaria	96 (34.8)
Typhoid	236 (85.5)
Amoebiasis	67 (24.3)
Brucellosis	21 (7.6)
Pneumonia	83 (30.1)
Bilharzias	178 (64.5)
Influenza	50 (18.1)
Cholera	228 (82.6)

Note: The responses are multiple and therefore do not add to 100%

The results show that majority of the pupils identified Typhoid, Cholera and Bilharzias as diseases associated with lack of clean drinking water. The percentage of pupils who gave these responses ranged from 64.5 to 85.5 per cent. These responses by the pupils are correct since the pathogens that cause these diseases are found in polluted water. Though amoebiasis is water borne disease associated with polluted water, only a few pupils (24.3 per cent) identified it. A few pupils also identified Malaria, Brucellosis, Pneumonia and Influenza as diseases associated with lack of clean drinking water. The percentage of pupils who gave these responses ranged from 7.6 to 34.8 per cent. These responses are not scientifically correct since the pathogens that cause these diseases are not found in water.

4.4.1 Interpretation and Discussion of Results

To determine pupils' ability to identify effects of deforestation pupils were provided with a list of possible effects to identify the ones which affected forest in their immediate environment. The responses given by pupils have been put into seven categories. These categories are, flooding during rainy season, outbreak of diseases, reduction in amount of rainfall, human wildlife conflict, disappearance of plant species, soil erosion and inadequate water.

The responses given by pupils revealed that majority of the pupils are aware of effects of deforestation. More than 50 per cent of all the sampled pupils identified effects of deforestation to be soil erosion, reduction in amount of rainfall, inadequate water, and floods during rainy season and disappearance of plant species. These findings are scientifically correct since the immediate and long-term consequences of deforestation are loss of biodiversity and climatic disruption leading to reduction in amount of rainfall. Research findings have also shown that because of deforestation the world is losing plant species.

The litter from tree leaves and tree trunks slow down surface runoff hence deforestation contributes to floods and intensified soil erosion. The consequences of forest destruction in Narok North District have been common flooding which has carried soil into rivers. The roots of trees create macro-pores in the soil that increase infiltration of rain water increasing volume of underground water. Hence deforestation would lead to inadequate water availability.

Less than 31.9 per cent identified outbreak of diseases as the other effect of deforestation. There is no direct link between forest destruction and outbreak of diseases since diseases are caused by pathogens. Wildlife conflict was identified by 44.2 per cent of the sampled pupils as an effect of deforestation. This finding is scientifically correct since forests are self sustaining units (ecosystem) and if this balance is interrupted through forest destruction there would be human wildlife conflict (Wikipedia, 2007). As the human population expand and natural habitats (forests) shrink, people and animals are increasingly coming into conflict over living space and food. The pupils' responses therefore are in agreement with scientific research findings.

To determine pupils' ability to identify effects of poorly disposed solid waste, pupils responded by selecting problems that would be associated with poor solid disposal. The responses given by pupils have been put into five categories. These categories are: solid wastes are associated with increase in water borne diseases, breading ground for mosquitoes, rusting of iron roofs, spoiling of scenic beauty and increase in livestock diseases.

The responses given by pupils revealed that more than 40.0 per cent of the pupils are aware of effects of poor solid waste disposal since they identified spoiling of scenic beauty, breading grounds for mosquitoes and increase in water borne diseases as effects of poorly

disposed garbage. Poorly disposed solid waste spoils the beauty of the environment while garbage contains tins and polythene papers which collect water in them during the rainy season providing breeding grounds for mosquitoes. Poorly disposed garbage also generates leachate when rain water percolates through the waste and reacts with the products of decomposition of organic waste, chemicals and other materials in the waste (Wikiperdia, 2007). Leachate can pollute ground water and surface water leading to waterborne diseases. Hence the pupil' responses are scientifically correct.

A few pupils (less than 40.0 per cent) also identified rusting of iron sheet roofs and increase in livestock diseases as the other effects of poorly disposed solid waste. Some solid waste like polythene bags if eaten by livestock are known to affect digestion in livestock and do not cause livestock diseases. Solid wastes also do not have any effects on corrosion of iron sheet roofs. Hence the explanations given by pupils are not scientifically acceptable.

To determine whether pupils' were aware of effects of water pollution, pupils responded by selecting diseases associated with lack of clean drinking water from the given list of diseases. The responses given by pupils have been put into 8 categories according to the disease selected by pupils. These categories are Malaria, Typhoid, Amoebiasis, Brucellosis, pneumonia, Bilharzias, influenza and Cholera. The results of the study revealed that majority of the pupils are aware of effects of water pollution. Typhoid, Cholera and Bilharzia were identified by most pupils as diseases associated with lack of clean drinking water (see Table 19). These diseases are water borne and common in polluted water. A good number of pupils do not perceive Amoebiasis to be water borne disease. Amoebiasis is caused by *Entamoeba histolytica* which is a protozoa found in water polluted by human excreta. Few pupils identified Malaria, Brucellosis, Pneumonias and Influenza as diseases associated with lack of clean drinking water. The pathogens causing these diseases are not found in water hence the explanations given by pupils are not scientifically correct.

In the primary science syllabus, water borne diseases are taught in standard 6 while water pollution and effects of water pollution are taught in standard 7 hence more than 60.0 percent of all the sampled pupils could identify Typhoid, Cholera and Bilharzia as diseases associated with lack of clean drinking water. Nevertheless 24.3 per cent of the pupils did not perceive Amoebiasis to be water borne disease. In the primary science syllabus this disease is described as diarrhea which is a symptom of Amoebiasis.

4.5 Pupils Solutions to Environmental Degradation

Pupils Environmental Education Questionnaire (PEEQ) (see Appendix A items 1c and 2d) was used to investigate whether primary school pupils were aware of solution to environmental degradation taking place in their environment. Pupils' responses on solutions to the specific environmental problem were categorised. Frequencies and percentages for each category were calculated. The percentages of pupils giving a specific response have been given in brackets. The question and responses given by pupils for each of the environmental problem are presented in Tables 20 to 21. Item 1c investigated pupils' awareness of solutions to deforestation taking place in their immediate environment. The results are shown in table 20 and discussed.

Q1 (c). What should people in your area do to conserve their forest?

Table 20:

Solutions to Forest Destruction (N=276)

Response	Number of pupils (%)
Re-afforestation	149 (54.0)
Use of firewood instead of charcoal	39 (14.1)
Keeping livestock instead of crop farming	46 (16.7)
Planting fast growing trees for firewood	104 (37.7)
Use energy saving jikos for cooking	154 (56.9)
Use solar energy for cooking	168 (60.9)

Note: The responses are multiple and therefore do not add to 100%

The results revealed that a good number of the pupils considered use of solar energy (60.9 per cent), energy saving jikos (56.9 per cent) and re-afforestation (54.0 per cent) as solutions to deforestation. These explanations aim at reducing the demand for wood energy and reforestation which will reduce forest destruction and come up with new forests. Therefore these pupils' explanations are the appropriate solutions to deforestation. A few pupils (37.7 per cent) identified planting of fast growing trees species for firewood as a solution to deforestation. This explanation is correct because it ensures sustainable supply of firewood. Other responses that were given by the pupils are, use of firewood instead of charcoal (16.7 per cent) and keeping livestock instead of crop farming (14.1 per cent). Keeping livestock requires pasture land which is created by clearing forests while firewood use leads to cutting

of trees to get firewood. Item 2d investigated pupils' awareness of how to handle solid waste in their environment. The results are shown in table 21 and discussed.

Q2 (d). How should residents of Narok town handle both organic and inorganic wastes from their homes?

Table 21:

Solutions to Poor Waste Disposal (N=276)

Response	Number of pupils (%)
Putting them in same waste bin	34 (12.3)
Separating and putting in different waste bins	17 (6.2)
Using them to make manure	19 (6.9)
Separate, recycle organic waste and use inorganic to make manure	65 (23.6)
Separate, use organic to make manure and recycle inorganic	80 (29.1)

Note: The responses are multiple and therefore do not add to 100%

The results in Table 21 show the responses given by pupils on solutions to garbage mismanagement. The results revealed that majority of the pupils do not know how to handle organic and inorganic. Very few pupils (12.3 per cent) proposed that organic and inorganic waste should be put in the same waste bin while at the same time only a few pupils (6.2 per cent) proposed that organic and inorganic wastes should be separated.

The right procedure of handling solid waste should be separating organic and inorganic waste at the source. Few pupils (6.9 per cent) suggested that organic and inorganic wastes should be used to make manure. Inorganic wastes are not biodegradable hence they should be separated with organic wastes so that only organic wastes are used to make manure. Few pupils (29.1 per cent) proposed that organic wastes and inorganic wastes should be separated and organic waste used to make manure while inorganic waste should be recycled to other useful forms. This is the correct procedure of handling the two types of wastes. That notwithstanding, a few pupils (23.6 per cent) also proposed that organic and inorganic waste should be separated and organic waste recycled while inorganic waste used to make manure. This is a wrong procedure of handling solid waste.

4.5.1 Interpretation and Discussion of Results

To determine whether pupils were aware of solutions to deforestation, pupils were requested to state what they thought people should do to conserve their forests. Pupils were presented with a list of activities to identify which would be a solution to deforestation. The responses given by pupils have been put into six categories according to pupils' responses on solution to deforestation. These categories are re-afforestation, use of firewood instead of charcoal, keeping livestock instead of crop farming, planting fast growing trees for firewood, using energy saving jikos for cooking and using solar energy.

The results have shown that pupils are aware of solutions to deforestation. More than 50.0 per cent of all the sampled pupils proposed use of solar energy, using energy saving jikos and re-afforestation as solutions to deforestation. Use of energy saving jikos, re-afforestation and use of alternative sources of energy like solar are some of the solutions to deforestation (AFEW, 2006). These observations are in agreement with pupils' observation. A few pupils suggested that use of firewood instead of charcoal and keeping livestock instead of crop farming is a solution to deforestation. Use of firewood and charcoal both lead to destruction of forest while keeping livestock instead of crop farming lead to destruction of forest to create farming land hence not solutions to deforestation.

To determine whether pupils were aware of how to handle garbage, pupils were presented with some procedures to identify the correct procedure of handling both organic and inorganic wastes from their homes. The responses given by pupils have been put into five categories according to the pupils' perception on how garbage should be handled.
These categories are:

- Putting organic and inorganic wastes in same waste bin
- Separating waste into organic and inorganic and then putting each in separate waste bins
- Using organic and inorganic wastes to make manure
- Separating the organic and inorganic wastes and using inorganic wastes to make manure and recycling organic wastes
- Separating the waste into organic and inorganic and using organic wastes to make manure and recycling the inorganic wastes.

The explanations given by pupils have shown that more than 70.0 per cent of all the sampled pupils are not sure of how solid waste (garbage) produced in their homes should be handled. Despite the fact that only very few (less than 30.0 per cent) of all the sampled pupils identify the correct procedures of handling garbage generated in their homes, majority (70.0 per cent) of the pupils also gave the wrong procedures. The correct procedure of handling waste is separating it into organic and inorganic wastes at the source and putting them in different waste bins. The organic wastes are then used to make manure while inorganic wastes are recycled into other useful forms.

4.6 Primary School Pupils Attitudes Towards the Environment

To determine primary school pupils' attitude towards the environment a five point Likert scale questionnaire (Pupils Environmental Education Attitude Questionnaire (PEEAQ)) was used. A scoring guide was developed by the researcher and used to score the questionnaire. Pupil's response representing the most favourable characteristic was given a score of five and a score of one was given to the least favorable. Individual pupils' scores were summed to get the total scores and percentage score per pupil was computed. The SPSS programme was used to compute the sample mean score. The results revealed that the mean score on the Pupils' Environmental Education Attitude Questionnaire was 72.31 per cent with a standard deviation of 13.36 (see Table 22). This was considered to be highly positive attitude towards the environment. Therefore primary school pupils had favourable attitude towards their environment.

4.6.1 Interpretation and Discussion of Results

The results on pupils' attitudes towards environment were found to be highly positive. This suggests that pupils had favourable attitudes towards their environment and learning of environmental education had enabled pupils acquire the desired environmental attitudes. Muthoka, Rego and Rimbui (1998) argue that knowledge about the environment and its basic concepts provide a foundation to bring about desired attitudes towards the environment in learning and teaching of EE. This is supported by the PEECAT results on pupils' achievement of environmental education concepts which revealed a moderately high mean score of 55.5 per cent. Pupils who have the desired attitudes towards the environment are likely to conserve their environments than pupils with negative attitudes towards environment.

4.7 Relationship between Pupils' Attitudes Towards the Environment and their Achievement in Environmental Education Test

Pupils' Environmental Education Concept Achievement Test and Pupils' Environmental Education Attitude Questionnaire were scored using scoring guides developed by the researcher. Pupils' raw scores on the test and questionnaire were summed up and percentage scores for both the test and questionnaire computed. Pupils' percentage scores on the test and questionnaire were correlated. The SPSS programme was used to compute the Pearson Product Moment Correlation Coefficient for the scores obtained from the attitude questionnaire and the achievement test. The results are shown in table 22.

Table 22:

Correlation between Pupils Achievement in Environmental Education Concept Test and Pupils' Attitudes Towards the Environment (N=276)

	Mean	Standard deviation	Pupils score on PEECAT	Pupils score on PEEAT
Pupils score on PEECAT	55.45	14.50	1.00	0.57**
Pupils score on PEEAQ	72.31	13.36	0.57**	1.00

**correlation is significant at the 0.01 level (2-tailed)

The above results show that the mean score of the Pupils' Environmental Education Achievement Test was 55.45 per cent. The mean score on the Pupils' Environmental Education Attitude Questionnaire was 72.31 per cent. The Pearson correlation coefficient for pupils attitudes towards environment and environmental education concept achievement test score r = 0.572. This is identified as being significant at the 0.05 level.

4.7.1 Interpretation and Discussion of Results

The above finding shows that the correlation between pupils' scores on PEECAT and PEEAQ was positive and moderately high. According to ACASTAT (2007), an r of 0.50 to 0.70 is considered to be a moderately high correlation. It therefore suggests that pupils who had a high attitude score had a good mastery of environmental education concepts. This suggests that attitudes towards the environment influences achievement in environmental education and therefore the two are inextricably interrelated. The correlation between pupils attitudes towards the environment and achievement in environmental education thus ought to be positive and high as was found in this study. Muthoka, Rego and Rimbui (1998) argue that

knowledge about the environment and its basic concepts provide a foundation to bring about desired attitudes towards the environment in learning and teaching of EE. Their argument, therefore also support a strong and positive correlation between high attitude towards environment and high achievement in environmental education.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

5.1. Introduction

This chapter is divided into four major sections. These include summary, conclusion, implication on current practices and recommendations.

5.2 Summary

On the basis of the data analysis presented in chapter four, the following are the major findings. The study found that primary school pupils in Central Division, Narok North District had achieved most of the environmental education objectives stated in the primary school curriculum. KIE (2002) states that primary school pupils in Kenya's primary schools should be able to manage and conserve available resources, develop awareness and appreciation of the environment and develop positive attitudes about the environment.

The study found out that pupils were aware of environmental degradation going on in their environments and the causes of some of the environmental problems. Pupils were also aware of the effects of the environmental problems and the solutions to some of the environmental problems. The study further revealed pupils attitude towards the environment was positive. However, pupils were not aware of causes of water pollution and were also not sure of how to handle solid waste (garbage). The study also found the relationship between pupils' attitude towards environment and achievement in EE was positive and significant at the 0.05 level. Thus achievement in environmental education is possible within the context of positive attitude by the pupils towards the environment.

5.3. Conclusions

Based on the results of this study it can be concluded that Kenya's primary schools in Central Division, Narok North District have achieved most of the environmental education objectives stated in the primary school curriculum (KIE, 2002). It can also be concluded that primary school pupils are aware of environmental degradation going on in their environments and the causes of some of the environmental problems. It can further be concluded that primary school pupils are aware of the effects of the environmental problems and solutions to some of the environmental problems experienced in their immediate environments. The study

further concludes that pupils' attitude towards the environment is positive. Nonetheless, the study further concludes that pupils are not aware of causes of water pollution and are also not sure of how to handle solid waste (garbage). The study also concludes that the relationship between pupils' attitude towards environment and achievement in EE is positive and that a high and positive attitude towards the environment is essential for the achievement of environmental education objectives.

5.4 Implications on Current Practice

This study offers evidence that primary schools in the study area have achieved some of the primary schools environmental education objectives. This implies that primary school teachers are integrating and infusing environmental education in subjects taught at school. This study also offers evidence that primary school pupils in the study area have observed some environmental degradation in their surrounding environments and are aware of the effects of environmental degradation. The implication is that environmental education ought to focus on local environmental issues (should be issue based) for meaningful learning of environmental phenomena to take place. The study further offers evidence that pupils are aware of some of the causes and solutions to the environmental degradation in their environments but are not aware of causes of water pollution and how to manage solid waste. This implies that learners should be encouraged to actively participate in taking relevant social action to address local environmental issues. The study further provided evidence that pupils had a positive attitude towards the environment and this attitude could increase achievement of the environmental education objectives. The implication is that teachers should help learners improve their attitude towards the environment for high achievement of environmental education objectives and that pupils with a positive attitude towards environment are likely to conserve their environment if equipped with appropriate environmental knowledge and skills.

5.5 Recommendations

Based on the findings of this study, it is recommended that primary school teachers should approach EE in an interdisciplinary manner and should focus on local environmental issues. It is further recommended that teachers should encourage learners to actively participate in social action that addresses local environmental issues. Teachers should also help learners develop positive attitudes towards the environment. Since pupils are aware of some of the environmental degradation taking place in their environment and have a positive attitude

towards the environment, it is recommended that primary school pupils be used to solve environmental problems and in management of environmental resources in their local environment. It is further recommended that primary school teacher training institutions should train teacher trainees on how to integrate and infuse EE in teaching subjects. Education authorities should also monitor implementation of EE and in-service teachers on interdisciplinary approaches in teaching of EE. KNEC officials should further give EE more weight in examinations.

5.5.1 Recommendations for further research

Further research is required in the following areas of concern:

i) Investigation with larger sample involving more schools from different regions to find out whether the findings of this study can be generalized to the whole country.

ii) Environmental education approaches may also influence pupils' achievement in environmental education hence there is need for studies aimed at evaluating how different EE approaches influences achievement in EE.

iii) An investigation to establish primary school teachers' environmental attitude and how their attitude affects pupils' environmental attitude is necessary since teachers may pass their attitudes to their pupils.

iv) Studies on primary school teachers' knowledge of environmental education would also be useful since it may affect pupils' achievement in EE.

REFERENCES

Abidha, N. O. (1987). *The need for basic environmental education. BERC bulletins No. 17,* Nairobi, Kenya: Kenyatta University.

Ahlberg, M. (2003).*Education for sustainable development.* Available on the internet at http://savonlinnakampus.joensuu.fi/ahlberg/index.htm. 24/4/ 2003.

ACASTAT, (2007). *Applied statistical handbook.* Available on the internet at htt://www.acastat.com/Statbook/correlation.htm. 2/8/2007.

AFEW, (2006). Education for sustainable development: AFEW Kenya Ltd- Giraffe Centre Nairobi, Kenya: Giraffe Centre.

Akumu, G. (2005). Climate change: potential impacts on forests and energy in Kenya. *Wajibu journal of social and religious concerns Vol.20, No. 2, 5-6.*

Anderson, D. & Johnson, D. (1988). *The ecology of survival- case studies from northeast African history.* Lesser Crook. Academy publishers.

Beaz, G.A., (1987). *Education and conservation strategy.* In Beaz, G.A., Knamiller, G.W., Smyth, J. C. (1987). *The environment and science and technology education.* (pp.11-13). Oxford, England: Pergamon press.

Bennaars, G.A Otiende J.E & Boisvert, R. (1994). *Theory and practice of education.* (pp.205-224). Nairobi, Kenya, Kenya: Kenya Litho Ltd.

Benedict, F. (1999). A systemic approach to sustainable environmental education. *Cambridge Journal of Education, 29* (3), 433-442.

Breiting, S., & Mogensen, F. (1999). Action competence and environmental education. *Cambridge Journal of Education, 29* (3), 349-353.

Cutter, A. (2001). *Gauging Primary school teachers environmental literacy.* Rochhampton Queensland: Central Queensland University. pp. 2-6. Available on the internet at file://A: CHAPTERONE. Htm. 7/11/2004.

DiChiro, G. & Stapp, W. (1986). *Education in action research approach to environmental problem solving.* In Parkins, D., Alexis, D. & Bayer, K. (1986). *Monographs in environmental education and environmental studies vol. 3.* The North America Association for Environmental Education.

Elliot, J. (1999). Sustainable society and environmental education: future perspectives and demands for the educational system. *Cambridge Journal of Education, 29* (3), 325-340.

ENSDA (2005). *Maasai mau forest status report 2005.* Narok, Kenya: Ewaso Ngiro South Development Authority.

Fain, J. A. (1999). *Reading, understanding, and applying nursing research.* Philadelphia, USA: F.A. Davis Company.

Fien, J. (1993). *Education for the environment*: critical curriculum theorizing and environment. Georgia, USA: Deakin University Press.

Fien, J. (1994). Critical theory, critical pedagogy and critical praxis in environmental education. In B. B. Jensen & K. Schnack (Eds.), *Action and action competence as key concepts in critical pedagogy*. Copenhagen: Royal Danish School of Educational Studies.

Fien, J., & Greenall Gough, A. (1996). Environmental education. In R. Gilbert (Ed.), *Studying society and environment- a handbook for teachers* (pp. 200-216). Melbourne: Macmillan.

Fien, J. (1998). Education for Australian environment. Bicentennial Australian studies school project, Bulletin 6. Curriculum Development center: Canberra.

Fraenkel, J.R. & Wallen, N.E. (2000). *How to design and evaluate research in education (4th ed.)* (pp. 106, 178): New York, The McGraw-Hill companies, Inc.

Gad, F. (1985). *Environmental law*. In Otiende *et al.*, (1991). *An introduction to environmental education*, (pp. 224-262). Nairobi, Kenya; Nairobi University Press.

Gall, M. D., Borg, W. R. & Gall, J. P. (2003). *Education research: an introduction*, (p.379) New York, NY, Longman Publishers.

Gough, A. (1997). *Education and the environment: policy, trends and the problems of marginalisations*. Melbourne: The Australian Council for Educational Research.

Graham, V. (1987). *Teaching for the environment in third world schools: some implementation constraints*. In Buez et.al. (1987). *The environment and science and technology education*. (pp 79-82. Oxford, England: Pergamon press.

Greenall, G. A. (1991). Greening the future for the education: changing curriculum content and schools organization. *Journal of curriculum studies, 23*(b), 559-571.

Hines, J., Hungerford, H &Tomera, A. (1986). Analysis and synthesis of research on responsible environmental behaviour. *Journal of Environmental Education, 18*(2), 1 – 18.

Huckle, (1985). *Geography and schooling*. In R.. J. Johnston (ed.) 1985. *The future of geography* (p. 303): Methuen, London.

IUCN/UNEP/WWF. (1980). *How to save the world: strategy for world conservation*. Kogan, London.

Jensen, B. B., & Schnack, K. (1997). The action competence approach in environmental education. *Environmental Education Research, 3* (2), 163-179. Benedict, F. (1999). A systemic approach to sustainable environmental education. *Cambridge Journal of Education, 29* (3), 453-442.

Kabeberi, J. (1991). *Kenya environmental policies*. In Otiende *et al.*, (1991). *An introduction to environmental education*, (pp. 224-262). Nairobi, Kenya; Nairobi University Press.

Kaburu, M. (2005. April 3, pp 17). *Move to impose levy on plastic bags causes stir*. Sunday Nation Newspaper.

Kemmis, S. (1986) Mapping utopia: towards a socially critical curriculum. *Interaction, 14* (5): 11 – 30.

Kemmis, S. Cole, P and Suggett, D. (1983). *Orientation to curriculum and transition; towards the socially critical school.* (pp. 13 - 44). Melbourne. Victoria Institute of Secondary Education.

Khensani, M. (2000). Issue-based environmental education programmes: In Roux, K. (2000). Environmental education processes, active learning in schools. (pp. 317-323). Natal, South Africa: University of Natal Press.

Khoshoo, T. N. (1987). *Environmental education: the Indian experience:* In Beaz et.al. (1987). *The environment and science and technology education.* (pp 55-78) Oxford, England: Pergamon press.

K.I.E (1997). *Environmental education for primary schools book for standard 4 - 8,* (pp. 10 - 18). Nairobi, Kenya: Kenya Institute of Education.

K.I.E, (2002). *Primary education syllabus Vol. two* Nairobi, Kenya: Kenya Institute of Education.

Kinyua, A. & Murungi, J. (2002). Factor impeding the development of evaluation in Africa with special reference to policy and practice: A case of environmental education curriculum in Kenya. Nairobi. Kenya Available on the internet at htt://www.afrea.org/document/documentcfm?docID=127. 22/10/2008.

Knamiller, G W. (1987). *Environmental education in schools*: In Beaz et.al. (1987). *The environment and science and technology education.* (pp 55-78) Oxford, England: Pergamon press.

Korir , K. (1987), Environmental education and population education. *BERC Bulletin No. 17* Nairobi, Kenya: Kenyatta University.

Laddawan, K. & Joan, W. (1987). *An environmental education development project for elementary and secondary school level*: In Beaz et.al. (1987). *The environment and science and technology education.* (pp 55-73) Oxford, England: Pergamon press.

Lijmbach, S., Margadant-van Arcken, M., Van Koppen. C. S. A., & Wals, A. (2002). Your view of nature is not mine: learning about pluralism in the classroom. *Environmental Education Research, 8* (2), 122-135.

Lucas, A. (1979). *Environment and environmental education: conceptual issues and curriculum implications.* Sydney: Australia International Press and Publications.

Macmillan English dictionary for advanced learners (International student ed.). (2002). UK: Macmillan Publishers.

Majumdar, P. K. (2005). *Research methods in social science.* New Delhi, India: Viva Books Private Limited.

Mbugua, G. (2005). Energy sources in Kenya: implications for forests. Wajibu journal of social and religious concerns Vol.20, No. 2, 10-11.

Mburu, M. & Kimani, J. (2005, June 22, pp.4). *Real issues buried in politics.* Daily Nation Newspaper.

MOE Narok North (2007). *Primary School enrolment for the year 2007.* Narok North District: MOE, Narok.

Mugenda, O.M & Mugenda. A.G (1999). *Research methods. quantitative and qualitative approaches.*(pp. 46 - 48). Nairobi, Kenya: ACTS Press.

Muthoka, M., Rego,A.& Rimbui, Z. (1998) *Environmental education: essential knowledge for sustainable development.* (pp. 1 - 18). Nairobi, Kenya: Longhorn publishers.

Nairobi Rotary Club (2004). *Baseline survey of the Mara river basin.* (unpublished document)

NEAP, (1994). *Kenya national environmental action plan, (14) June 1994 report.* Nairobi, Kenya: Government press.(Unpublished).

NEMA, (2004). *State of environment report 2003,* (pp. 123-124). Nairobi, Kenya National Environmental Management Authority.

NEMA, (2006). *District environment action plan (2006-2010).* Narok District. National Environmental Management Authority. (Unpublished).

Nguny, J.G. (2001). Environmental education, a handbook for primary school teachers in Mt. Elgon region (pp.75-76) Kitale, Kenya: Kenya Institute of Education.

Ombech, A. N. (1991}. *Teaching environmental education.* In Otiende J. Ezaza, W. Boisvert, R (1991). *An introduction to environmental education.* (pp. 1 -32). Nairobi, Kenya: Nairobi University Press

Orodho, A. J. (2003). *Essentials of education and social science research methods.* Nairobi. Kenya. Masola Publishers.

Orodho, J. M. A. (1991). *Development and the environment.* In Otiende J. Ezaza, W. Boisvert, R (1991). *An introduction to environmental education.* (pp. 1 -32). Nairobi, Kenya: Nairobi University Press

Otiende J. Ezaza, W. Boisvert, R (1991). *An introduction to environmental education.* (pp. 1 - 32). Nairobi, Kenya: Nairobi University Press

Otim, J.J. (1992). The taproot of environmental and development crisis in Africa: the great challenge. (pp. 7-18). Nairobi, Kenya, ACLCA publishers.

Palmer, J.A. (1998). *Environmental education in the 21st century. Theory practice, progress and promise.* New York: Routledge.

Rachel, B., Bronwen, C. &Chris, E. (2004). *Environmental education in New Zealand schools: research into current practice and future possibilities Vol. one (pp.1-35).* Ministry of Education, New Zealand. . Available on the internet at file:_www.minedu.govt.nz. 20/11/2007.

Rauch, F. (2002). The potential of education for sustainable development for reform in schools. *Environmental Education Research, 8* (1), 44-51.

Republic of Kenya (1965). *African socialism and its application to planning in Kenya: Sessional Paper No. 10:* Nairobi, Kenya: Government press.

Republic of Kenya (1974). *Development plan for 1974-1978:* Nairobi, Kenya: Government press.

Republic of Kenya (1978). *Development plan for 1978-1983:* Nairobi, Kenya: Government press.

Republic of Kenya (1984). *Development plan for 1984-1988:* Nairobi, Kenya: Government press.

Republic of Kenya (1989). *Development plan for 1989-1993:* Nairobi, Kenya: Government press.

Republic of Kenya (1999). *Commission of Inquiry into the Education system of Kenya*: Nairobi: Government Printers.

Robottom, I. (1982). *What is environmental education: environmental education as education about the environment*: Paper presented at the Second National Conference of the Association for Environmental Education. Brisbane, Australia.

Roux, K. (2000). *Environmental education processes, active learning in schools.* (pp. 374 -376). Natal, South Africa: University of Natal Press.

Rugumayo, E. (1987). *Issues in environmental education.* In Beaz et.al. (1987). *The environment and science and technology education.* (pp 79-84). Oxford, England: Pergamon press.

Sauve, L. (1996). Environmental education and sustainable development: Further appraisal. *Canadian journal of environmental education, 1, 7 – 35*

Sauvé, L. (2002). Environmental education: possibilities and constraints. *Connect, 27* (1-2), 1-4.

Scott, W., & Reid, A. (1998). The revisioning of environmental education: a critical analysis of recent policy shifts in England and Wales. *Educational Review, 50* (3), 213-223.

Sterling, S. (2001). *Sustainable education: re-visioning learning and change.* Bristol: Green Books.

Stevenson, R. (1987). Schooling and environmental education: contradictions in purpose and practice. In I. Robottom (Ed.), *Environmental education: practice and possibility* (pp. 69-82). Geelong: Deakin University Press.

Stivers, R. (1976). *The sustainable society. ethics and economic growth.* Philadelphia. Westminster Press.

Swaminathan, (1987). *Environmental education and conservation.* In Beaz, G.A., Knamiller, G.W., Smyth, J. C. (1987). *The environment and science and technology education.* (pp.24-28). Oxford, England: Pergamon press.

Tilbury, D. (1995). Environmental education for sustainability: defining the new focus of environmental education in the 1990s. *Environmental Education Research, 1* (2), 195-212.

Tilbury, D. (2001a). Reconceptualising environmental education for a new century. Author's manuscript cited pp. 1-17. *Topicos en educacion ambiental, 3* (7), 65-74.

Tilbury, D. (2001b). Sustaining innovation in education: experiences in the learning for a sustainable environment project. *Australian Journal of Environmental Education, 17*, 87-93.

Tsuma, G. K. (1998). *Science education in the African context. (pp. 180 -185).* Nairobi, Kenya: Jomo Kenyatta Foundation.

Turner, B. (1997). The sustainability principle in global agendas: implications for understanding land-use/cover change. *The Geographical Journal, 163* (2), 133-140.

UNESCO. (1978). *Final Report: Intergovernmental Conference on Environmental Education, Tbilisi (USSR) 14-26 October 1977.* Paris: United Nations Scientific and Cultural Organisation.

UNESCO (1980). Environmental education in the light of the Tbilisi conference. Paris. UNESCO

UNESCO (1983). Education module on environmental education problems in cities: *Environmental education series, No. 4*: Paris, France.

UNESCO – UNEP (1986). Procedures for developing education curriculum: *Environmental education series, No. 22 (P 13)*: Paris, France.

UNESCO. (1992). *Report of the United Nations Conference on Environment and Development. Chapter 36 "Promoting education, public awareness and training".* Rio de Janeiro, 3-14 June: UNESCO.

UNESCO. (1997). *Educating for a sustainable future: a transdisciplinary vision for concerted action.* Thessaloniki: UNESCO and the Government of Greece.

(UNESCO, 2005). International implementation scheme for decade of education for sustainability

Wachira, E. (2006). Efficient service provision will help create environmental sustainability. *Wajibu journal of social and religious concerns Vol.21, No. 2, 16-19.*

Walker, K. (1997). Challenging critical theory in environmental education. *Environmental Education Research, 3* (2), 155-162.

Wals, A. (1994). Action taking and environmental problem solving in environmental education. In B. B. Jensen & K. Schnack (Eds.), *Action and action competence as key concepts in critical pedagogy*. Copenhagen: Royal Danish School of Educational Studies.

Wals, A., Arjen, E., & Alblas, A. (1997). School-based research and development of environmental education: a case study. *Environmental Education Research, 3* (3), 253-267

Wals, A. & Stapp. W.B. (1989). *Education in action: A community problem solving model for schools.* In Lozzi, L.A. & Shepherd, C.L. (1989). Conference proceedings of the North American Association for Environmental Education.

Wikipedia (2007). *Deforestation.* Available on the internet at file: http// ien wikipedia.org. 3/8/2007.

Wikipedia (2008a). *Sustainable development.* Available on the internet at file: http//en. wikipedia.org/wiki/sustainable_development 25/10/2008.

Wikipedia (2008b). *Education for sustainable development.* Available on the internet at file: http//en.wikipedia.org/wiki/education-for-sustainable-development 23/10/2008.

Wikipedia (2008c). *Milllennium development goals.* Available on the internet at file: http//en.wikipedia.org/wiki/millennium_development_goals 20/11/2008.

Wilson, R.A (1994). *Environmental education at the early childhood level: Washington, DC: North American Association for Environmental Education.* (pp.1-5),: Washington, DC.

WCED. (1987). *Our common future: the Brundtland report.* New York: Oxford University Press from the World Commission on Environment and Development.

WWF, (2001). *Environmental education for teacher educators.* Dar es Salaam. Tanzania. WWF Regional Office. Available on the internet at file http://gupea.ub.se/dspace/bitstream/2077/3908/1/HT06-2450-03. 22/10/2008.

Young, A. J. and Maggs J. E. (1987). *Issue based learning at primary school level.* Oxford ICSU press.

APPENDIX A

PUPILS' ENVIRONMENTAL EDUCATION QUESTIONAIRRE (PEEQ)

Instruction

a. **Please read each item carefully before answering them.**
b. **All information given will be treated with confidence**
c. **For each question, circle the letter that corresponds with the correct answer.**

1. (a) Is there uncontrolled cutting down of trees in your environment? (Tick one and if the answer is No go to question 2)

Yes	
No	

(b) Which of the following human activities contributed most to the uncontrolled destruction of the forest? (Tick 4 of the most common)

Human settlement	
Clearing land for farming	
Wild fires	
Cutting firewood	
Sale of timber	
Charcoal burning	

(c) What should people in your area do to conserve their forest? (Tick at least three solutions)

Re-afforestation	
Use firewood instead of charcoal	
Keep livestock instead of crop farming	
Plant fast growing trees for firewood	
Use energy saving Jikos for cooking	
Use solar energy for cooking	

(d) Which problems are people in your home area likely to face in future because of destroying their forest? (Tick at least five problems)

Floods during the rainy season	
Outbreak of diseases	
Reduction in amount of rainfall	
Human wildlife conflicts	
Disappearance of plant varieties	
Soil erosion	
Inadequate water	

2. (a) How would you describe the standards of cleanliness of Narok town? (Tick one, if the answer is very clean or clean go to question 3)

Very clean	
Clean	
Dirty	
Very dirty	

(b) Which of the following human activities have contributed to the low standards of cleanliness of Narok town? (Tick any 2 of the most common)

Oil spills from motor vehicles	
Poor sewage disposal	
Straying of cows to the town	
Poor waste disposal by people	
Congestion in town	

(c) Which of the following solid wastes are commonly found in Narok town dumping sites? (Tick at most 3 of the most common)

Papers	
Tins	
Bottles	
Plastics	
Food remains	

(d) How should residents of Narok town handle both organic and inorganic wastes from their homes? (Tick one of the most appropriate)

Put them in the same waste bin	
Separate and put them in different waste bins	
Use them to make manure	
Separate and recycle organic waste and use inorganic waste to make manure	
Separate and use organic waste to make manure and recycle inorganic waste	

(e) Which of the following problems would you associated with poor solid waste disposal? (Tick 3 of the most common)

Increase in water borne diseases	
Breeding ground for mosquitoes	
Rusting of iron sheet roofs in town	
Spoil the beauty of the surrounding	
Increase in livestock diseases	

3. (a) What are the main source(s) of the water used in your home? (Tick at most 3 of the most common)

River	
Well	
Rain	
Dam	
Springs	
Borehole	

(b) How would you consider the quality of water from your source(s)? (Tick one and if your answer is very clean or clean go to question 3d)

Very clean	
Clean	
Dirty	
Very dirty	

(c) Which human activities have led to the low quality of water from your source(s)? (Tick 3 of the most common)

Untreated sewage from homesteads	
Fertilizers used in farming	
Soil due to poor farming methods	
Chemicals used in farming	
Contamination by human faeces	

(d) Which of the following diseases are associated with lack of clean drinking water? (Tick 4 only)

Malaria	
Typhoid	
Amoebiasis	
Brucellosis	
Pneumonia	
Bilharzias	
Influenza	
Cholera	

APPENDIX B

PUPILS' ENVIRONMENTAL EDUCATION ACHIEVEMENT TEST (PEEAT)

Instructions

a. **Please read each item carefully before answering them.**
b. **All information given will be treated with confidence**
c. **For each question, circle the letter that corresponds with the most appropriate answer.**

1. Which of the following is a non-renewable resource?
   A. Minerals
   B. Forests
   C. Wild animals
   D. Soil
2. Sustainable water management involves.
   A. Using water for irrigation purposes
   B. Using water for domestic purposes only
   C. Controlled utilization of water resources
   D. Controlling the harmful effects of water on the environment.
3. The type of soil erosion that takes place when soil is carried away from the ground surface forming shallow channels is called?
   A. River bank erosion
   B. Splash erosion
   C. Gully erosion
   D. Rill erosion.
4). Which of the following solid waste should be disposed safely by burying?
   A. Broken Bottles
   B. Old papers
   C. Scrap metal
   D. Plastics

5). Which one of the following uses of water can be improved to conserve most water?

A. Watering plants
B. Recreation
C. Watering animals
D. Transportation

6). Which one of the following statements about plants could lead to an environmental problem?

A. Source of medicine
B. Source of beauty
C. Uses carbon dioxide
D. Source of firewood

7). Which one of the following is not likely to pollute water?

A. Agricultural chemicals
B. Raw sewage
C. Treated sewage
D. Washing clothes in a river.

8. Which of the following is a sustainable land use?

A. Using different pesticides per year to kill plant pests
B. Using herbicides instead of weeding farm crops.
C. Adding excess chemical fertilizers to replace extracted nutrients by crops.
D. Adding organic manure to replace extracted nutrients by crops.

9. Which of the following animal is a predator?

A. Wild beast.
B. Hippopotamus.
C. Hawk.
D. Vulture.

10. Which of the following is a soil conservation method?

1. Planting cover crops
2. Planting one type of crop
3. Practicing mixed farming
4. Planting drought resistant crops

11. Which of the following sources of electricity would lead to environmental problems?
    A. Solar
    B. Geothermal
    C. Windmills
    D. Diesel generators

12. In a community of wild animals if the population of female is more than the population of males, what is likely to happen in the long run?
    A. Population will decrease.
    B. Population will increase.
    C. More females will be born.
    D. More males will be born.

13. Which of the following is a renewable source of energy?
    A. Gas.
    B. Electricity.
    C. Coal.
    D. Kerosene.

14. Which of the following is an adaptation of a camel to its habitat?
    A. Having sharp eyesight.
    B. Having flat hooves.
    C. Having fur on their skin.
    D. Having mammary glands.

15. Which of the following is an effect of destruction of vegetation cover in water catchments areas?
    A. Reduced run-off during rainy season
    B. Floods during rainy season.
    C. Increased ground water levels.
    D. High percolation of rainwater into the ground.

16. Which type of forest is found near salt water regions?

A. Tropical forests.

B. Dry upland forests.

C. Montane forests.

D. Mangrove forests.

17. Which of the following is a major environmental problem of urban areas in Kenya?

A. Oil spills

B. Garbage collection

C. Poverty

D. Floods

18. The process of introducing or adding harmful materials to the environment is known us:

A. Depletion of ozone layer

B. pollutant

C. Pollution

D. Global warming

19. The protection and sustainable use of the earth's resources so that future generations can also use them to meet their needs is known as:

A. Preservation

B. Construction

C. Protection

D. Conservation

20. The following is a food chain in Maasai Mara Game Reserve.

Grass ⟶ Wild beast ⟶ Lions

Lions occasionally kill cows belonging to the Maasai People living around the game reserve. If the people decided to kill all the lions, which of the following is likely to happen. .

A. Wild beast will decrease in number

B. Cows may starve to death .

C. Amount of grass will increase.

D. Wild beasts will migrate.

21. In a food chain organisms that make their own food using sun energy are called:

A. Plants

B. Producers

C. Manufacturers

D. Synthesisers

Use the information below to answer the questions 22 and 23.

Frogs eat grasshoppers, grasshopper eats grass, and snakes eat frogs. .

22. From the information above which one of the following food chains is correct?

A. Frog → Grasshoppers → Grass → Snakes

B. Snakes → Grasshoppers → Frogs → Grass

C. Grass → Grasshoppers → Frogs → Snakes

D. Grass → Grasshoppers → Snakes → Frogs

23. From the food chain identified in question **22** above what type of a consumer is snake:

A. Primary consumers

B. Secondary consumer

C. Tertiary consumer

D. Quaternary consumer

24. Which of the following pollutes soil?

A. Green manure

B. Crop weeds

C. Solid wastes

D. Animal manure

25. Industrial waste gases are treated to:

A. Add oxygen to them

B. Make them heavier

C. Remove substances harmful to the air

D. Improve the products being made

26). Pollution from sound is dangerous as it might lead to:

A. Alertness

B. Deafness

C. Blindness

D. Paralysis

27). Which of the following is an air pollutant?

A. Aerosols

B. Vapour

C. Aeroplanes

D. Moisture

28). Which of the following sources of heat is inexhaustible?

A. Firewood

B. Sun

C. Coal

D. Kerosene

29). Which of the following energy source does not pose any danger to the environment?

A. Coal

B. Kerosene

C. Biogas

D. Firewood

30). Which of these materials cannot be recycled?

i) Ashes

j) Sewage

k) Old newspapers

l) Plastic bags

APPENDIX C

PUPILS' ENVIRONMENTAL EDUCATION ATTITUDE QUESTIONNAIRE (PEEAT)

Instructions

Please consider each of the following statements and indicate the responses that best reflect your opinion by circling one of the options given only.

1) I like Environmental education.
   - A. Strongly agree
   - B. Agree
   - C. Not sure
   - D. Disagree
   - E. Strongly disagree

2) I am less concerned about environmental destruction taking place in my area.
   - A. Strongly agree
   - B. Agree
   - C. Not sure
   - D. Disagree
   - E. Strongly disagree

3) We should always be concerned about the effect of our activities in the environment.
   - A. Strongly agree
   - B. Agree
   - C. Not sure
   - D. Disagree
   - E. Strongly disagree

4) A controlled use of natural resources may benefit future generations.
   - A. Strongly agree
   - B. Agree
   - C. Not sure
   - D. Disagree
   - E. Strongly disagree

5) Polythene bags pose a serious environmental problems.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

6) It is worrying that people are settling in Mau Forest.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

7) Environmental Education is somehow difficult:

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

8) I am concerned about the problems affecting the environment in the world today.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. strongly disagree

9) Man can continue to survive even without other living organism.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

10) Natural resources have always been there and will be there in future.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

11) Taxing polythene bags used for packing shopping goods is punishing people.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

12) It is important for Kenya to have large acres of forest land though some Kenyans have no land.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

13) Practical activities during environmental education lesson make it enjoyable.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

14) Environmental conservation should be done by all citizens.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

15) What we do in the environment rarely affects other living things.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

16) Future generations may not require today's natural resources.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

17) I would rather carry my shopping items in a basket than use polythene bags.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

18) Government should collect taxes from charcoal burning income.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

19) Environmental education is only necessary for one to pass his/her examinations.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

20) There is little to be done about the current environmental problems.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

21) Man may be blamed for the conflicts existing between him and wild animals.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

22) Future generations have a right to inherit today's natural resources.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

23) Polythene bags may affect environmental beauty.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

24) Kenya may benefit more in the long run by giving out forest land for crop farming.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

25) Environmental education may help me change my behaviour in the environment.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

26) Cleaning of a school compound should be left to the school grounds workers.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

27) Development activities should only consider how man will benefit.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

28) It is being greedy to over use our natural resources to meet our needs.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

29) Solid-waste rarely causes health risks to people.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

30) Local community should be allowed to benefit from sale of timber from Mau Forest.

A. Strongly agree

B. Agree

C. Not sure

D. Disagree

E. Strongly disagree

APPENDIX D

RESEARCH AUTHORIZATION

MINISTRY OF SCIENCE & TECHNOLOGY

Telegrams: "SCIENCE TEC", Nairobi

Fax No.
Telephone No: 318581
When replying please quote
MOS&T 13/001/36C 536/2

REPUBLIC OF KENYA

JOGOO HOUSE "B"
HARAMBEE AVENUE
P.O. Box 60209-00200
NAIROBI
KENYA

28TH August 2006

Sammy M. Mutisya
Egerton University
P.O. Box 536
NJORO

Dear Sir

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *'Achievement of Kenya's Environmental Education Objectives by Primary Schools in Central Division, Narok District'*

I am pleased to inform you that you have been authorized to carry out research in Narok District for a period ending 30th July 2007.

You are advised to report to the District Commissioner and Education Officer Narok District before commencing your research project.

On completion of your research, you are expected to submit two copies of your research report to this office.

Yours faithfully

B. O. ADEWA
FOR: PERMANENT SECRETARY

Copy to:

The District Commissioner
Narok

The District Education Officer
Narok

APPENDIX E

PERMISSION TO CONDUCT RESEARCH

SAMMY M. MUTISYA
EGERTON UNIVERSITY
FACULTY OF EDUCATION AND COMMUNITY DEVELOPMENT
P.O. BOX 536
NJORO

15th June, 2007

THE HEADTEACHER
.....
.....
.....
.....

RE: PERMISSION TO COLLECT RESEARCH DATA IN YOUR SCHOOL

I am a postgraduate student of Egerton University pursuing a master degree in science education. The title of the research study is Achievement of Kenya's Environmental Education Objectives by Primary Schools in Central Division, Narok District, Kenya.

The data collected will be for the purpose of my study only and will be treated with all confidentiality. The findings could be made available to your school after completion of the study on request. I will be visiting your school to administer my questionnaire on.....

Thanks for the permission

Sincerely,

MUTISYA

APPENDIX F

STANDARD 8 ENROLMENT CENTRAL DIVISION PUBLIC PRIMARY SCHOOLS

Olchorro Zone

Primary School	Total
Olchorro	12
Erusiai	12
Murua	8
Oloolorten	11
Olelusie	10
Ilkarampuni	6
Olendeem	11
Olenkasurai	6
Sanaet	12
Ole Mwanik	7
Entontol	14
Ntimama Ridge	8
Sonkoro	9
Nairenke	8
Total	**134**

Nkoben Zone

Nkairamiram	20
Mpora Eshumata	13
Nkareta	32
Olokuseri	15
Nairasirasa	22
Mpora Eabori	13
Katakala	14
Olooltoto	10
Total	**139**

Ilmashariani Zone	
St Peters	72
St Marys	88
Ilmashariani	33
Empopongi	12
Oletukat	22
NTC Model	29
Syapei	13
Pulunga	13
Limanet	6
Iltumtum	10
Total	**284**
Ole Sankale Zone	
Olopito	30
Olorroito	10
Masikonde	116
Oimerru	11
Ole Sankale	70
JS Ole Naeku	30
Lenana	48
Hosanna Enelerai	7
Osonkoroi	5
Rokonka	12
Naisoya	48
Moi Eor Enkitok	20
Total	407

Source: MOE Narok North, (2007).