CHALLENGES AND OPPORTUNITIES OF TEACHING ENVIRONMENTAL EDUCATION IN SECONDARY SCHOOLS IN KENYA: THE CASE OF RUIRU DISTRICT

By

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DECLARATION

This Thesis is my original work and has not been submitted for examination in any other University or any other award.

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This work is dedicated to my family, husband Ng'ang'a and sons Chege and Njoroge for their constant support and encouragement and to all those who make efforts to conserve and protect the environment for future generations.

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May the Almighty God abundantly bless you all!

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ABBREVIATIONS AND ACRONYMS

AFEW	African Forum for Endangered Wildlife
EE	Environmental Education
EECN	Environmental Education Centre Nairobi
IEEP	International Environmental Education Programme
EMCA	Environmental Management and Coordination Act
FAO	Food and Agriculture Organization
KNEC	Kenya National Examinations Council
KIE	Kenya Institute of Education
NEAP	National Environmental Action Plan
NEMA	National Environment Management Authority
UN	United Nations
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNCED	United Nations Commission on Environment and Development
WCED	World Conference on Environment and Development
WED	World Environment Day
WHO	World Health Organization

ABSTRACT.

The primary objective of this study was to investigate the challenges faced and opportunities available in the teaching and learning of Environmental Education in secondary schools in Kenya using Ruiru District in Central Province as a case study. This was achieved by analysing the secondary school syllabi for selected environment related subjects, namely biology, chemistry, geography and agriculture to establish the elements of EE infused therein. The methods used to teach these elements, the preparedness of teachers to handle them, availability of teaching and learning resources as well as the attitudes of both teachers and students towards EE were also investigated. The target population was the 15 secondary schools in Ruiru district which was a division at the time of the study. A sample of 150 form three students was taken from five randomly selected schools in the division together with 20 teachers of environment related subjects making a total of 170 subjects. Data were collected using questionnaires, attitude scale tests and content analysis of the secondary school syllabi of the selected EE related subjects. Data from questionnaires and attitude scale tests were coded then scored for analysis while data from content analysis of the selected subject syllabi were summarised in tables to show the particular EE related topic and the EE objectives therein. The results are presented in text and tabular form and analysed by use of percentages, means and frequency tables. The findings of the study established that though EE is adequately incorporated in the secondary school syllabi of subjects studied; various challenges are faced by the teachers in the teaching of EE elements in these subjects. These challenges include, fragmentation of EE themes in the various subjects, inadequate instructional materials, inadequate training of teachers to handle EE related topics in their subject areas and over-reliance on the lecture method of teaching among others. However, attitudes of both teachers and students to EE were found to be highly positive with 90% of teachers and 98% scoring above the mean score in the attitude Scale tests. From the research findings, major recommendations such as adequate provision of instructional materials, a review of pre- and in-service EE programmes for teachers as well as regular monitoring of EE programmes among others were made. The findings of the study and the accompanying recommendations will no doubt prove invaluable to curriculum developers and policy makers in the country.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Problem

Environmental Education (EE) is the process of recognising the values and various conceptions of the environment with the aim of determining the skills and approaches necessary for understanding the relationship between man, his culture and the biophysical environment (Otiende *et al* 1991). EE stresses the holistic nature of the environment encompassing socio-economic, cultural and political aspects as well as the biophysical elements (Majengwa, 1988). EE should therefore create an awareness of the economic, political and ecological interdependence in the present world so as to enhance environmental responsibility among nations.

The world is currently experiencing a myriad of environmental problems such as the global warming, extinction of plant and animal species, the unsafe storage and disposal of nuclear waste, the decline of biological diversity and the pollution of air, water and soil among others. Scientists and environmentalists have one common message that if we fail to change our behaviour radically within a short period; these problems will be aggravated and could finally lead to an irreversible situation.

Haunted by these alarming future scenarios politicians and policy makers are becoming more and more convinced that education should play a crucial part in these necessary societal changes: Pupils and students , tomorrow's citizens ought to be taught how they can contribute to the development of a sustainable world (Postma, 2002). National and

international reports on environmental policy promote environmental education as an instrument for realising environmental and ethical awareness, values and attitudes, skills and behaviour consistent with sustainable development.

In the Stockholm Conference in Sweden in 1972, participants recommended the need for environmental education. Recommendation 96 of this Conference forms the foundation of environmental education internationally. It states that

"*The Secretary General of the organization of the UN system especially UNESCO and other agencies concerned such as FAO, WHO etc should after consultation and agreement take the necessary steps to establish an international programme in environmental Education, interdisciplinary in nature, in school and out of school, encompassing all levels of education and directed to the general public and in particular the ordinary citizen living in the rural and urban areas, youths and adult alike, with a view to educating them on the simple steps and measures they may take within their means to manage and control the environment.*" (UNESCO, UNEP, 1985)

This recommendation was implemented in 1975 during an environmental education workshop held in Belgrade Yugoslavia whose objective was to champion for the development of the IEEP.

Kenya participated in the Rio Earth Summit of 1992 where countries were encouraged to give greater consideration to environmental conservation, education and public awareness in their overall development projects. In response to the Rio Earth Summit proposals, Kenya developed the National Environmental Action Plan (NEAP) in 1994. The NEAP document acts as a guideline to the government in enhancing sustainable

development and promoting environmental education. In 1999, the Kenya parliament passed the Environmental Management and Coordination Act (EMCA). The Act helped to entrench environmental concerns in the Kenya legal framework. The Act facilitated the establishment of the National Environment Management Authority (NEMA), an institution charged with the responsibility of coordinating all environmental conservation activities in Kenya. NEMA, in collaboration with other stake holders in EE have developed an Environmental Education Strategy for Kenya, a document expected to provide guidelines on how to implement and evaluate EE to enhance sustainable development.

Despite the above measures, Kenya continues to witness extensive destruction of its natural resources caused by human activity. This destruction cuts across all the major ecosystems in both protected and unprotected areas. The magnitude and complexity of environmental crisis in Kenya includes hunger and malnutrition, degradation of the natural ecosystem and landscapes, desertification, depletion and wastage of natural resources, overproduction of wastes, pollution, conflicts and poverty. Environmental problems occur primarily because of our ever growing and often negative impact on the biosphere, through technological processes and the products we use (UNEP, 1988). The sustainable use of resources will depend on citizens who are environmentally aware and are able to use and manage resources effectively.

Environmentally sound and sustainable development requires new attitudes on the part of resource consumers and more realistic perceptions of global and local ecosystems to which we belong. Through education, these new attitudes and perceptions are beginning

to emerge and are leading to heightened environmental awareness (UNEP, 1988). Tsuma, (1997) notes that EE is vital for the survival of mankind. He observes that without educating the masses, especially in the early years of schooling, they will continue to mismanage and destroy the environment on which their existence depends. According to Freedman (1995) a well informed public will formulate opinions and make choices that will improve the quality of the environment and reduce anthropogenic stress (adverse human influence) on ecosystems. He notes that EE can be achieved by an institutional incorporation of objective information on changes in the environmental quality into school curricula at all levels.

There are two approaches that are used to teach EE in the formal education sector in Kenya, the interdisciplinary and multidisciplinary approaches (KIE, 1977, 1999, Ombech, 1991). In the interdisciplinary approach EE is taken as a unit and draws subject matter from existing disciplines. In the multidisciplinary approach, subjects use the environment as a resource for teaching with EE themes infused into different subjects in the curricula. Otiende *et al* (1991) observed that educators may not be familiar with the variety of interdisciplinary and multidisciplinary approaches available in dealing with environmental issues. This is due to the fact that EE is a relatively new discipline and the trend in teacher education is increasingly oriented towards specialisation. He further points out that effective or action oriented EE may not be welcome in the rigid institutional structures of certain educational establishments due to increased compartmentalization and specialisation. Also, in an already overcrowded curriculum, EE may constitute little to justify its inclusion as a separate subject. This denies the learners an opportunity to investigate, discuss and analyse environmental issues

exhaustively (Ombech, 1991)

Since at the moment it is not taken as a separate subject, Environmental Education is faced with various constraints. Though efforts have been made to incorporate EE across the existing disciplines, the curriculum may be congested to the extent that it is at times difficult for teachers to achieve the targets set in the disciplines. Most teachers assume that EE related topics in their subject are covered in other subjects thus giving it less emphasis. Problems associated with the teaching of EE may be due to a perceived lack of adequate pre-service and in service training on EE in the subjects in which it is covered (Cutter, 2001). It thus becomes a challenge to ensure that EE is in line with Kenya's industrialisation goal of the year 2020 or the Vision 2030. Though Kenya has had several environmental initiatives over the last decade with positive impact on the environment, much still needs to be done to ensure that the quality of the environment is maintained at the recommended level (Ombech, 1991).

1.2 Statement of the Problem.

The rapid expansion of population and subsequent fast pace of development has led to the degradation of the environment through unsustainable use of natural resources. In an attempt to address the issue, the Kenya Government has put in place various strategies one of which has been to use the schools as a key means to educate the people on the need for environmental protection and conservation through environmental education. In the formal schooling, a multidisciplinary approach is used to infuse EE into the curricula. It would therefore be expected that students leaving school would have been

equipped with the desirable skills, attitudes, and values to ensure environmental conservation and protection. The ultimate aim of EE is for each school leaver to have formulated a responsible attitude towards the sustainable development of Planet Earth, an appreciation of its beauty and an assumption of an environmental ethic (Bell, 2004).

However, despite the many efforts in place, it is observed that many environmental problems such as air, pollution and deforestation among others continue to be experienced in the country. In Ruiru town and its environs in particular, it is observed that air and water pollution from the many industries in and around the town and improper refuse disposal abound. This could be a pointer to the fact that the young people graduating from our schools have not been well environmentally sensitized to be able to transfer sound environmental practices to the general population. This can only imply that there are some shortcomings in the teaching and learning of EE in schools.

One of the ways in which to address the shortcomings is to adequately prepare the students in secondary schools in EE. The quality of any attempts made to address the environmental crisis depends on the quality of EE one has had. It is therefore essential to assess EE in secondary schools in order to find out the factors that hinder its effectiveness so that suggestions can be made to the relevant authorities for adjustments, replacements, revision, and/or strengthening it. This study sought to establish the challenges faced and opportunities available in the teaching and learning of EE in secondary schools in Ruiru district of Kenya that may hinder its effectiveness.

1.2 Purpose of the Study

The purpose of this study was to examine the challenges faced by teachers and learners in the teaching and learning of EE in secondary schools. The focus of the research was to analyse which elements of EE have been infused into the school curriculum in selected subjects the methods used to teach them, resources available as well as the attitudes of both teachers and students towards EE.

1.1 Objectives of the Study

Objectives are intentions or purposes stated in measurable terms. They provide opportunities for evaluating the end results. In research, an objective is a specific statement relating to the defined aim of the study (Kombo and Tromp, 2006).

The overall goal of this study was to investigate the challenges of teaching environmental education in secondary schools in Ruiru district of Kenya.

The specific objectives that guided the study were to:-

i. Identify the elements of EE that have been infused into the biology, chemistry, agriculture and geography syllabi.
ii. Identify the teaching methods used to teach these elements.
iii. Determine the preparedness of secondary school teachers to handle the EE content in the curriculum
iv. Identify resources available in the schools for effective teaching of EE
v. Find out the attitudes of teachers and students in secondary schools towards EE.

1.2 Research Questions.

Responses to the following questions aided in adducing data for the research.

i. What elements of EE have been incorporated into the secondary school curriculum

in selected subjects?

ii. What are the teaching methods used to teach the EE elements?

iii. Have the secondary school teachers been adequately prepared to handle EE?

iv. What resources are available in schools for effective teaching of EE?

v. What are the attitudes of both teachers and students towards EE?

1.6 Significance of the Study

The findings of this study may help teacher trainers to evaluate the teacher training curriculum on EE and therefore form a basis for modification and harmonization of the present teacher training curriculum. The ministry of Education could benefit from this study as it will make data available for making crucial decisions about the EE curriculum and especially in organising in-service courses for practising secondary school teachers. The identification of the problems that hinder the effective teaching and learning of EE may assist educators responsible in planning, designing and implementation of EE programmes.

The results may prove invaluable in the design of future pre-service and in-service teacher training programmes by identifying areas where future teacher development is needed. Improved training programmes may help motivate teachers to teach environmental themes and equip them with more knowledge thereby improving the quality of EE. Results of the study will in particular be significant to curriculum developers since it will suggest ways of improving the teaching of EE in secondary schools and also in the pre-service and in-service of secondary school teachers. Overall, the provision of improved curriculum materials and human resources may increase the

diffusion rate of EE by making it easier for teachers to incorporate environmental themes into the schools.

1.7 Scope and Limitations of the Study

The research was conducted in five secondary schools in Ruiru District, Kenya. The study focused on form three students from both single sex and mixed secondary schools. Teachers of environment related subjects, namely chemistry, biology, agriculture and geography were also involved in the study.

The study was limited to investigating the challenges faced and opportunities available in the teaching and learning of EE in the four subjects only and did not consider the other subjects in the secondary school curriculum. The study was also limited to a sample of five secondary schools and results generalized to the entire population in the study area due to similarity of general conditions in the schools in the area.

1.8 Assumptions of the Study

A basic assumption of this study was that the Kenyan population has not been adequately sensitized about the need for environmental conservation and that sound environmental awareness among the majority of people is lacking. This is supported by the fact that there has been continued degradation of the environment by the Kenyan people over the years despite the many environmental education programs and policies that have been put in place. The study therefore also made the assumption that environmental education has not been well handled in the existing school curricular due

to various constraints which may include:

1. Inadequate training of teachers to handle EE.
2. Teaching and learning resources in schools
3. Poor attitude of both students and teachers towards environmental education.

These assumptions were subject to confirmation by the end of the study

1.9 Conceptual Definition of Terms.

Environment: The set of physical, chemical, biological components and economic social and cultural factors relating to a group of human beings or to an individual or living organism which interacts with him/her to a lesser or greater degree such that they transform each other to a lesser or greater extent. (IEEP-UNESCO-UNEP, 1985)

Environmental Education: Transmission of desirable environmental knowledge, skills attitudes and values necessary for the individual to understand and appreciate the interrelationships of man, his culture and the biophysical aspects of the environment (UNESCO-UNEP-IEEP, Series 9, 1985)

Curriculum: Program containing planned material/subject matter to be covered within a period of time

Environmental awareness: Consciousness of the problems and dangers facing mankind and the environment and of the pressing need for positive action to control the undesirable impact of man's activities and demands upon the environment (Environment Education Committee, Kenyatta University College, 1980)

Environmental issues: Matters pertaining to the environment that are of concern to environmentalists in view of the fact that the manner in which they are handled will determine whether or not they will degrade the environmental problems.

Multidisciplinary approach: A curriculum approach where aspects of EE are infused into the existing traditional disciplines.

Interdisciplinary approach: An approach where aspects of EE are drawn from other traditional disciplines to make an independent subject.

Sustainable Development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987)

EE Components: Aspects of environmental education infused in the secondary school curricula.

Teaching Resources: Materials used in and out of the classroom to enhance the learning process

Challenges: Factors that may hinder the effectiveness of the teaching and learning process.

Teacher Competency: The ability of a teacher to effectively impart desired knowledge to learners.

Infusion: Incorporation of Environmental education themes into the school curricla.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter covers a review of various issues, texts and other publications considered to be relevant to this study. Topics reviewed include: the role of EE, EE in global perspective, EE in secondary schools, objectives of teaching and learning EE in secondary schools, attitudes and perceptions of teachers and students towards EE as well as teacher training and competency in teaching of EE.

2.2 Role of EE

Many studies have been undertaken on the role of education in the face of environmental problems. The Tbilisi intergovernmental conference on EE of 1977 noted that education had a crucial role to play in the effort of the world to solve environmental problems. EE is seen as the only way of developing an awareness of the environment and a sense of responsibility for its protection. It is hence the most effective vehicle for persuading the human race to adopt a rational attitude towards the natural environment and to avoid the deterioration of the human race as a result of unwise exploitation and misuse of nature (Otiende *et al*, 1991).

Geddes, in Otiende *et al* (1991) asserts that there is a connection between the qualities of environment and quality of education. He states that environmental awareness makes a student learn better and develop a creative attitude towards his/her surroundings. The international community agrees that the goal of environmental education should be to

develop a world population that is aware of and concerned about the environment and its associated problems and which has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively towards solution of current environmental problems and the prevention of new ones (UNESCO, 1981). Precisely, EE is the key to sound environmental protection and sustainable use of natural resources.

2.3 EE in Global Perspective.

Maintaining and improving the quality of the environment and life is a major public policy at national and international levels. Man has perceived the environment as a resource to be exploited rather than a system to be maintained (Khashoo, 1987).

The extent of human intervention has grown to a point where it has produced vast and disruptive changes in the environment. In all countries, there are substantial deficiencies in the awareness of citizens about environmental issues. In part, these shortcomings exist because the public largely relies on mass media for EE (Freedman, 1995).

Though the media communicates a great deal of useful environmental information, its presentation of some issues may be biased and sometimes inaccurate. Therefore a serious need of an institutional exposure to objective and critical environmental information is not only helpful but also necessary. Otiende *et al (1991)* note that the use and misuse of the immediate surrounding and the subsequent degradation of the quality of the environment created a considerable concern in almost all African communities According to Tsuma (1998), many of the dramatic climatic changes, ozone layer

depletion, desertification, pollution, etc, are of humanity's own making. These problems have continuously increased in magnitude due to development, industrialisation, technological advancement and human population growth. Freedman (1995) agrees that the population growth could be considered the cause of the environmental crisis.
He indicates that the cumulative anthropogenic impact on the biosphere is a function of the size of the human population and environmental impact per person both of which largely depend on the nature and degree of industrialisation.

Compared to other disciplines such as mathematics and others, EE is a relatively new area of study that dates back to the 1970's. Environmental degradation in terms of undesirable impacts of technology and economical activity became a matter of environmental concern by the end of the 1960's. This is when major conferences on human environment created a totally new awareness about the environment in the world (Khoshoo, 1987). In the 1972 Stockholm Conference on human environment, the governments realised how fragile and interdependent the earth's ecosystems are. The conference stressed the role and need for EE of both the public and the specialists in other fields in the solution, prevention and anticipation of these pressing problems. They undertook to collectively protect the environment and enhance environmental protection (Otiende *et al* 1991, Tsuma, 1998).

In response to the Stockholm recommendations, UNESCO and UNEP set up an international EE programme with a view to promoting exchanging of information and experiences in the field of EE (Khoshoo, 1987). The 1977 Tbilisi Declaration on EE and training sought to enhance EE principles and practices that have been included in many

learning institutions and curricula worldwide. In 1988/89 the Regional Programme of Action on EE and Training was adopted by governments in Africa, Asia and Caribbean regions (Tsuma, 1998). In 1992 the UNCED resulted in the formulation of Agenda 21 and the Rio declaration both of which outlined policy objectives and principles for sustainable development in the new millennium (Mckeown, 2002).

To a large extent, the current concern on environment and development emerge out of problems experienced by industrially advanced countries. All these efforts and others like them contribute towards improving the quality of the environment (Tsuma, 1998). The approach to EE should differ in content where it is taught in developed and developing countries (Acar, 1993). EE in Africa ought to determine the place and role played by traditional education in overall environmental management. Two issues arise out of this.

Firstly, EE contradicts the interest of some people to utilise the ecosystems and secondly, in the developing world there are limited means to deal with such conflicts and seek satisfactory results. This contradiction calls for school curricula to play a role so that the place and role of cultural and economic conditions are taken into account. EE is a suitable way of developing awareness of the environment and sense of responsibility for its protection (Otiende *et al* 1991).

Thus it is vital for EE to inculcate knowledge, skills, values and attitudes that will help improve the quality of the environment. In Kenya, the school system is recognised as the most effective means of conveying messages to resolve environmental problems and to

develop environmental awareness. The programmes in schools are viewed as long term strategies. As future parents and leaders of the nation, the primary and secondary school leavers will become powerful instruments of change in resolving environmental problems and developing environmental awareness among the population (Acar, 1993). The approaches through which EE has been introduced in the school curricula are interdisciplinary and multidisciplinary approaches (Ombech, 1991).

2.4 EE in Secondary Schools.

The goal of environmental education is to develop a world population that is aware of and concerned about the environment and its associated problems and who has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively towards solution of current environmental problems and prevention of new ones. The school system provides the largest organized base for environmental education and action. It offers an effective instrument for embedding in students the desirable environmental ethics. (Pradhan, 2002). School leavers therefore are expected to have formulated a responsible attitude towards the sustainable development of Planet Earth, an appreciation of its beauty and an assumption of an environmental ethic (Bell, 2004)

The Presidential Working Party on Education and Manpower Development for the next Decade and Beyond of 1988 (Sessional Paper No 6) realized that there was an urgent need to intensify environmental studies in schools and training institutions to educate the youth about conservation and enhancement of the environment. The working party

realizing the contributions of the environment to the national development and the role of education in its enhancement recommended that environmental studies be made part and parcel of the education and training curricula at all levels of the education system. It also called for concerted efforts to be made by all learners and organizations to educate the public on the importance of the environment and their specific roles in enhancing its protection and conservation. It also recommended that education and training be used to develop positive attitudes and habits towards maintaining a clean and hygienic environment (KIE, 1997). Following the recommendations of the working party, EE themes and messages were introduced in the curriculum at pre-primary, primary and secondary schools, and primary teacher education colleges using multi-disciplinary and inter-disciplinary approaches (KIE, 1997).

The responsibility for helping Kenyan citizens to acquire knowledge and incentives necessary to make wise environmental decisions has therefore been resting on schools (Roger, 1998). Teachers have a crucial role to play in bringing about the extensive social change needed to address an environmental crisis. (Cutter, 2001). In Kenya, in particular there have been a number of studies examining EE teaching practices in school systems some of which have been cited in this study. However, the implementation of the various recommendations made by the researchers has been wanting. For EE to be effectively taught in secondary schools learners need to be given an opportunity to investigate, discuss and analyze environmental concerns through hands on activities. (Otiende *et al* 1991, Cutter, 2001).

2.5 Objectives of Teaching and Learning EE in Secondary Schools.

To achieve the objectives of EE, the Tbilisi conference of 1977 recommended that each country sets up and strengthen the organizational structures necessary for the realization of the objectives (Otiende *et al*, 1991; Tsuma, 1998). In Kenya, the KIE (1987) articulated the general objectives for strengthening the teaching and learning of EE in Kenya. They include increasing the learners' awareness of the physical, biological and human components of the environment and how they interact to modify our surroundings.

The learner should also be encouraged to be more aware of and sensitive to their surroundings and show how people depend on the environment and the importance of using environmental resources wisely. Development of skills to investigate the environment with a view to recognizing and solving actual and potential environmental problems thus encouraging personal concern for the quality of local and distant environment and of the lives of the people living in them should also be a major objective of EE.

Teaching of EE should help learners to make choices between alternative ways of using the environment based on a sound knowledge of the relevant factors – ecological, social, and aesthetic and the needs of future generations. This will make them understand that management and conservation of the environment would eventually help to meet individual, national and global needs. This will create awareness on the effects of urbanization on the environment thus enabling the learners to acquire knowledge and skills necessary to understand and analyse population issues which affect quality of life

of the people of Kenya thus appreciating the importance of good health habits and practices

2.6 Attitudes and Perceptions of Teachers and Students towards EE.

.Environmental problems occur primarily because of our ever growing and often disruptive impact on the environment. It is only when people are made aware of the environment and its significance to their lives that they will act responsibly towards it (UNEP, 1988). UNEP further indicates that environmentally sound and sustainable development requires new attitudes and more realistic perceptions of ecosystems to which we belong. Through education these new attitudes and perceptions are beginning to emerge and are leading to heightened environmental awareness.

The teacher is one of the important factors which is bound to affect the environmental education programmes. Teachers can provide a vital link in the delivery of environmental knowledge, its associated problems and their solutions Therefore, teachers' positive attitudes and perceptions towards the environment can play an important role in shaping the students' attitudes and perceptions in order to bring about effective environmental management. Teachers' attitudes can affect the quality of task setting. Students whose teachers attribute least importance to fieldwork will spend more time on practicing basic skills and learning factual and theoretical components of EE (Roux, 2000)

The traditional approach to EE has been to 'teach facts' and assume that if people 'get the facts' about the environmental problems, they will become concerned about the problem. Ombech, (1991) notes that the model can be successful if the person already has some concern or emotional feelings about the problem, and also has the attitude that he/she can solve the problem. It is therefore clear that EE has to become more action oriented in order to be more effective. In order to change the perceptions and attitudes of students towards their environment, UNEP further points out that information should be presented in forms and levels appropriate to different target groups. It should be also related to local situations since environmental problems and choices to be made are usually site specific (UNEP, 1998)

Ombech (1991) recommends the promotion of attitudes that will encourage individuals to discipline themselves in order to play a positive role in collective action to improve the environment. However, the process of developing a school environmental education policy can be a daunting task if the head teacher is not supportive and if members of staff are anticipating extra work onto the full load carried already. It is therefore hard to see how EE can be delivered effectively unless schools have a member of staff responsible for its coordination.

Cutter (2001) observed that the individual commitment by the teachers had an important component with respect to the implementation of EE However, Tsuma (1997) notes that the teaching of EE in Kenya using traditional methods may have little effects on environmental quality improvement. He therefore recommends the teaching of ecological thinking because telling people what to believe may delay or even undermine

any movement directed towards improvement of environmental quality. Educators therefore need to devote more time to teaching students how to think rather than what to think.

2.7 Teacher Training and Competency towards EE

Teachers' qualities and teacher training are important factors for the success of EE. Rogers (1998) cites the quality of recruits into the teaching profession as one of the constraints of EE in Kenya. Cutter(2001) concludes that the problems associated with the implementation of EE are due to a perceived lack of adequate pre-service and in-service training in EE It is through this training that the attitudes and perceptions of teachers who have been exposed to EE can be strengthened and updated (UNEP, 1988)., The provision therefore of further restructured teacher education can be identified as the priority for EE as the teachers my posses inadequate knowledge on how to teach the subject or what it is all about (Tsuma, 1998).

Otiende *et al* (1991) revealed that effective EE certainly relies on available human resource whose calibre may be the decisive factor in creating lasting impact. Meaningful recognition from a caring teacher can spark interest, enthusiasm and effort thereby motivating students to use their full ability. Such personnel should therefore be fully conversant with the aims and objectives of the subject.

Ultimately, it is the teacher who interprets and transmits the message of EE to the students. In order to become effective, a teacher of EE should acquire a wider range of competencies ranging from familiarization with the content inputs to certain higher cognitive and affective domains.

According to Roux (2000) there are three competencies an EE teacher should possess. They include reflective, foundational and practical competencies. For reflective competencies, the teacher is expected to reflect on the values of various learning experiences within an African context and to reflect on how gender, language, ethnicity, geographical and other differences impact on learning A teacher is expected to make appropriate adaptations to teaching strategies and guide students in acquiring competencies for solving their immediate environmental issues.

The foundational competencies involve understanding key community problems with particular emphasis on issues of poverty, health, environment and democracy. For practical competencies, Roux further recommends teachers to adjust their teaching strategies to match the developmental stages of learners, meet the knowledge requirements of the particular learning areas to cater for cultural, gender, ethnic, language and other differences among learners. They are expected to prepare for teaching by drawing a variety of resources, knowledge, skills and processes of relevant learning areas.

Thus in a teacher education program, pre-service and in-service courses should focus on the upgrading of teachers' environmental knowledge, skills and attitudes and building the capability for proper selection and effective utilization of teaching-learning strategies. In order for objectives of EE to be achieved, teachers who are curriculum implementers should posses the necessary competencies which can be learned either during the initial training or during in-service induction (Mwangi, 2000).

2.8 Conceptual Framework

A conceptual framework is used in research to outline possible causes of action or to present a preferred approach to an idea or thought. Conceptual frameworks are a type of intermediate theory that attempt to connect to all aspects of inquiry. They can act like maps that give coherence to empirical inquiry (Botha, 1989).

The concept informing this study was that the effectiveness of any learning process can be influenced by the inter-relationship between various aspects affecting both the teacher and the learner. Factors such as availability of teaching and learning resources, student and teacher attitude towards the subject as well as teacher competency greatly determine level of effectiveness of the learning process.

For effective delivery of environmental education concepts to take place therefore, these various factors that have to be favourable. Inadequacy in any one of the factors will seriously affect the desired outcome of producing students with a positive attitude towards environmental protection. The following conceptual framework shows the relationship between factors that lead to effective delivery of the EE content in the secondary school curriculum resulting to sound environmental practices, awareness, skills and positive attitude towards the environment.

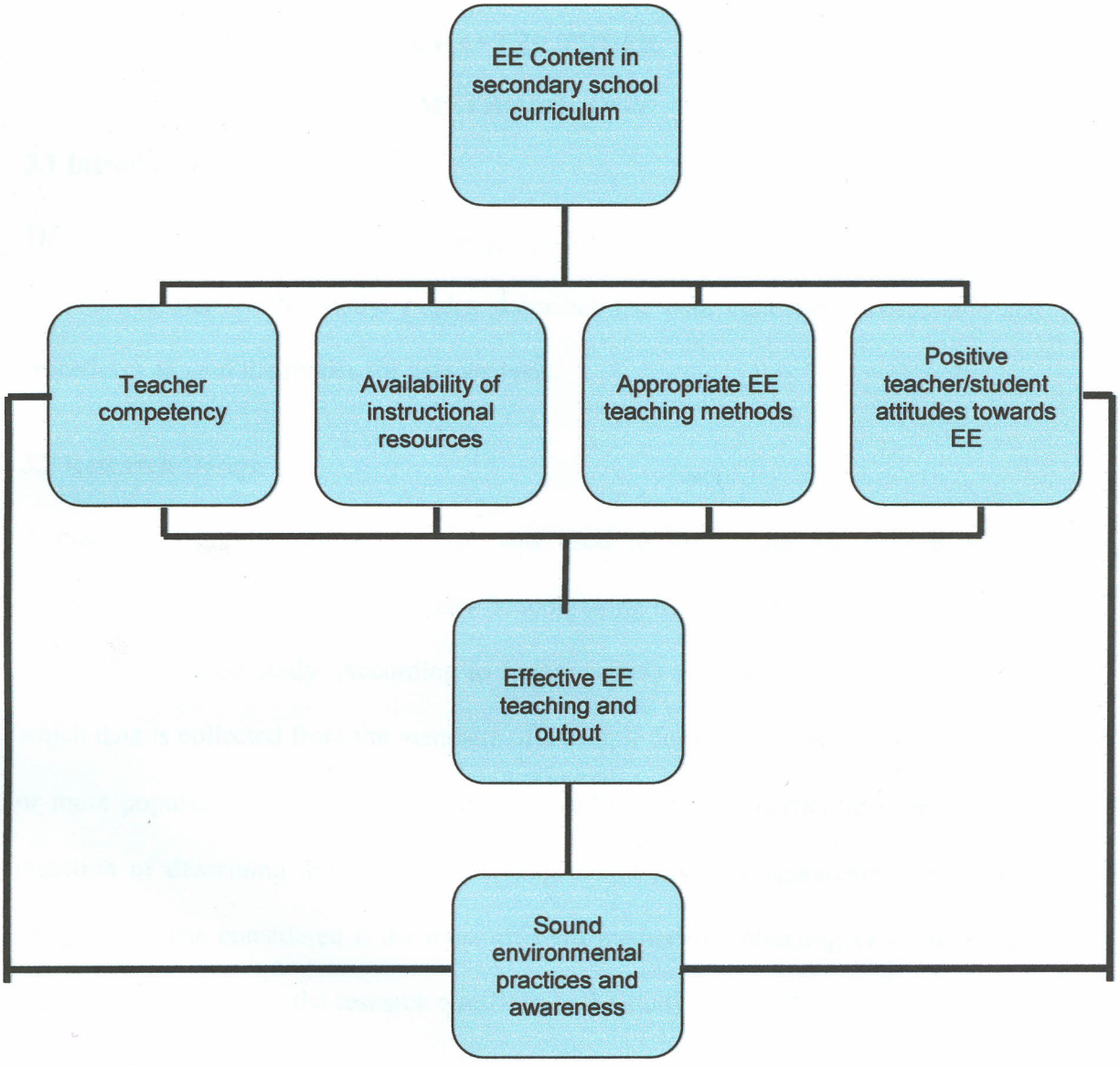

Figure 2.1: Conceptual Framework

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter discusses the research design, population under study, sampling procedure and sample size of the study. It also describes the data collection instruments and procedures as well the modes for data analysis.

3.2 Research Design

A descriptive survey research design was used to investigate the challenges and constraints of teaching EE in Secondary Schools using Ruiru District in Central province of Kenya as a case study. According to Jaeger (1988) a survey is a research study in which data is collected from the members of a sample for the purpose of estimating one or more population parameters. It is used to gather data at a particular time with the intention of describing the nature of existing conditions. The researcher used survey design since she considered it the most efficient method of collecting descriptive data that would help address the research questions in the study.

3.3 Study Area and Target Population

The study was carried out in Ruiru District in the Central Province of Kenya. (See appendix G). Ruiru is a District Headquarters and one of the major towns in Central Province. The district has both urban and rural characteristics so it enabled the researcher to capture the views of both rural and urban settings. Its accessibility and familiarity to the researcher made the area ideal for the study.

At the time of the study, the district had fifteen secondary schools which formed the

target population (see appendix F) Teachers of selected environment related subjects in these schools namely biology, geography, chemistry and agriculture, were also targeted for the study. Although most subjects in the secondary school curriculum have aspects of EE in their content, it was considered after perusal of the curriculum that the above four, by virtue of their areas of specialization, were bound to tackle more aspects of EE than the rest. In addition, with some of the UN recommended methodologies for the teaching of EE being the development of critical thinking and problem solving skills through practical activities and first hand experiences, the likelihood of finding EE themes in other subjects was slim.

3.4 Sample and Sampling Procedures.

Simple random sampling which is the process of selecting from the population that provides every sample of a given size an equal probability of being selected was used to identify five out of fifteen secondary schools that formed the sample. A list of all the schools was made and random numbers used to draw a sample from the list. Since the general characteristics and conditions of the schools in the district were similar, the researcher considered the five schools to be representative enough of the entire population. Form three class was deemed appropriate as the focus group of study due to the fact that the students at this level are assumed to have covered most of the environment related topics. The form four class was deemed not to be appropriate since they were preparing for their final examinations at the time of the study. The form One and Two classes were not considered suitable since they had not yet covered most of the EE related topics.

Stratified random sampling was used in mixed schools to select a total of thirty students from each school The students were divided into two strata of boys and girls and simple random sampling used to select a proportionate number of boys and girls. In single-sex schools, simple random sampling was used to select 30 students per school making a total of 150 subjects. One teacher per subject per school of selected environment-related subjects (Geography, Biology, Agriculture and chemistry) were selected on availability making a total of 20 teachers.

3.5 Data Collection Instruments.

The following instruments were used to collect data for the study:-

1. Questionnaire for teachers
2. Attitude scales for teachers
3. Attitude scales for students
4. Content analysis of syllabi of environment related subjects.

3.5.1 Questionnaire for Teachers

The questionnaires for teachers consisted of both closed and open ended questions considered relevant to the data being sought. The questions were constructed to elicit responses that would reliably answer the research questions raised (See Appendix A).Reliability refers to the consistency with which an instrument or research process repeats itself or with which a survey or test can be repeated. In this case therefore, reliability was checked by comparing the consistency of the questionnaire responses during the piloting stage.

3.5.2 Attitude Scales for Teachers

An attitude and value scale consists of a set of statements or questions that do not have correct or wrong answers. Attitude scales assume that subjective attitudes of people can be measured by quantitative techniques by assigning numerical scores to the responses of individuals (Ogula, 1998). One of the most commonly used attitude scale is the Likert type. Under this method, statements which reflect both positive and negative attitudes towards an object are stated. Respondents are then asked to indicate their level of agreement with each statement by marking each of the following categories:

- Strongly agree
- Agree
- Undecided
- Disagree
- Strongly disagree

A Likert Scale was used to determine the attitude of teachers towards EE (See Appendix B). The questionnaire comprised of 10 items of both positive and negative nature. Teachers were required to tick the right parenthesis to indicate whether they strongly agreed, agreed, disagreed or strongly disagreed with the statements given. Although Likert type scale normally uses a five point scale, the 'undecided' response was not included in this study as it was considered as not being representative of the respondents' opinion or feeling and therefore would not help in determining their attitudes.

For the positive items, the responses were valued as follows:

Strongly Agree	4
Agree	3

Disagree 2

Strongly disagree 1

For the negative statements, the values were as follows:

Strongly agree 1

Agree 2

Disagree 3

Strongly disagree 4

The scoring board which was constructed on the basis of this valuing is presented in appendix D

The total score for all the 10 items was achieved by adding all the values of each item. The highest score that any respondent could score in an item was 4 and the lowest 1. The highest score achievable was 10x4 = 40 and the lowest was 10x1 = 10. The expected total mean score for every respondent was 40+10 = 50/2 = 25. Reliability was checked by comparing the consistency of the responses given by different respondents.

3.5.3 Students' Attitude Scale

A Likert Scale was administered to sampled form three students in the sampled schools to determine the students' attitude towards EE (See Appendix C). The ten itemed questionnaire consisted both positive and negative statements to which the respondents were required to tick in the right parenthesis. The valuing system was the same as for the teachers' attitude scale. The maximum score attainable was 10x4 = 40 and the minimum was 10x1 = 10. The expected total mean score was 40+10 = 50/2 = 25.

3.5.4 Content Analysis of Syllabi

The KIE Secondary School syllabus (2002) was used to analyse the EE content in the syllabi of selected subjects (Biology, Geography, Agriculture and Chemistry) in order to determine how much of EE exists in them. The objectives and content of each selected subject syllabus was analysed to determine the number of EE related topics existing in the selected subjects.

3.6 Piloting of Research Instruments

To test the validity and reliability of the data collection instruments piloting was done in two schools in the study area which were not included in the study sample. Responses elicited were compared with the objectives of the study to determine whether the instruments were actually measuring what they were intended to measure. Comparison was also made with responses elicited from similar studies. The necessary refinement of the instruments such as re-wording of some questions and statements was done thereafter.

3.7 Data Collection Procedures

A research permit was sought from the Ministry of Education. The sampled schools were consulted in advance in order to obtain their consent and book appointments.

The direct method of administration of questionnaires was used. This means that all the questionnaires were distributed directly to the subjects by the researcher, clarifications made where sought, and collected on completion. A content analysis of the syllabi for environment-related subjects provided the required information to determine the percentage of EE related topics in the syllabi of these subjects.

3.8 Data Analysis Procedures.

The data collected from questionnaires and attitude scale tests were coded then scored for analysis as described under the section on data collection instruments. The data were tabulated and analysed using simple descriptive statistics such as means, percentages and frequency distributions. The percentage for each response was calculated and comparisons made to come up with viable conclusions. The results are presented by use of tables, pie-charts and bar graphs. Data from content analysis of the subject syllabi were summarised in tables showing the topics with EE content and the percentage of these topics for each subject calculated for comparison.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results of the data collected and analyzed and further discusses the findings. The purpose of the study was to investigate the challenges faced by teachers of secondary schools in teaching EE (Environmental Education). A total of five secondary schools participated in the study. The respondents who were administered with questionnaires included 150 students and 20 teachers of environment related subjects. The results, analysis and discussions are based on the objectives of the study as outlined in chapter one i.e. elements of EE that were infused into the syllabi of selected subjects, the teaching methods used, teacher preparedness, attitudes of both teachers and students towards EE and availability of resources. Data is analysed by use of descriptive statistics using percentages and means and presented in tables, pie-charts and bar-graphs.

4.2 EE-related Topics in the Secondary School Selected Subjects Syllabi

A major objective of this study was to find out which topics related to EE existed in the secondary school syllabi of environment-related topics. A survey of the syllabi revealed that each of the four selected subjects had a number of EE related topics among its recommended list of topics. The topics were determined by analysing the stated objectives of each topic in the syllabi. Following is a list of topics identified in each of the four subjects.

Table 4.1: Topics on EE Integrated into the Secondary School Biology Syllabus.

Topic on EE	Identified objectives related to EE
Nutrition in plants and animals, photosynthesis	• state importance of nutrition in living organisms. • .state factors affecting photosynthesis
Gaseous exchange	• state causes, symptoms and prevention measures of respiratory diseases.
Ecology	• define the terms ecology, ecosystem carrying capacity. • describe interrelationships of organisms and their ecosystem • describe effects of pollutants on air, water and soil on humans. • identify symptoms of different types of human diseases, methods of transmission and control.

Table 4.2: Topics on EE Integrated into the Secondary School Agriculture Syllabus

Topic	Identified objective related to EE
• Factors influencing agriculture	• Define soil • Describe the process of soil formation.
Water supply, irrigation	• Explain how agricultural activities pollute water and

and drainage	how this can be prevented
Crop production (Nursery practices)	• Distinguish between nursery bed, seedling bed, and a seed bed. • Transplant crops from a nursery • Describe damage caused by animals on tree seedlings and how to prevent it.
Crop production (field practices)	• State importance of crop rotation • State importance of mulching.
Soil and water conservation	• Define soil erosion • List agents, and types of erosion and describe methods of erosion control • Carry out soil erosion control measures • Describe water harvesting and conservation techniques.
Weeds and weed control	• Exercise safety measures to oneself, to crops and the environment while controlling weeds.
Crop pests and diseases	• Demonstrate a caring attitude towards the environment while controlling pests and pests and diseases.
Agro forestry	• explain importance of trees • Describe tree nursery management and transplanting • Explain routine tree management

Table 4.3: Topics on EE Integrated into the Secondary School Chemistry Syllabus

Topic	Identified objective related to EE
Air and combustion	• State pollution effects due to burning of substances.
Water and hydrogen	• Identify common pollutants of water from local sources and suggest their control
Carbon and some of its compounds	• Explain the disadvantages and advantages of carbon dioxide in the atmosphere • Explain the importance of carbon compounds in the natural environment and industry
Nitrogen and its compounds	• Explain the pollution effects of nitrogen compounds in the environment
Sulphur and its compounds	• Explain environmental pollution caused by sulphur containing compounds.
Chlorine and its compounds	• Explain environmental pollution caused by chlorine and chlorine- containing compounds.
Energy changes in chemical and physical processes	• State and explain the factors that influence the choice of fuel. • -Explain the environmental effects of fuels.
Metals	• Describe the effects of the industrial production processes of metals on the environment
Organic chemistry	• State advantages and disadvantages of synthetic

	materials compared to those of natural origin • Investigate methods of recycling and disposal of plastics.
Radio-activity	• Pollution effects of radio-activity.

Table 4.4: Topics on EE Integrated into the Secondary School Geography Syllabus

Topic	• **Identified objective related to EE**
Introduction to geography	• Define the term environment
Mining	• Explain the effect of mining on the environment
Internal and external land forming	• Discuss the significance of features due to faulting and vulcanicity to the environment
Climate	• Account for the causes of aridity and desertification and discuss possible solutions. • Discuss the cause and impacts of climate change on the physical and human environment
Forestry	• Identify and explain problems facing forests in Kenya. • Discuss ways and means of managing and conserving forests.
Soils	• Discuss ways and means of managing and conserving soils.
Land reclamation and	• Describe methods used in land reclamation and

rehabilitation	rehabilitation in Kenya
Wildlife and tourism	• Demonstrate ability to conserve wildlife.
Energy	• Discuss ways and means of conserving energy • Explain the impact of energy crisis in the world
Settlement	• Discuss the effects of urbanisation
Management and conservation of the environment	• Demonstrate a sense of responsibility in environmental management and conservation.

A general overview of the subject syllabi analyzed indicates that there are a number of environment-related topics in all the four subjects. However, some subject areas had more topics on EE than others; for instance, geography and chemistry have more EE related topics than biology and agriculture. Table 4.5 shows the percentage of EE topics contained in each of the selected subjects.

Table 4.5: Proportion of EE Topics in the Selected Subject Areas

Subject area	No of topics on EE	Total no of topics	% of EE topics
Biology	3	17	17.6
Agriculture	8	33	24.2
Chemistry	10	24	41.7
Geography	11	31	35.5

The above results indicate that biology has the lowest percentage (17.6%) of EE topics. This may be attributed to the fact that most of the EE themes in the subject are consolidated in the topic on ecology which is a relatively wide topic. Though chemistry

seems to have the highest percentage of EE topics, several sub-themes are widely scattered in many of the topics. Agriculture and geography, being generally environmental subjects have a relatively high content of EE topics, 24.2% and 35.5% respectively.

From the analysis of the syllabi, it was established that several EE themes have been infused into the four subjects studied. However, one major shortcoming in the syllabi that the analysis revealed is too much fragmentation of EE themes within and across all the four subject areas. For instance the topic on environmental pollution is fragmented into short shallow topics which are distributed in all the four selected subjects. In addition to being taught shallowly, the fragmentation of these EE themes may render it difficult for the learners to see the relationship of the various sub-topics in the different subject areas. For the knowledge to be of any significant use to the learners, the EE content should be organized in such a way that it ensures unity of the subject matter even when learnt from different subjects. This will enable the learners to see the interrelationship and cohesion of EE.

Despite these shortcomings, the various subject teachers were generally in agreement that EE had been adequately incorporated into their subject areas. This is shown by the responses given to the item in the teachers' questionnaire which sought to find out the teachers' feelings on the adequacy of incorporation of EE in the curriculum. 15 teachers (75%) indicated that EE was adequately incorporated in the curriculum while only 5 teachers (25%) indicated otherwise. Topics suggested for inclusion in the syllabi included environmental hazards e.g. earthquakes, waste management, environmental

epidemics, environmental pollution, environmental conservation and environmental pollution. However, some of these were found to be already infused in the syllabi of other subjects under study.

4.3 Methods Used in Teaching EE Content.

The effectiveness of any learning process will to a large extent be dependent on the teaching method that the teacher uses to impart knowledge. Instructional methods used should address learning skills, perspectives and values that guide and motivate students to seek sustainable practices. For this reason, the study sought to find out the general instructional methods that the teachers of environment related subjects employed to teach EE topics in their subjects. The question in the teachers' questionnaire on teaching methods used for EE-related topics elicited the responses shown in Figure 4.1 below.

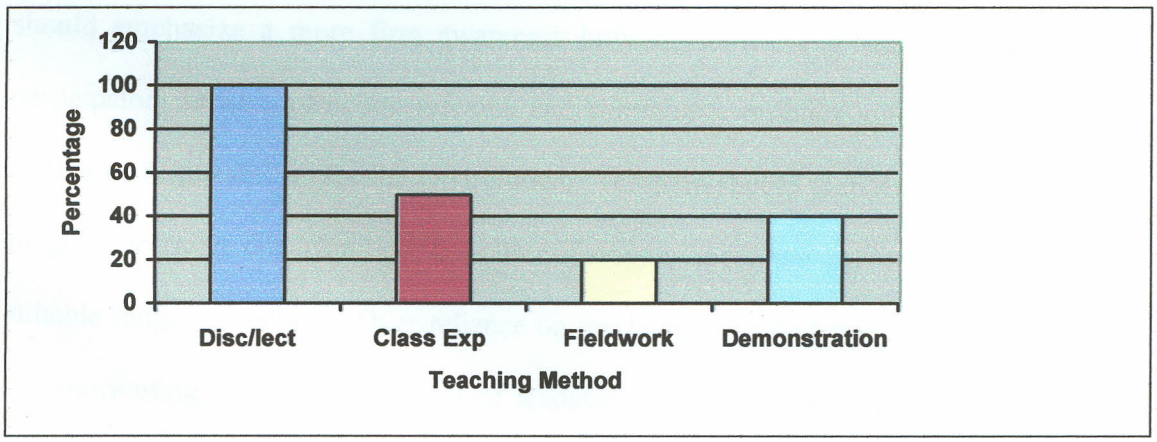

Figure 4.1: EE Content Teaching Methods

The main teaching method that the teachers were found to use was a combination of teacher-led discussion and lecture methods. All the 20 (100%) respondents indicated that they used this method. In addition, 8 respondents (40%) indicated that they also used demonstrations, 4 (20%) conducted fieldwork while another 10 (50%) conducted class

practical experiments. This analysis of teaching methods shows that a combination of discussion and lecture methods are the most commonly used to teach EE themes in secondary schools. This poses a major shortcoming in that EE should be an active process of learning that tries to address the wide range of environmental issues and tasks that arise. EE should also put emphasis on critical education that involves students in their own learning and interpretation of their own world through dialogue, questioning, participation and decision-making (Roger, 1998).

Action learning methods involve learners in diverse experiences such as hands-on or encounter dialogue through discussions and reflection so as to foster environmental awareness and meaningful change. These methods require students to criticise environmental policies and take action for improving their environment. The approach should emphasize a more firm awareness building to learning about problems in a participatory process of action research and community problem solving to enhance a feeling of responsibility for the environment. Teachers should therefore provide a wide range of learning opportunities that allow dialogue, encounter and reflections using a suitable range of methods. Over-reliance on the lecture method was therefore found to be contributing to the development of students' environmental awareness without an accompanying enculturation of positive attitudes towards the environment.

4.4 Co-curricular Activities in EE

Co-curricular activities in schools complement the formal learning activities thereby enhancing the learning process. The teachers' questionnaire on EE teaching therefore sought to find out information relating to non-formal curricular activities that took place

in the selected schools.

An analysis of the responses revealed that 11 teachers (55%) indicated that they involved students in environmental conservation activities in the school compound and surrounding areas while 9 of them (45%) indicated that they did not. 9 teachers or 45% of the respondents conducted field trips with their students to environmentally threatened areas while 11 or 55% of teachers conducted no such trips. Problems such as inadequacy of financial resources, limited time and lack of transport were cited as some of the reasons for failure to conduct field trips.

The researcher also sought to find out whether clubs that enhance EE activities existed in the sampled schools. The results are presented in Figure 4.2 below.

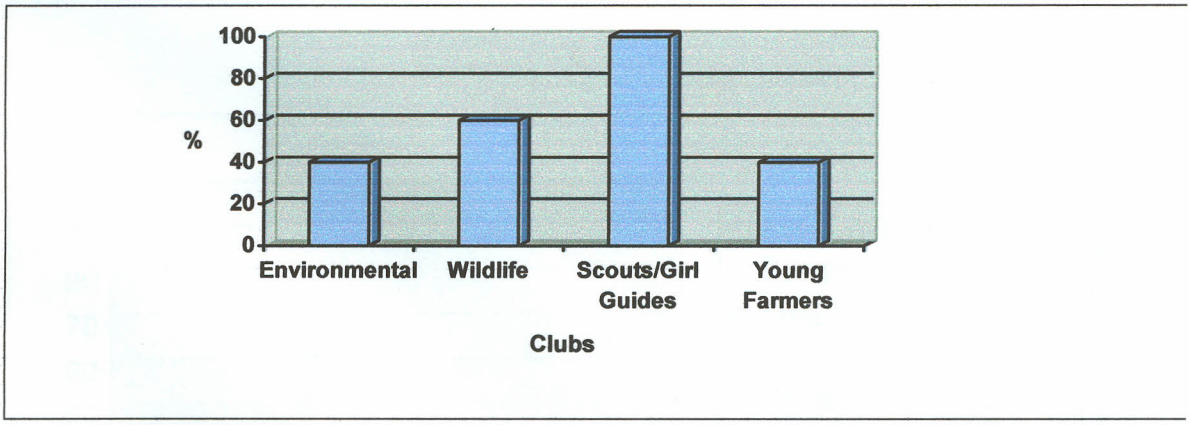

Figure 4.2: EE Co-curricular Activities

The analysis of responses given indicated that environmental clubs existed in 2 of the sampled schools, wildlife clubs in 3 and young farmers club in 2 schools. The scouts/Girl guides is the only club that was found to exist in all the sampled schools. Where they existed, such clubs helped a lot in giving the students an opportunity to

participate in activities geared towards the conservation of the environment, thus creating environmental conservation awareness among the students and teachers. Activities of the environment-related clubs should include film shows, public environment related lectures and exhibitions among others, all of which should be related to the problems of the immediate environment. Since the school is an integral part of the community, these activities should be open to the public in order to enhance awareness of environmental issues both in the students and the public in general.

However, it was noted that most of the clubs did not have sustained activities throughout the year and hence contributed little to the creation of environmental awareness. The teachers cited limitation by inadequate funds and time to engage in comprehensive activities that would go a long way in enhancing environmental awareness. Other EE supportive activities that were mentioned by the teachers are shown in figure 4.3 below.

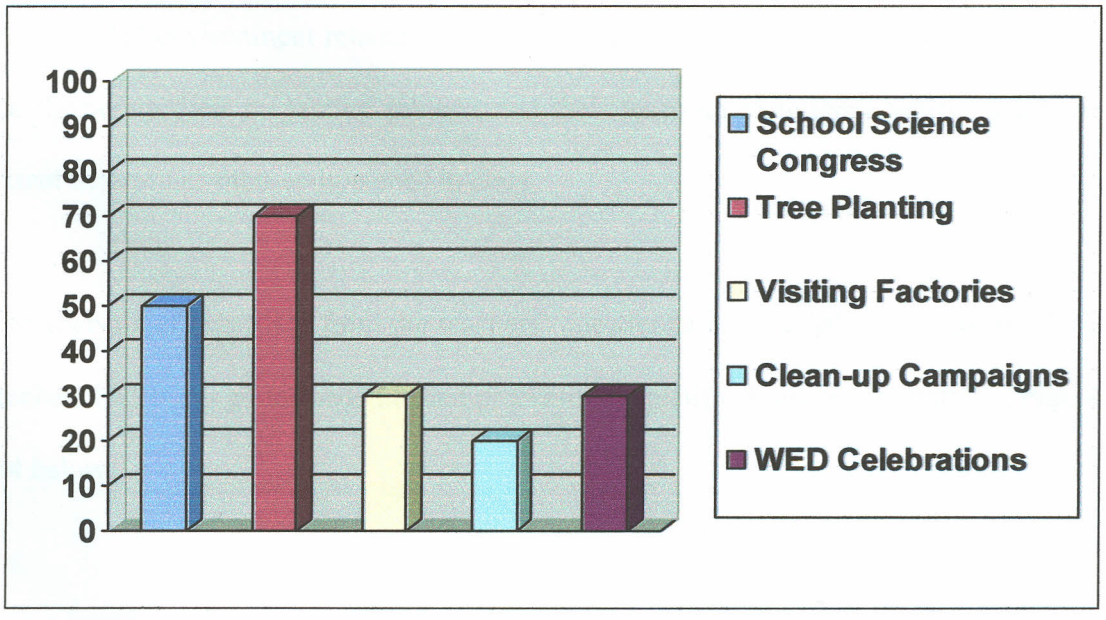

Figure 4.3: EE Supportive Activities in Schools

4.5 Teacher Training in Relation to Teaching of EE

The success of any teaching and learning of EE activities in a school largely depends on the teacher and his/her competencies, knowledge, skills abilities, attitudes and values. Consequently, one factor which may affect the teaching and learning of EE in secondary schools is the training of personnel responsible for imparting environmental knowledge. The success with which the secondary school students can be initiated, involved and prepared for understanding and tackling environmental issues depends primarily on teacher competency. Teaching methodologies have to be responsive to the needs of the curriculum area which they purport to cater for. Teacher education should be expected to include the nature of environment, environmental perspectives and values, EE and the school curriculum, teaching strategies and curriculum processing and evaluation. However, more emphasis is laid on the nature of environment with other aspects being subsumed within the rest of the course thereby losing prominence and specificity

Based on this assumption, the study sought to investigate whether or not the teachers who handled environment related subjects had been trained on how to effectively handle EE themes in their respective subjects and their teaching experience which to a large extent determines their competence in class.

The analysis of responses from the teachers' questionnaire revealed that majority of the teachers had fairly good academic and professional qualifications as illustrated in Figure 4.4 below.

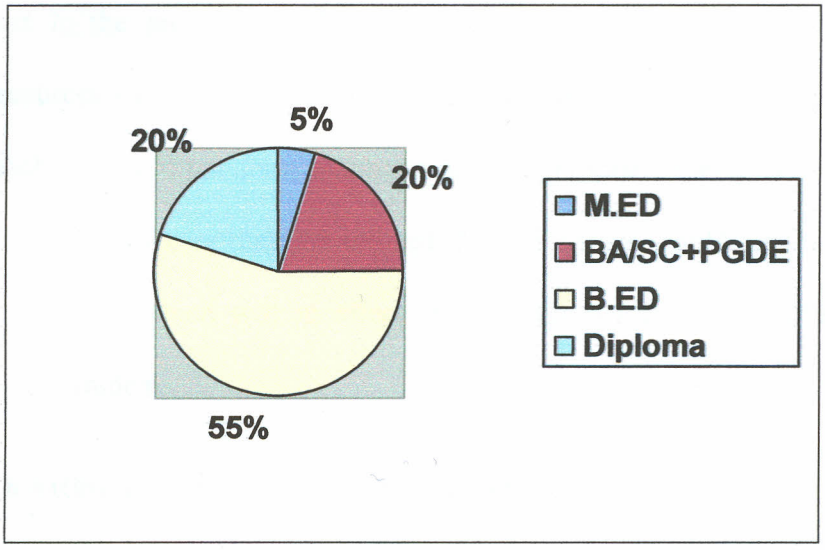

Figure 4.4 Academic/Professional Qualifications of Teachers

The results indicate that the teachers in the study sample are relatively highly qualified and are therefore likely to be well skilled, knowledgeable and competent in their teaching. The study however established that this training was very general as far as EE was concerned. Only two of the twenty teachers sampled indicated that they had at least some special pre-service training in handling of EE while the remaining 18 or 90% indicated that they had no such training.

Asked whether or not they had attended in-service training programs or seminars on EE, only 4 respondents (20%) were positive while the majority (80%) had not. This may imply that there is a lack of seriousness on the part of the government in respect to the teaching of EE. If the government had a serious policy on integration and teaching of EE, then in-servicing and training of teachers in EE would rate highly among its priorities. All the teachers involved in the study were unanimous in agreement that in-

service courses should be organized at divisional levels to enable most teachers to take part in the programs and that centres for organization and production of teaching resources should be established in every division. In addition, pre-service training of teachers should put some emphasis on the appropriate methods of handling EE topics in the subjects where they are infused. All these steps would lead to effective preparation of teachers which will in effect enhance the diffusion rate of EE among secondary school students.

4.6 Attitudes of Secondary School Teachers towards EE

One of the objectives of the study was to find out the attitude of secondary school teachers towards EE. To achieve this objective the respondents were presented with several environment related statements of both positive and negative nature (see appendix C) Table 4.6 is a summary of the distribution of the responses to the attitude items.

Table 4.6: Distribution of Responses of Teachers to Attitude Items

Item	Statement	SA	A	D	SD	Total
1	Our environment is being destroyed by soil erosion, deforestation, pollution and other environmental problems	15 75%	5 25%			20 100%
2	All citizens should be concerned about these environmental problems.	17 85%	3 15%			20 100%
3	Education in secondary schools should play great role in imparting environmental	12 60%	8 40%			20 100%

	awareness to the secondary school students					
4	Though environmental studies have been part of the secondary school curriculum, most school leavers have continued to destroy environmental quality.	2 10%	13 65%	5 25%		20 100%
5	The exam oriented teaching in secondary schools gives less emphasis to environmental education	10 50%	5 25%	4 20%	1 5%	20 100%
6	EE should be taught as a separate subject in secondary school for it to become effective	6 30	7 35%	5 25%	2 10%	20 100%
7	Topics on environmental education require more time than a allocated in the timetable	3 15%	10 20%	6 30%	1 5%	20 100%
8	Environmental studies in the secondary school curricular are too detailed for secondary school students	2 10%	1 5%	15 75%	2 10%	20 100%
9	Secondary school teachers' in- service courses on environmental education should be organised at divisional level and made frequent	7 35%	13 65%			20 100%
10	Centres for environmental education responsible for organising seminars and production of teaching resources should be established in every division in each district	10 50%	10 50%			20 100%

An analysis of the responses clearly shows that majority of secondary school teachers scored highly in the attitude scale test. Generally, the positive items were agreed with

while the negative ones were disagreed with. For instance, all the respondents were in agreement with item number one which stated that our environment is being destroyed by soil erosion, deforestation pollution and other environmental problems and item number two stating that all citizens should be concerned about these environmental problems. This shows that the secondary school teachers had a good level of environmental awareness, concern and positive attitudes. Figure 4.5 below represents an analysis of the scores attained in the Likert type items. The scoring procedure is discussed in chapter 3.

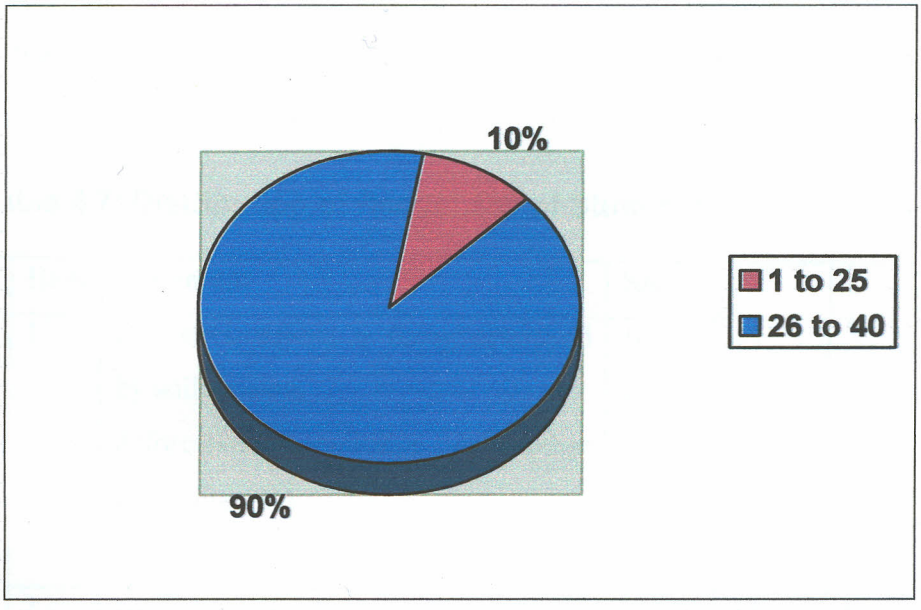

Figure 4.5: Scores Attained by Teachers on Attitude Scale Test.

The results indicate that the majority of teachers (90%) scored very highly in the attitude items. This shows that majority of teachers are highly positive about EE. The findings corroborate with those of Mbwesa (1996) and Mang'uriu (1987) who after carrying out a similar study in Murang'a, Nairobi and Kajiado districts established that the attitude of primary and secondary school teachers to EE were very positive. The findings are encouraging in that if teachers are positive, then they are likely to play a greater role in

the efforts of effectively teaching EE. The teachers therefore, only need to be motivated by providing them with instructional materials, in-servicing and making environmental information more accessible to them.

4.7: Students Attitude towards EE

The attitudes of students towards a subject can greatly contribute towards either enhancing or retarding the learning of the subject in schools. It was therefore deemed necessary for this study to investigate the attitudes of the students towards EE. The responses to the attitude scale items presented to the respondents are summarised in Table 4.7 below. The valuing and scoring is explained in chapter 3.

Table 4.7: Distribution of Responses of Students to Attitude Items

Item	Statement	SA	A	D	SD	Total
1	Our environment is being destroyed by soil erosion, deforestation, pollution and other environmental problems	105 70%	45 30%			150 100%
2	All students should be concerned about these environmental problems.	59 39.3%	80 53.4%	5 3.3 %	6 4.0 %	150 100%
3	Active participation in the protection of the environment should be a duty of every youth in Kenya	80 53.4%	53 35.3%	14 9.3 %	3 2.0 %	150 100%
4	Education in secondary schools should play a great role in imparting environmental awareness to secondary school students.	68 45.3%	62 41.3%	20 13.4 %		150 100%

5	EE helps us to learn about proper methods of conserving the environment.	90 60.0%	51 34.0%	9 6.0 %		150 100%
6	Environmental education-related topics are too complex to understand.	6 4.0%	14 9.3%	76 50.7 %	54 36.0 %	150 100%
7	The secondary school curriculum is too overloaded to accommodate EE as a separate subject.	13 8.7%	22 14.6%	58 38.7 %	57 38.0 %	150 100%
8	EE should be given more emphasis in secondary schools.	67 44.7%	66 44.0%	13 8.6 %	4 2.7 %	150 100%
9	EE has no importance to secondary school students	2 1.3%	3 2.0%	95 63.3 %	50 33.3 %	150 100%
10	EE activities are boring.	4 2.7%	10 6.7%	80 53.3 %	56 37.3 %	150 100%

An analysis of the responses shows that in general the positive items were agreed with while the negative items were disagreed with. Items number one and two which state the environmental problems and that students should be concerned about them respectively were overwhelmingly agreed with. This shows that the students have a good level of environmental awareness and positive attitude. The observations concur with findings by Keiru (1991) in her study 'A survey of environmental awareness among std 7 pupils in some schools in Lari division, Kiambu district'.

Such awareness and positive attitude among secondary school students could be attributed to the already existing themes of EE in the school curriculum and also the environmental awareness campaigns. However, this positive attitude of environmental education and the awareness of environmental problems do not mean that these students have internalized the awareness to the extent of making personal initiatives to protect the environment. More effort is still needed to uplift this awareness to operational status. This will ensure that students develop personal initiatives to protect the environments. Figure 4.6 below shows a summary of scores attained by students in the attitude scale items.

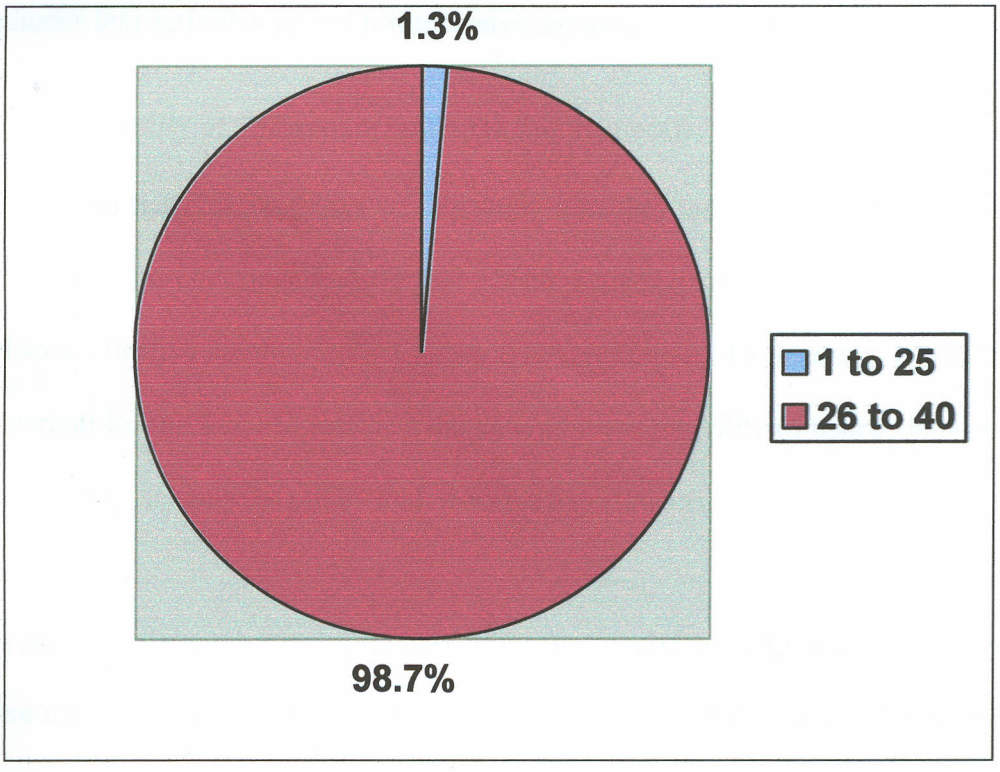

Figure 4.6: Scores Attained by Students on Attitude Scale Test.

The analysis shows that all the students scored very highly with 148 (98.7%) scoring above the mean score of 20 points. Only 2 respondents (1.3%) scored below the expected mean score. This indicates a highly positive attitude towards EE among secondary school students.

These findings have great implications to policy makers in education, curriculum developers and teachers at secondary school level. Policy makers should establish clearer policies in regard to EE while curriculum developers should closely monitor the teaching of EE in order to ascertain availability of instructional materials and detect any shortcomings in the curriculum. Teachers on the other hand should endeavour to motivate and encourage students in order for them to be able to translate the positive attitudes into activities geared towards environmental conservation.

4.8: Availability of Classroom Instructional Materials.

One of the basic assumptions of this study was that there were inadequate resources available in secondary schools for the effective teaching of EE. Instructional materials enhance effective communication between the teacher and the learners. It was therefore important for the study to establish the level of the availability of instructional materials in secondary schools for use by both teachers and students.

An analysis of the teachers' responses to the questionnaire on EE teaching revealed that there are no particular resources for specifically teaching EE in secondary schools. The resources available were made for use in the general teaching of carrier subjects but were used for teaching EE related topics. The teachers use only the text books

recommended by the KIE/MOE for the particular carrier subject. The same kind of text books were found to be in use by both teachers and students. The text books found to be most commonly used by both teachers and students were the Secondary School Biology, Secondary School Chemistry, Secondary School Agriculture and Secondary School Geography all by The Kenya Literature Bureau.

The survey revealed that there were no particular books on EE available for use by teachers and students. This can be attributed to the multidisciplinary approach used in the integration of EE in the secondary school curriculum. Other resource materials that were mentioned in the teachers' questionnaire were jembes, school demonstration farms, newspapers, magazines and periodicals. Table 4.8 below is a summary of the responses on the item requiring the teachers to name resources available in their schools that helped in the teaching of EE related topics.

Table 4.8: Other Instructional Resources Available in Schools

Resource	No of Teachers	%
Jembes/pangas	10	50
School demo farms	14	70
Magazines/journals	15	75
Newspapers	10	50

The study generally revealed that there is a scarcity of instructional materials for purposes of teaching EE. This calls for a clear policy on the provision of materials on EE in schools. The cost, quality and variety of such materials should be taken into consideration. Where financial constraints are a hindrance to provision of such materials,

teachers and students should make an effort to improvise as long as the standards of quality are maintained. This calls for a high level of creativity and innovativeness on the part of teachers and learners. This would help to develop a school resource centre where teachers and students would contribute their works.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter presents a summary of the major findings of the study, conclusions drawn from the study and recommendations that the researcher deems necessary in addressing the shortcomings in the teaching of EE in secondary schools that came up from the study.

5.1 Summary of Research Findings

The main objective of this study was to establish some of the challenges experienced in teaching the EE content in various subjects in secondary schools with a view of suggesting recommendations that would help in addressing them. The following is a summary of the major findings of the study.

5.1.1 Each of the four selected subjects had a number of EE related topics among its recommended list of topics. Biology had 17.6%, chemistry 41.7%, agriculture 24.2%, and geography 35.5%

5.1.2 Among the teachers included in the study, 75% agreed that EE themes had been adequately incorporated in the selected subject areas while 25% indicated otherwise.

5.1.3 The main teaching method used to handle EE related topics was the lecture and teacher-led discussion method which was used by 100% of the respondents. 50% also used class experiments, 20% conducted fieldwork while 40% used demonstration method.

5.1.4 Co-curricular activities used in schools were involvement in clubs such as

environmental club in 40% of the schools in the study, wildlife clubs 60%, scouts/girl guides 100% and young farmers 40%.

5.1.5 Other EE supportive activities that schools engaged in were tree planting 70%, visiting factories 30%, community clean-up campaigns 20%, participation in WED celebrations 30% and School science Congress activities 50%.

5.1.6 Though teachers in the study were highly qualified in their subject areas, only 10% indicated that they had at least some special training in handling EE while 90% indicated that they had no such training. 20% of the respondents had attended in-service training on EE while 80% had not.

5.1.7 The teachers in the study had a positive attitude towards EE as 90% of them scored above average in the attitude scale tests while only 10% scored below average.

5.1.8 The students' attitude towards EE was found to be equally positive with 98% scoring above average and only 2% scoring below average in the attitude scale test.

5.1.9 There was scarcity of EE related instructional materials in schools. Those in use included jembes/pangas (50%), school demonstration farms (70%), magazines and journals (75%), and newspapers (50%). Text books found to be present were those of carrier subjects with none specifically designed for EE.

5.2 Conclusions

This section highlights the major conclusions drawn from the study.

1. From the analysis of the secondary school syllabi of environment related subjects, namely biology, chemistry, agriculture and geography, it was observed that EE themes had been fairly well accommodated. However, the analysis revealed a number of shortcomings key among them being the fragmentation of topics on EE. It was evident that different topics on EE have been broken down into small portions which have then been integrated into the various subjects analysed. For instance, the topic on pollution had been broken down into various fragments and distributed among the four subject syllabi analysed. Such fragmentation hindered detailed coverage of the topic and fails to give a good flow of the content. Replication and overlapping of certain topics was also observed. An example was the topic on soil erosion which was covered under the same themes in agriculture, biology and geography.
2. Though the syllabi of subjects analysed contained diverse topics relevant to EE, the wording precluded their being approached from an EE perspective. Some topics needed a second look before one could see the connection with EE. Examples of topics included waste paper recycling in chemistry, population regulation methods in biology and sources of power in the farm in agriculture, to mention but a few. Since EE was not the central theme in any of the subjects, this kind of wording, lost focus and made the topic prone to being approached in a manner that overlooked its environmental context.
3. The teachers also cited an over-loaded curriculum as a factor that hindered

effective teaching of EE content as little time was available for field trips and other out of class activities related to environmental conservation. Scarcity of financial resources was also cited as a reason why field trips were hardly conducted. The overloaded school curriculum also encourages use of lecture methods thus denying the learners an opportunity to participate actively in the learning process. This marginalises the importance of the learners' interest which allows the learner to explore the environment wholly, making wise choices and decisions about the environment.

4. Another challenge that came up from the findings is the inadequacy of instructional material. Reference books for use in the teaching and learning of EE were found to be inadequate. Those that were available were found to be general for the carrier subjects. The fact that there are no specific books for EE means that students are never psychologically prepared for EE even as they read EE topics from books meant for the carrier subjects. This calls for a more thorough examination of the multidisciplinary approach in EE teaching. Other resources such as school farms, farm implements, environment related charts, magazines and periodicals that would enhance the teaching of EE were found to be either inadequate or lacking all together.
5. Inadequate specialised training is a major setback in effectively imparting EE. Rote learning which is widely used to prepare students to pass in national exams renders itself inappropriate for EE whose major objective is to create awareness in students to acquire the right skills, attitudes and values towards the environment. Previous researchers have also established that inadequate training of teachers in EE methodologies was a major variable affecting the

teaching of EE in secondary schools, e.g. Omondi (I998).

5.3 Recommendations

From the findings of the study, the researcher makes the following recommendations for application:

1. Consolidation of the topics with EE themes so that similar themes are not spread out in various subjects would lead to decongestion of the curriculum to some extent. The teachers should take advantage of the leeway provided by curriculum decongestion to lay greater emphasis on value clarification, learning by inquiry, stress on relevance, case study approaches, games and simulation, community resource use among other activities. In addition, all topics with EE themes should be so stated as to ensure their being broached in text books with EE in mind.
2. Re-wording of relevant environmental related topics in the syllabi should be considered so that they are approached from an environmental perspective. For instance, instead of 'Methods of population control' in biology, the topic should be reworded 'Effects of overpopulation on the environment and methods of population control'. This would ensure that it is approached from an environmental perspective.
3. Effective teaching of EE and proper use of teaching materials depends on suitably trained personnel as regards both content and methods specific to EE. Pre and in-service training of teachers should recognize the fact that they should be taught in a similar way to the one they will be expected to teach with. Whether taken as a separate course, a separate unit within a course or an integral part of existing units, the EE programs for teachers should be reviewed. Teaching methodologies should

take into account the nature of the discipline itself, the objectives, learner characteristics, availability of resources and the psychology of teaching and learning.

4. Teacher attitude should be changed by their trainers before they can hope to direct the students they teach towards a desirable commitment to the environment. A greater emphasis should be laid on how to teach to augment the currently predominant 'what to teach'. Since it is not possible to achieve all competencies within a single education programmes, these should be developed gradually through in-service courses especially for teachers of environment related subjects. These will improve their skills and help them to acquire new knowledge in this area. The courses should be regular and accessible so that majority of teachers can attend. The teachers should also participate in workshops and seminars on environmental issues in order to widen their understanding.
5. Monitoring and evaluation of EE programmes by the KIE and KNEC should be undertaken on a regular basis in order to yield feedback on which curriculum developers can develop strategies of improvement where necessary. EE themes should be regularly tested in national exams.
6. The present multi-disciplinary approach used in the teaching of EE should be reconsidered. The content on EE dealing with knowledge, skills and attitudes identified as being relevant to the achievement of the aims and objectives of EE can be assembled and structured to form a special subject on its own. This interdisciplinary approach will ensure the unity and cohesion of EE lending itself to more in-depth study and serious research. This will in addition prepare students to specialise in the subject which is being currently handled as an independent

discipline at the university level. However, this option will not easily be accepted because the curriculum is already too congested to accommodate extra subjects.

7 The KIE and MOE should encourage the teachers to form multidisciplinary teams to develop teaching resource materials such as wall charts, films, slides; tapes etc. School libraries should collect appropriate materials to form an EE collection/resource centre. Students should be encouraged to also contribute such materials.

8 Students should be encouraged by their teachers to take part in co-ordinated programmes such as World Environment Day, community environmental clean-ups and tree planting which will enable them to contribute to environmental conservation at the community level. They should also be encouraged to form environmental and other related clubs such as wildlife, scouts/guides, young farmers etc. Such clubs should help spread the environmental conservation message by making displays and environmental posters for school events such as Parents' days.

5.4 Suggestions for Further Research

- A similar study should be conducted to compare schools in rural and urban settings.
- An investigation of the level of participation of post secondary school students in informal and non-formal EE programs at the community level.
- A study to investigate the development of non-formal EE programmes among different communities in Kenya.

- An investigation of the level of preparedness of secondary school teacher trainees to handle EE in secondary schools.

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APPENDICES

Appendix A Teachers' Questionnaire on EE Teaching

The following questions are meant to assess the understanding of Environmental Education and teaching methods used to handle EE elements in the secondary school curriculum.

Instructions

1. Do not write your name on this questionnaire.
2. Indicate your choices by the use of a tick ( ) and fill in the blank space where applicable.

Section A

Background information

1. Gender: Male ( ) Female
2. Highest qualification
   - (a) Diploma..... ( )
   - (b) B.Ed..... ( )
   - (c) BA/BSc+PGDE..... ( )
   - (d) M.Ed..... ( )
   - (e) Other..... ( )
3. Teaching experience in years.....
4. Length of stay in present school.....

Section B

1. Have you been trained on how to teach EE?

   Yes [ ] No [ ]

2. Have you ever attended any seminar or in-service course on EE?

   Yes [ ] No [ ]

3 a) Do you conduct field trips such as visits to development project sites, exhibitions, and other EE supportive learning activities?

   Yes [ ] No [ ]

b) If yes, please explain why?

.....

.....

.....

1. Have you involved students in your class(es) in environmental conservation activities like tree planting, soil conservation in the school compound and surrounding areas?

   Yes [ ] No [ ]

2. In teaching environmental education related topics, which reference book(s) do you use?

   i) .....

   ii) .....

   iii) .....

6(a) Do students use the same text books? Yes [ ] No [ ]

b) If No, please give the titles of the books the students use in learning environmental education related topics.

i).....

ii).....

iii).....

7. a) Do you get information on environmental issues from other sources apart from text books mentioned above?

   Yes [ ] No [ ]

b) If yes, name those sources.

i).....

ii).....

iii).....

c) What teaching methods do you generally use when handling environmental education related topics?

i).....

ii).....

iii).....

iv).....

v).....

8. What other resources are available in the school to help you in the teaching of environmental education related topics?

.....

.....

.....

9 a) Do clubs such as Environmental club, Wildlife Club, Young Farmers, Scouts/ Girl Guides which play an important role in imparting environmental awareness in students exist in your school?

Yes [ ] No [ ]

b) If yes, please name the existing clubs.

i).....

ii).....

iii).....

10. From your own observation, do you think-:

a) Environmental education is adequately incorporated into the secondary school curriculum?

Yes [ ] No [ ]

b) If No, give some of the topics you would like to be included in the curriculum.

i).....

ii).....

iii).....

11. Mention some of the problems you encounter while teaching environmental education related topics in your subject.

i).....

ii).....

iii).....

iv).....

(v).....

12. What suggestions would you recommend to help in maintaining environmental quality through environmental education?

i).....
ii).....
iii).....
iv).....

Appendix B: Environmental Education Attitude Questionnaire for Teachers

Put a tick in the appropriate parenthesis to the right to indicate whether you; strongly agree, agree, disagree or strongly disagree.

	SA	A	D	SD
	4	3	2	1
1. Our environment is being destroyed by soil erosion, deforestation, pollution and other environmental problems.	( )	( )	( )	( )
2. All citizens should be concerned about these environmental problems.	( )	( )	( )	( )
3. Education in secondary schools should play a great role in imparting environmental awareness to the secondary school students.	( )	( )	( )	( )
4. Though environmental studies have been part of the secondary school curriculum, most school leavers have continued to destroy environmental quality.	( )	( )	( )	( )
5. The exam oriented teaching in secondary schools gives less emphasis to environmental education.	( )	( )	( )	(
6. EE should be taught as a separate subject in secondary for it to be effective				
7. Topics on environmental education require more time than allocated in the timetable.	( )	( )	( )	( )

8. Environmental studies in secondary school curricula are too detailed for secondary school students. ( ) ( ) ( ) ( )

9. Secondary school teachers' in- service courses on environmental education should be organised at divisional level and made frequent. ( ) ( ) ( ) ( )

10. Centres for environmental education responsible for organising seminars and production of teaching resources should be established in every division in each district ( ) ( ) ( ) ( )

THANK YOU AND GOD BLESS YOU.

Appendix C: EE Attitude Questionnaire for Students

The following statements are meant to assess the attitude of secondary school students towards environmental Education (EE).

Put a tick in the appropriate parenthesis to the right to indicate whether you; strongly agree, agree, disagree or strongly disagree.

	SA 4	A 3	D 2	SD 1
1. Our environment is being destroyed by soil erosion, deforestation, pollution and other environmental problems.	( )	( )	( )	( )
2. All students should be concerned about these environmental problems.	( )	( )	( )	( )
3. Active participation in the protection of the environment should be a duty of every youth in Kenya.				
4. Education in secondary schools should play a great role in imparting environmental awareness to secondary school students.	( )	( )	( )	( )
5 EE helps us to learn about proper methods of conserving the environment	( )	( )	( )	( )
6. Environmental education-related topics are too complex to understand.	( )	( )	( )	( )
7. The secondary school curriculum is too overloaded to accommodate EE as a separate subject.	( )	( )	( )	( )
8. EE should be given more emphasis in secondary schools	( )	( )	( )	( )

9. EE has no importance in secondary schools ( ) ( ) ( ) ( )

10. EE activities are boring ( ) ( ) ( ) ( )

THANK YOU AND GOD BLESS YOU.

Appendix D: Teachers' Attitude Scale Scoring Board

Item	Statement	P/N	SA	A	D	SD
1	Our environment is being destroyed by soil erosion, deforestation, pollution and other environmental problems	P	4	3	2	1
2	All citizens should be concerned about these environmental problems.	P	4	3	2	1
3	Education in secondary schools should play a great role in imparting environmental awareness to the secondary school students	P	4	3	2	1
4	Though environmental studies have been part of the secondary school curriculum, most school leavers have continued to destroy environmental quality.	N	1	2	3	4
5	The exam oriented teaching in secondary schools gives less emphasis to environmental education	N	1	2	3	4
6	EE should be taught as a separate subject in secondary for it to be effective	P	4	3	2	1
7	Topics on environmental education require more time than allocated in the timetable	P	4	3	2	1
8	Environmental studies in secondary school curricula are too detailed for secondary school students	N	1	2	3	4

9	Secondary school teachers' in- service courses on environmental education should be organised at divisional level and made frequent	P	4	3	2	1
10	Centres for environmental education responsible for organising seminars and production of teaching resources should be established in every division in each district	P	4	3	2	1

Appendix E: Students' Attitude Scale Scoring Board

Item	Statement	P/N	SA	A	D	SD
1	Our environment is being destroyed by soil erosion, deforestation, pollution and other environmental problems	P	4	3	2	1
2	All students should be concerned about these environmental problems.	P	4	3	2	1
3	Active participation in the protection of the environment should be a duty of every youth in Kenya	P	4	3	2	1
4	Education in secondary schools should play a great role in imparting environmental awareness to secondary school students.	P	4	3	2	1
5	EE helps us to learn about proper methods of conserving the environment.	P	4	3	2	1
6	Environmental education-related topics are too complex to understand.	N	1	2	3	4
7	The secondary school curriculum is too overloaded to accommodate EE as a separate subject.	N	1	2	3	4
8	EE should be given more emphasis in secondary schools.	P	4	3	2	1
9	EE has no importance to secondary school students.	N	1	2	3	4
10	EE activities are boring.	N	4	3	2	1

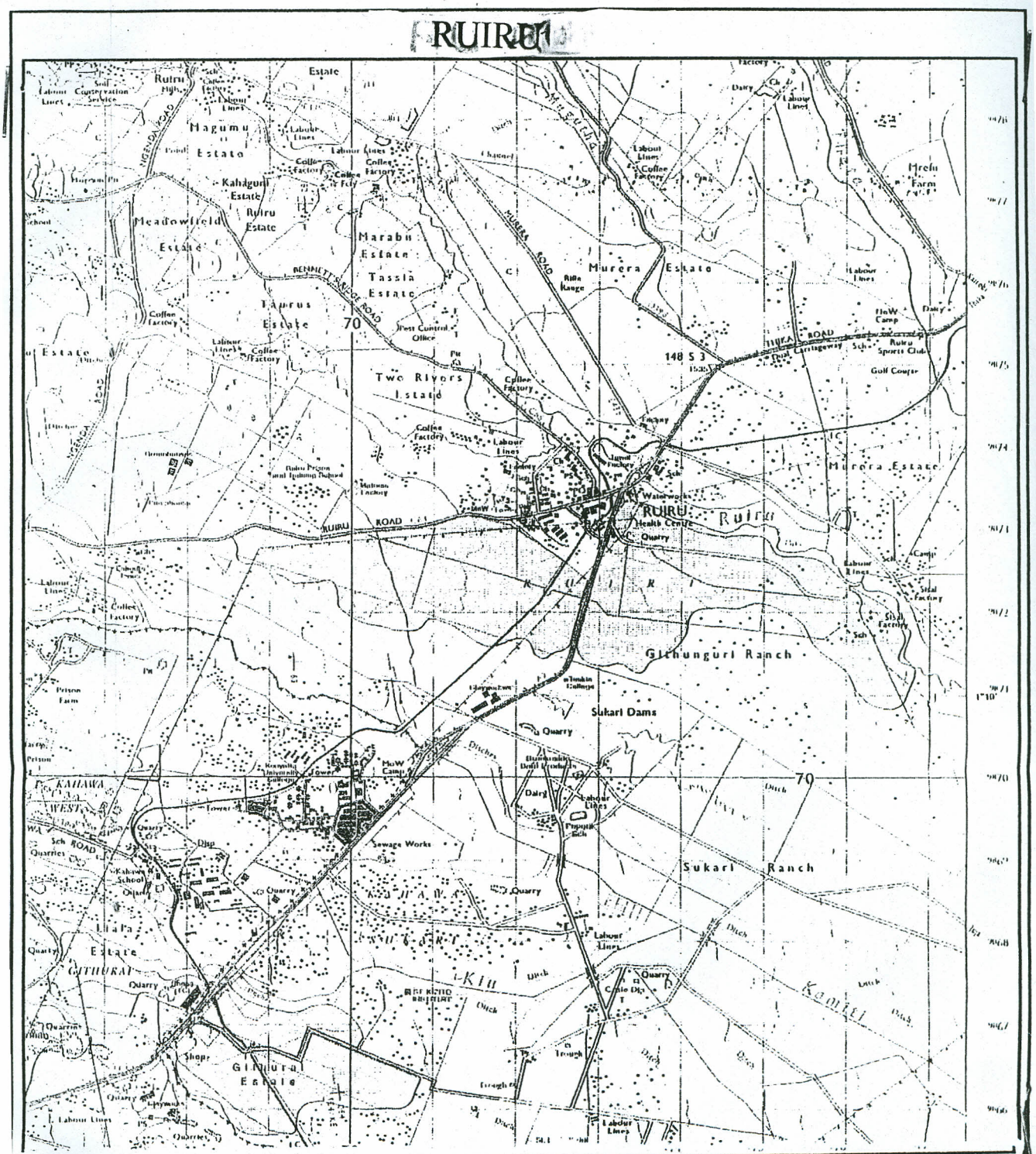
Appendix F: Secondary Schools in Ruiru District

1. Githunguri Secondary School
2. Githurai Mixed Secondary School
3. **Kitamaiyu Secondary School**
4. Murera Secondary School
5. **Ruiru Girls' Secondary School**
6. **Ruiru Boys' Secondary School**
7. Kwihota Secondary School (Started after the study)
8. Matopeni Secondary School (New at time of study)
9. Blessed Hands Secondary School
10. Cardinal Otunga Sec School (Started after the study)
11. City Science Secondary School
12. Ruiru Star Secondary School
13. St Linda Girls' Secondary School
14. St Lucie Kiriiri Secondary School
15. **St Trizahs' Secondary School**
16. Wankan Girls' Secondary School
17. **Palesia Secondary School**

NB: Highlighted schools formed the sample.

Source: District Education Office, Ruiru

Appendix G: Map of Study Area



Source: Survey of Kenya SCALE 1: 50,000