# INFLUENCE OF ENVIRONMENTAL KNOWLEDGE ON SECONDARY SCHOOL STUDENTS' ATTITUDES TOWARD ENVIRONMENTAL CONSERVATION IN CENTRAL DIVISION, MACHAKOS DISTRICT, KENYA


**BY**

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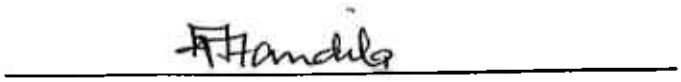
## DECLARATION

This research project is my original work and has not been presented for a degree in any other university.



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This research project has been submitted for examination with my approval as university ervisor.

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# DEDICATION

I wish to dedicate my work to my wife Annastasia and our daughters Fiona and Stella for their patience, understanding and unreserved attention and support throughout my research undertakings. This work is also dedicated to my mother Priscilla and my late father, Mackenzie who gave me the zeal for knowledge and the confidence and persistence in the toil for success.

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## ABSTRACT

The title of this study is, "The influence of environmental knowledge on secondary school students' attitudes toward environmental conservation". The purpose of the study was to investigate the influence of environmental knowledge on attitudes of secondary school students toward conservation within the framework of the established school curriculum. The research project was carried out in the Central division of Machakos district.

The overarching objectives of the study included establishing secondary school students' environmental knowledge levels; establishing students' attitudes toward conservation; determining the extent to which environmental knowledge influences students' attitudes toward conservation and to find out environmental activities that students engage in while in school and out of school.

The research problem was based on the premise that Kenya is among 47 countries in Sub – Saharan Africa that basically depend on their natural resources for development. However the rate at which the natural resource base is deteriorating in the country is increasingly becoming unsustainable and therefore necessitating an urgent solution. Environmental education hence knowledge within the formal school curriculum was seen as a pragmatic response to this concern. It was on this basis that this study was carried out to investigate the influence of environmental knowledge on secondary school students' attitudes toward conservation.

The study was guided by the descriptive research design. Important variables in this study were students' environmental knowledge which was the main factor of investigation while students' and teachers' attitudes were the dependent variables. Extraneous variables were gender and challenges that students and teachers faced in their effort to conserve the environment.

Twenty one (21) public secondary schools, eighty four (84) public secondary school teachers and four hundred and twenty (420) public secondary school students were sampled for the study. Two questionnaires, thus the teachers' attitude questionnaire (TAQ) and the students' attitude questionnaire (SAQ) as well as one (1) observation schedule (OB) were used to collect data. Four hundred (400) students and seventy eight (78) teachers completed the questionnaires representing 94.84 percent response rate. The researcher completed twenty one (21) observation schedules for the twenty one (21) public secondary schools that had been sampled.

The Likert scale was used to measure the respondents' attitudes. A series of statements that were a good representation of the attitudes were provided. Each statement was measured on a five-point Likert response scale with alternatives running from one extreme, strongly agree (SA), through a neutral point (Undecided – U), to the other extreme, strongly disagree (SD). The scores given to each statement were summed up and means calculated. The means and the scores were then analysed quantitatively and qualitatively to establish the students' and teachers' attitudes toward conservation.

Closed and open ended items in the students' questionnaire were also used to elicit responses that were quantitatively and qualitatively analysed to determine students' environmental knowledge. The relationship between students' environmental knowledge and their attitudes toward conservation was determined by using simple regression analysis. The relationship between gender and conservation attitudes was also investigated through analysis of the Likert scale and regression techniques.

Findings of this study revealed that students and teachers had requisite knowledge on the environment albeit inadequate. The study also indicated that environmental knowledge is important in determining environmental attitudes although knowledge alone is an insufficient

factor. The study further revealed that there was a relationship between gender and environmental attitudes. In addition, the study showed that most students and teachers lacked support and encouragement to enhance environmental conservation and this would likely lower their morale and positive attitude towards conservation. It was also found that most students and teachers regarded environmental conservation highly. Despite high positive environmental attitudes among the students and teachers, there was poor commitment among schools to carry out environmental activities. The existing education curriculum in Kenya offers ample opportunities to impart environmental knowledge to students. However, this often remains at the blackboard level. The students do not go beyond the blackboard to sufficiently participate in environmental protection.

Studies done on attitudes and environmental conservation were appraised under the literature review section. Varying results were given. Some studies showed a correlation between environmental knowledge and environmental attitudes among students. Other studies portrayed a negative relationship. This calls for further research into factors other than environmental knowledge that are likely to influence more strongly students' and teachers' attitudes toward environmental conservation. Further research should be carried out to investigate reasons for high positive environmental attitudes among teachers and students yet their schools lacked commitment in carrying out environmental activities.

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ASALs | Arid and Semi-arid Lands |
| DC | District Commissioner |
| DEO | District Education Officer |
| EAL | Environmental Action Learning |
| EAC | East Africa Community |
| ECDE | Early Childhood Development and Education |
| EE | Environmental Education |
| EFA | Education for All |
| EO | Education Officer |
| ESD | Education for Sustainable Development |
| FAO | Food and Agriculture Organization of the United Nations |
| GDP | Gross Domestic Product |
| IDRC | International Development Research Centre |
| IEEP | International Environmental Education Programme |
| IUCN | International Union for Conservation of Nature |
| KIE | Kenya Institute of Education |
| KOEE | Kenya Organization of Environmental Education |
| MDG's | Millennium Development Goals |
| MEA's | Multi-lateral Environmental Agreements |
| MOEST | Ministry of Education Science and Technology |
| NCEOP | National Committee on Educational Objectives and Policies |
| NCST | National Council for Science and Technology |
| NEMA | National Environmental Management Authority |
| NEPAD | New Partnership for Africa Development |
| NES | National Environmental Secretariat |
| NGOs | Non-Governmental Organizations |
| PAMFORK | Participatory Methodologies Forum of Kenya |
| PE | Physical Education |
| SADC | South Africa Development Committee |
| SPCB | Strategic Plan for Capacity Building for Africa |
| TSC | Teachers Service Commission |
| UNCED | United Nations Conference on Environment and Development |
| UNDP | United Nations Development Programme |
| UNEP | United Nations Environment Programme |
| UNESCO | United Nations Education, Scientific and Cultural Organization. |
| UNFCCC | United Nations Framework Convention on Climate Change |
| USSR | Union of Soviet Socialist Republic |
| WSSD | World Summit on Sustainable Development |
| WWF | Worldwide Fund for Nature |

# CHAPTER ONE

## INTRODUCTION

### 1.0 Background Information

The development of human society has through time depended on its level of interaction with the environment. In the beginning, man lived in harmony with nature, but as his numbers grew, and his scientific discoveries and inventions led him on the path of industrialization, he became the predator and his increasing demands on the environment and its resources have led to its exploitation (Shoberi, Omidvar & Prahallada, 2006). This has been guided by a belief that nature exists to serve man, a concept described as anthropocentrism.

According to World Bank Report (2001), about 90% of the 1.2 billion poor depend on forests for livelihood, while one third of the world's population depends on wood fuel as a significant source of energy. Ayodeji (n.d) further notes that in Sub-Saharan Africa, it is estimated that 75% of the people are dependent on forests in various ways. In Kenya, rural households depend on forest products for fencing, electric poles, energy, and food, reducing forest cover to a critical 1.7% (NEMA, 2003).

The situation is more critical in ASAL lands such as Machakos where rainfall except in the hilly region is low and unreliable (Benjamin, Diang'a & Rocheleau, 1995). (Barber, Thomas, & More, 1981, in Benjamin, Diang'a & Rocheleau, 1995) further observed that Soils in Machakos are generally fragile, of low fertility and highly erodible. The dominant vegetation here is dry bush with trees and in the higher areas, savanna with scattered trees (Ominde, 1968, in Benjamin, Diang'a & Rocheleau, 1995). Due to commercial charcoal burning and conversion of dry forest to agriculture, the hills that were once forested are now mere patches

and corridors of forests on hilltops, along rivers and ravines (Benjamin, Diang'a & Rocheleau, 1995).

The majority (90%) of the population lives in rural villages and relies on a combination of subsistence and commercial agriculture with some wage labour (Benjamin, Diang'a & Rocheleau, 1995). As further observed by Benjamin, Diang'a & Rocheleau (1995), the density of population in Machakos district exceeds the number of people that can be supported by subsistence or commercial agriculture under present technology. Consequently, land degradation by cropping and overgrazing has been recurring through the last 70 years of colonial and later national agriculture and resource management programmes (Barber, Thomas, & Moore, 1981; Moore, 1979, in Benjamin, Diang'a & Rocheleau, 1995). This makes land and the people susceptible to ecological and economic stress.

In response to these challenges, NEMA (2005) notes that environmental education and public awareness are identified as important tools by which attitudes, values and sustainable use of the environment are influenced. The term 'environmental education' has been broadly used here to comprise acquisition of knowledge and other attributes such as attitudes, skills, values, motivation and action abilities.

Robinson, Trojok and Norwisz (1997) observe that environmental education can play a role in helping the current generation of students understand the importance of collective effort to improve global environmental sustainability. Changes in cognitive knowledge levels can influence students' attitudes toward environmental concerns (Chi Kin Lee & Williams, 2001). Cross (2004), further observes that attitudes are reinforced by subjective knowledge (belief) which often attracts strong feelings (emotional component) that may lead to particular behavioural intents (the action tendency components).

The Kenya Government recognizes the importance of environmental education through its policies. Although the current constitution of Kenya does not have direct environmental conservation provisions, section 71 of the constitution deals with the right to a clean and healthy environment. Kenya has about 77 statutes relating to the conservation and management of the environment.



Environmental policies are also reflected in various National Development Plans and Session Papers number 10 of 1965 and number 6 of 1988. Session Paper Number 6 of 1988, "Education and Manpower Training for the Next Decade and Beyond", states that environmental education should be made part and parcel of education and training curricula and be taught at all levels of the education systems (Otieno, 2002). Since 1985, environmental issues have been defined and integrated into the curriculum in agriculture, home science, geography, history and government, biology and chemistry subjects taught in Kenya schools (Otieno, 2002).

The fundamental objective of environmental education is to empower students to promote and maintain environmental quality. This is in line with one of the specific objectives of Tbilisi (1977) for environmental education which states "to help social groups and individuals acquire awareness and sensitivity to the total environment and its allied problems." However the learner has limited field activities resulting into difficulties in practical environmental practices. There is also inadequacy of well trained staff in environmental education thereby constraining dissemination of environmental knowledge (NEMA, 2005).

While efforts to enhance environmental education in the school curriculum is in progress, concern has been voiced over the disappointing failure of secondary school students in putting into practice environmental knowledge gained. Otieno (2002) observes that the

infusion of EE components into subjects has not adequately offered opportunities for students to develop genuine concern for and sensitivity to environmental protection and preservation. NEMA (2005) further observes that despite the steps undertaken to integrate environmental education in the mainstream curriculum, the effective implementation of this programme has been hampered by a wide range of constraints and therefore environmental education does not seem to have a noticeable impact on the students' environmental attitudes yet according to Pajeres (1992) attitudes are action agenda.

### 1.1 Statement of the Problem

According to NEMA (2005), Kenya is among 47 countries in Sub-Saharan Africa that depend more on their natural resources for economic and social development. But the rate at which the natural resource base is deteriorating is so fast that it is pushing the country into poverty. Current projections indicate that 56% of the Kenyan populations live below the poverty line earning less than US $1.00 per day (NEMA, 2007). In terms of poverty, the World Bank ranks Kenya 172 on the basis of GDP per capita and UNDP ranks the country 123 on the basis of human development index (Ekbom, 2002).

Poverty among majority Kenyans, especially those living within the fragile ASAL lands such as Machakos district, exerts considerable pressure on the already delicate environment leading to severe overexploitation of resources, often resulting into deforestation, occasional flooding, soil erosion, recurring droughts and crop failure. Rural residents report frequent crop failure and water shortages and as a result food relief has become a permanent feature of rural life (Benjamin, Diang'a & Rocheleau, 1995).

Arising from this, there is growing concern to intensify efforts toward conservation in order to mitigate such environmental problems. Shobeiri, Omidvar & Prahallada (2006) observe that environmental education has developed as a pragmatic educational response to these

problems and concerns of environment. Viewed against a back-drop of this consideration this study was carried out to investigate the influence of environmental knowledge on secondary school students' attitudes toward conservation in the Central division of Machakos district. Environmental knowledge, a critical attribute of environmental education was isolated for investigation because of its perceived role in enhancing environmental awareness and action. Emmons (1997) observes that the relationship between environmental education and positive environmental action is a complex one and requires a deeper understanding of contributing factors hence the need to understand students' environmental knowledge and its influence on conservational attitudes.

The aim of this study was to enhance conservational work through curriculum intervention. What the students learn from their experiences with the formal curriculum and what they could do with their new knowledge to conserve the environment was therefore critical to this study. The main independent variable of the study was environmental knowledge and the dependent variable was environmental attitudes. It was hoped that findings of the study would influence the way students perceive, value and use the environment sustainably to secure quality life.

### 1.2The Purpose of the Study

The purpose of this study was to investigate the influence of environmental knowledge on students' attitudes toward environmental conservation.

### 1.3 Objectives of the Study

The objectives of the study included:

i. To find out secondary school students' environmental knowledge levels in Central division of Machakos District.

ii. To determine the attitudes of the secondary school students toward environmental conservation in Central division of Machakos district.

iii. To establish environmental activities that secondary school students in Central division of Machakos district engage in while in school and out of school.

iv. To find out the extent to which environmental knowledge influences secondary school students' attitudes toward environmental conservation in Central division of Machakos district.

### 1.4 Research Questions

The study addressed the following questions:

i. What is the existing secondary school students' environmental knowledge?

ii. To what extent does environmental knowledge influence secondary school students' attitudes toward environmental conservation?

iii. To what extent does gender and the teaching approaches in environmental education influence students' attitudes toward conservation?

iv. What environmental activities do secondary school students engage in while at school, at home and within the community?

v. What are some of the challenges that secondary school students and teachers face in their effort to improve and protect their local environment?

### 1.5 Significance of the Study

Trends strongly indicate that it is through environmental education that people can be made aware of the magnitude of environmental degradation in their country and the rest of the world (NEMA, 2005). This would encourage them to check further environmental deterioration by changing attitude and engaging in conservation practices. As a result

comprehensive study of attitudes toward environmental action is critical to secondary school students and teachers for sustainable environmental conservation.

The aim of this study was to provide empirical data on teachers' and students' attitudes toward conservation to help inculcate positive attitudes and environmental ethic among teachers and students in the Central division of Machakos district. Lessons learnt from the study findings would be harnessed to enhance environmental conservation in other learning institutions and their neighbourhoods by engaging teachers and students in positive conservation action in the district. Information from the study is expected to help abate environmental degradation to improve the quality of life in Machakos which is one of the semi-arid districts of Kenya. It was hoped that this study would also contribute to empowering teachers and students to contribute positively to curriculum development in conservation education through critical and systematic reflections on their actions.

The Ministry of Education, Kenya Institute of Education, and Kenya National Examinations Council might find this study a valuable source of information for making decisions on curriculum evaluation to make environmental education more relevant to students, individuals and the society. Besides, the study was to enable the researcher to understand better the attitudes of public secondary school teachers' and students' toward environmental conservation. Findings from this study were to complement the already existing knowledge on this topic which is still inadequate. It was the hope of the researcher that this study would provide useful ideas for policy makers, educational planners and those interested in further research to improve school-based environmental conservation programs. Environmental knowledge would lead to practical understanding of situations that open up new avenues for further research. While there is research on the assessment of students' acquired

environmental knowledge and attitudes, there is relatively little information about how environmental attitudes are formed (Chi Kin Lee & Williams, 2001).

### 1.6 Delimitations of the Study

The study covered public secondary schools within the Central division of Machakos district. Respondents in this study were confined to secondary school teachers and form four students studying Geography, Biology, Chemistry and Agriculture in the Central division of Machakos district. The four subjects were selected because they carry topics on environmental knowledge.

The study focused on form four students in public secondary schools because the students had already made their subject choices and had been exposed for a longer period to knowledge on environmental education in the carrier subjects. Teachers handling the selected subjects at form four level were also chosen because of their role in teaching those subjects.

### 1.7 Limitations of the Study

Attitudes are hidden constructs hence intangible. Attitudes are concealed and therefore not directly observable in themselves. As a result attitudes in this study were only inferred or implied from students' external behaviour. This is the aspect that was measured as a manifestation of attitudes. It is possible for such measurements of attitudes to be subjective as attitudes are not always highly correlated with behaviour (Bain, 1930)

### 1.8 Basic Assumptions of the Study

The following assumptions were made in this study:

(i) The respondents gave accurate and honest responses to the items in the questionnaire.

(ii) That the respondents' verbal statements were highly correlated with their behaviour in terms of environmental conservation.

## 1.9 Definitions of Significant Terms

**Attitude:** refers to "the sum total of a man's inclinations and feelings, prejudice and bias, preconceived notions, ideas, fears, threats and convictions about any specified topic" (Thurstone, 1928).

**Attitude object:** refers to anything that has an attitude towards it.

**Belief:** refers to one's stable subjective knowledge.

**Curriculum:** refers to all subjects taught and all activities provided at any school and may include the time devoted to each subject and activity (Ministry of Education, Education Act Cap 211).

**Environmental Attitude:** refers to a learned belief which develops from an individual's knowledge and values about the environment and governs action to support or sustain the environment.

**Environmental Awareness:** refers to consciousness of dangers facing man 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 and its resources, (Environmental Education Committee, Kenyatta University College, 1980).

**Environmental Conservation:** refers to all efforts and careful practices carried out to protect and preserve available resources so that they yield benefit to the present generation while maintaining its potential to meet the needs and aspirations of future generation.

**Environmental Education:** refers to a holistic approach to the learning process, whereby individuals and community acquire knowledge, attitudes, skills, values and motivation to improve the quality of environment and attain an ecologically and socially sustainable future (Bhandari, & Osamu, 2000)

**Environmental Ethic:** refers to the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man, his culture and the biosphere (NEMA, 2006)

**Environmental Issues:** refer to matters pertaining to the environment that, while not problems per se, are of concern to environmentalists in view of the fact of the manner in which they are handled will determine whether or not they will degenerate into environmental problems.

**Environmental knowledge:** refers to understanding of the concept, scope, philosophy and meaning of environmental issues and problems and the manner in which they may be successfully handled to satisfy man's needs without detriment to his quality of life, human happiness or environmental quality.

**Environmental Problems:** refer to man-made or natural conditions that serve to destroy the quality of the environment thereby putting the total well-being of man in jeopardy.

**Gender:** refers to the social status ascribed to men and women by virtue of their sex.

Relevance: Refers to the importance related to or pertinent to the matter in hand (Simpson, 1989).

**Sustainable Development:** refers to development that meets the needs of the present without compromising the ability of future generations to meet their own needs, (Bruntland Commission, 1987).

### 1.10 Organization of the Study

The study was organised into five chapters.

**Chapter one** of the study focused on background information, statement of the problem, purpose, objectives, research questions, significance, delimitations and limitations of the study. Basic assumptions and definitions of significant terms were also included.

**Chapter two** of the study explored literature review as well as the theoretical basis and conceptual framework of the study. **Chapter three** of the study described research methodology which set out the research design, the target population, sample size and sampling procedures, research instruments, validity and reliability of research instruments, data collection procedures and data analysis techniques. **Chapter four** presented data analysis and interpretation of findings of the study. Descriptive and inferential statistics were administered in examining the relationships between independent and dependent variables. Landman (1988) states that descriptive statistics deals with the central tendency, variability and relationships (correlations that are readily at hand). **Chapter five** provided a summary, conclusions and recommendations of the study on the basis of the main findings that were discussed. Significant implications were pointed out and recommendations of the study together with openings for further research were presented.

# CHAPTER TWO

## LITERATURE REVIEW

### 2.0 Introduction

Literature review discussed the following aspects; introduction to review; general views on environmental education; secondary school students' knowledge of environmental education; secondary school students' attitude toward environmental conservation; teaching approaches and students' attitudes toward conservation; environmental activities that secondary school students' engage in; challenges that students and teachers face in their effort to improve and protect the local environment; theoretical basis and conceptual framework.

### 2.1 General Views on Environmental Education

Ever since man has been on earth, there has been a constant interaction between him and the natural world (Shobeiri, Omidvar, & Prahallada, 2006). Toili (2007) observes that although the exploitation of the earth's resources for development purposes started since the beginning of humankind, much of the environmental degradation we see today is the result of increased human consumption of natural resources which began during the industrial revolution. Romao (2006) observes that until recently, environmental concerns have not been taken seriously by either developing or developed countries. This negligence has caused serious damage to the environment (Kakonge, 1999). Daily there are references in the news media to environmental issues such as global warming, ozone depletion and loss of the world's forests (Government of British Columbia, Ministry of Education, 2000). Powell (2000) observes that the world is on the road to becoming a barren, overcrowded and lonely place for humanity. This concern requires an urgent solution to ensure that we are not destroying our environment and with it ourselves. Environmental education has developed as pragmatic educational response to the problems and concerns of environment (Shobeiri, Omidvar, & Prahallada, 2006). Chi Kin Lee, & Williams (2001) further observe that changes in cognitive knowledge

levels can influence students' attitudes toward environmental concerns. Therefore environmental education was recognized and its development recommended by the world community as a measure for understanding, protection and improvement of the environment and its quality (United Nations, 1972; UNESCO, 1976). As a response to these concerns, the education system in Kenya has infused aspects of environmental education in most subjects taught in the school curriculum.

Ballantyne (2001); Knapp, & Poff (2001) observe that schools should play a crucial role as informative institutions and in creating appropriate attitudes toward the environment among the students. Schools were found ideal because they already have structures which are recognized and used to reward individuals and institutional efforts in environmental conservation. In addition schools are capable of replicating environmental efforts among neighbouring communities.

Some countries have placed more emphasis on formal education because they envision that children will help educate their parents and can more easily influence their actions (Bhandari, & Osamu, 2000). It is expected that as students talk at home about what they have learned, entire families start to think about the environment, thereby educating parents as well (Fukushima, & Urashima, 2006).

The assumption may have been that it is easier to mould the minds of school children than out of school adults (Ayodeji, n. d). In addition, students are many and highly vulnerable to the effects of environmental degradation. As a result they are bound to take environmental issues more seriously than other groups.

However there is increasing concern that students' do not adequately participate in daily environmental activities (Toili, 2007). The influence of environmental knowledge on

students' attitudes toward conservation is therefore questionable. It is within this framework that this study sought to address secondary school students' environmental knowledge; students' attitudes toward environmental conservation; teaching approaches and students" attitudes toward environmental conservation; gender and students" attitudes toward environmental conservation; environmental activities that secondary school students engage in; challenges that students and teachers face in their effort to improve and protect the local environment.

**2.2 Secondary School Students' Environmental Knowledge.**

Environmental education is largely envisaged as multi-disciplinary in its study. Environmental concepts that are integrated into the secondary school curriculum include concept and meaning of environment, components of environment, ecosystems, natural resources, environmental ethic, environmental degradation, and global warming (K.I.E, 2002).

However, analysis of students' environmental knowledge and attitudes in developed and developing countries supported the claim that the level of environmental knowledge was rather poor (Lee & Tan, 1994). For example, despite twenty-five years of experience with environmental education in the classroom, surveys indicate that American students are still lacking in knowledge about environmental concepts (George, 1997).

Holger (1997) conducted a study on environmental awareness among primary, Secondary School and University students in China. The researcher interviewed 273 University Students, and 134 Primary and Secondary school Students. Data was analysed using percentages (Tables 1 & 2). From the tables, findings among Chinese students did not concur with the observation by George (1997) among the American students. It is clear that Chinese students were generally aware of environmental issues and problems after experiencing

environmental curriculum for 20yrs. Ninety one percent (91%) of them knew the concept of environment and thought that natural environment has a price. Among the 10 problems that the students chose, they ranked environment as third most important problem after population and science and technological development (Tables 1 & 2).

**Table 1: Environmental Awareness Among Students in China (Source: Holger, 1997)**

| Aspect | % |
|---|---|
| Knew the concept of environment | 91 |
| Differentiated between environmental protection and public sanitation | 87 |
| Considered environment as a resource | 85 |
| Thought that natural environment has a price | 91 |
| Claimed they understood something on global warming, ozone layer decomposition, biodiversity reduction, fresh water resource depletion, and acid rain. | 80 |
| Able to write down effects of green house effect | 70 |
| Chose freezers as ozone layer destroying | 85 |
| Had heard about environmental protection laws | 93 |
| Knew that environmental resources are scarce | 94 |

**Table 2: Students' Most Pressing Problems in China (Source: Holger, 1997)**

| Problem | 1st Rank % |
|---|---|
| Population | 27 |
| Science and Technology Development | 15 |
| Environment | 14 |
| Education | 12 |
| Social morals | 9 |
| Security | 5 |
| Social injustice | 4 |
| Housing | 2 |
| Unemployment | 2 |



In Kenya, Ali (2002), Carried out a participatory action research on conservation education with Moi Isinya Girls High School. The researcher involved four teachers teaching science, agriculture, geography, history and social ethics. The sample also included form three

students because of their likelihood to be taught ecology in their biology lessons. An external facilitator was involved to help the teachers and students with difficulties and problems they faced in the research. Questionnaires and interview schedules were administered. Students were asked to name issues of concern in environmental conservation. A list of over 11 issues was produced. Some of the issues referred to were soils, forests, water, culture, wildlife, energy, food, ozone layer, parks, minerals, sceneries and so on. Among the issues, students focused on wildlife (48.8%) and culture (34.9%). Students' conservation efforts were therefore largely limited to wildlife and culture. This implied a narrow range of environmental knowledge and awareness among the students. The study to find out secondary school students' environmental knowledge in Machakos district would compliment the study findings described above in order to nurture students' values and attitudes toward environmental conservation.

As observed by Hodson (1992) students learn things that have some bearing on their daily lives and which contribute to solving their problems. This means that one of the ways of responding to environmental crisis is by localizing the curriculum or developing school – based learning programmes that are responsive to local environmental contexts and issues (KOEE, 2006). However the development of the secondary school curriculum in Kenya is highly centralized and has not as yet inbuilt students' local environmental experiences in different geographical settings. This makes it difficult for students in varied environments to develop interest in conceptualizing environmental issues in their local settings.

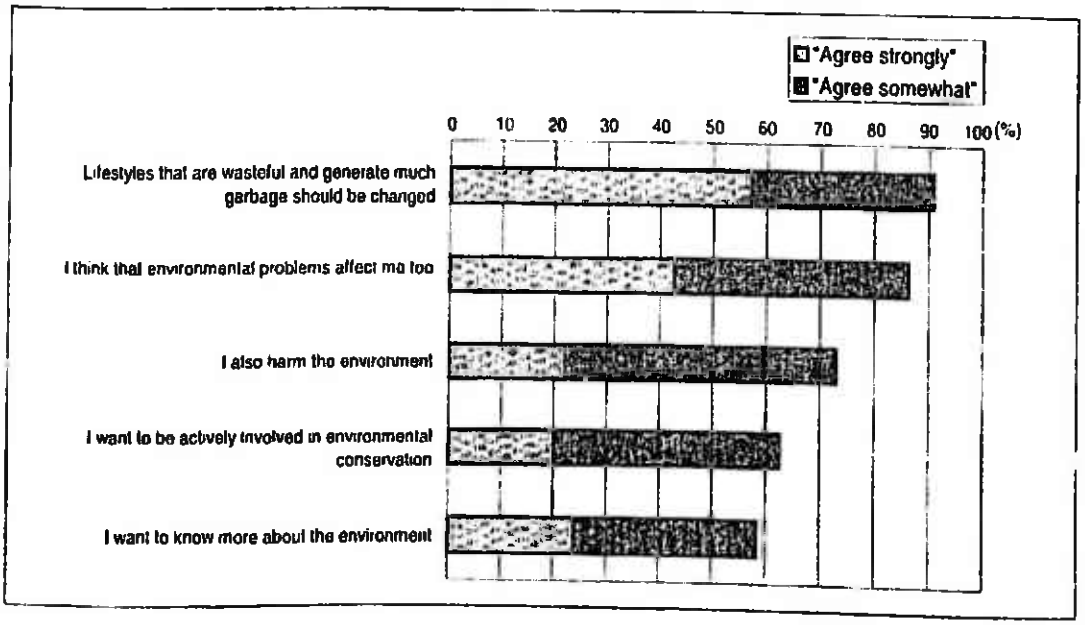
### 2.3 Secondary School Students' Attitudes Toward Environmental Conservation

There have been a number of studies of students' knowledge, opinions and beliefs concerning environmental issues in different countries (Blum, 1987; Kwan & Miles, 1998; Lyons & Breakwell, 1994; Szagun & Mesen, 1993). For example, the government of Singapore

through the National Environment Agency (2006) carried out an assessment of the level of students' knowledge, awareness, beliefs and practices with respect to the environment. A total of 1860 students from 30 primary schools and 39 secondary schools, 1 centralized Institute, and 6 Junior Colleges were sampled for the study.

Results showed that 90% of the students on the knowledge index were highly aware of environmental issues. However students' attitudes toward environmental conservation were low, thus only 43% were willing to volunteer their free time to help out in environmental issues at school, and only 36% were willing to pay more for recycled products to help save natural resources. Similar trends have also been found in Japan, where students were aware (Figure l) that "lifestyles that are wasteful and generate much garbage should be changed" (Fukushima, & Urashima, 2006). However students' desire to take action in terms of "I want to be actively involved in environmental conservation is low".

**Figure 1. Elementary and Junior High School Students' Ideas About Environmental Issues in Japan (Source: Fukushima, & Urashima, 2006).**




Prepared by the STFC based on Reference[13] (N=2,221)

Corresponding results were also evident in Poland. A study to examine levels of environmental awareness and knowledge (mainly toward waste) and its relation with environmentally responsible behaviour among 200 randomly sampled secondary school students (aged 17 – 18) was carried out (Grodzinska – Jurczak, & Friedlein, 2001). The study instrument consisted of a two part questionnaire. The first part of the questionnaire was to test knowledge on wastes and waste disposal. The second part was constructed in order to verify students' attitudes and opinions toward municipal solid waste. Statistical analysis and findings showed that Polish students were generally knowledgeable on environmental issues although they were not active in the field of waste management.

However, a study on knowledge and attitude among Chinese primary, secondary and university students by Holger (1997) revealed that the students were highly knowledgeable and aware of environmental issues and problems (Table 1) and were therefore highly inspired to conserve the environment. Ninety four percent of them considered that it was very important to do environmental protection; 90% thought that environmental deterioration was inflicted by pollution and urbanization; 90% did not want rubbish burnt; 87% wanted to treat pollution and pay for it 100 yuan per year; and 80% threw rubbish into dust bins.

The study by Arcury (1990) supports a consistent and positive relationship between environmental knowledge and environmental attitudes which inform action. Tamara (2004) observes that the more informed students are on the topic, the stronger their attitude typically predicts behaviour. This research project therefore sets out to establish students' environmental attitudes with an aim of determining the link between knowledge gained and students' attitudes toward conservation. This would complement the findings discussed here in order to clarify students' environmental attitudes.

## 2.4 Teaching Approaches and Students' Attitudes Toward Environmental Conservation

The role of the teacher in students' attitudes formation is critical to environmental conservation. Teachers determine what is to be taught and how it should be taught. Watson (1993) & Ryans (1969) observe that basic determinants in teaching of any subject are teachers. Teachers are identified as facilitators and organizers of experience in the environment (Chi Kin Lee & Williams, 2001). Ansu Datta (1984) further notes that at primary and secondary school levels, the teacher is a disciplinarian, a parent substitute, a judge, a confidant and above all a mediator of learning who guides children to achieve certification in education. Nkosana (1998) observes that if teachers' attitude towards a subject is negative, students form the same attitude. Curtis (1996) in shefield (ed.) observes that students' attitudes in Kenya to a large extent are influenced by attitudes of parents and teachers. Poh - Ai Cheong & Treagust (2001), in their paper, "Multiple Research Approaches for Research in Environmental Education and Application of Findings" describe an inquiry that was conducted to evaluate environmental education in Brunei. Qualitative and quantitative research methods were used to obtain data from teachers, teacher trainees, secondary school students and key persons from environmental education.

The evaluation of environmental education in Brunei examined environmental attributes (awareness, knowledge, beliefs, attitudes and action abilities) of 80 teacher trainees, 20 science teachers and 420 students using a questionnaire and focus group interview. Qualitative data was sourced from the focus group interview and quantitative data from the questionnaire. Data were analysed to provide a measure of the level of environmental knowledge, awareness, attitudes and action, Statistical evidences of reliabilities as well as comparisons and relationships of environmental attitudes were computed.

Findings of the evaluation of environmental education in Brunei showed that perceived awareness of environmental concepts among the respondents was high but their knowledge levels were low. Teachers were also found to have limited environmental knowledge. New environment concepts such as sustainable development and carrying capacity could not be defined by teachers. Even concepts that were normally found in the science syllabuses were not defined correctly by half of the teacher trainees. If teachers do not have adequate environmental knowledge, skill and commitment to environmentalize their curriculum, it is likely that an environmentally literate student will be produced (Shobeiri, Omidvar, & Prahallada, 2006).

Teachers experience in teaching and learning methods for environmental education were also found limited. Consequently the Pedagogy was mostly "Chalk-and-talk" method and learning based on the rote method and spoon - feeding (Bhandari, & Osamu, 2000). This renders learners inactive, blindly following the teacher without any critical input.

In Kenya the implementation of curriculum is left to individual teachers. If their perception and interpretation of environmental education content is correct, they include it in their lesson plans and if incorrect, they do not incorporate it. This affects both the teachers' and students' attitudes towards environmental conservation because of their limited environmental knowledge base.

The excessively examination driven culture in many secondary schools in Kenya also discourages positive teacher and student attitudes toward environmental conservation, which is seen as a waste of time that could otherwise be used for drilling students to pass national examinations in core subjects.

Kavagi (2002) observes that classroom bound methods especially within a system that sees environmental education as an additional content in the curriculum tend to dwell on knowledge and therefore ignore practical projects on environment conservation.

In the face of these challenges, secondary school teachers tend to accommodate negative attitudes toward practical approaches to environmental conservation. New Horizons for Learning (2006) reveals that practical action projects engage students and give them hope, feelings of accomplishment, involvement and responsible behaviour, what John Dewey called "the most important attitude that can be formed, the desire to go on learning". Interactive teaching and learning initiatives have proved successful in southern Peru where students find it entertaining, more interesting and democratic way of learning (Kavagi, 2002). Teachers were therefore a critical variable in this study as they largely influenced students' attitudes toward conservation, either positively or negatively through in-class and out-of-class interactions.

### 2.5 Gender and Students' Attitudes Toward Environmental Conservation

In Kenya, women are more important users of the environment than men and also the main victims of its mismanagement (NEMA, 2005). Environmental degradation forces women to spend more time and energy gathering firewood and fetching water (NEMA, 2003). Due to their central role in community life, women especially school girls should be encouraged to develop positive environmental attitude at the very earliest.

Ditto, Juuti, Lavonen, & Meisalo (2004) carried out a survey of Finnish 9$^{th}$ grade comprehensive school students on attitudes to environmental challenges. Three thousand, six hundred and sixty six (3,666) students of median age, 15 years from Finnish comprehensive schools were sampled.

Six positive statements concerning positive attitudes toward environmental responsibility were arranged on a Likert - Scale questionnaire moving from personal responsibility towards more distant position of others' responsibility to environmental challenges. The Likert scale questionnaire was then administered to students' to establish their attitudes toward environmental responsibility. Data was analyzed and the results revealed that more girls than boys showed positive attitudes towards environmental responsibility. The t-test further revealed a statistically significant difference between girls' and boys' responses to all the statements ($P<0.001$).

Holger (1997) investigated environmental awareness of Chinese Middle School and University students. The results revealed that male students were generally more environmentally aware thus 46% versus 27% of female students knew the date of environmental day. However female students showed more inclination towards participation in environment action thus 63% than their male counterparts, thus 49%.

Although male students tended to be more environmentally aware than the female students, the male students showed a low inclination towards participation in environmental actions. The Economic Commission for Latin America and the Caribbean (2000) observes that "Lack of correct Knowledge and technology inhibit people to take effective measures".

In general, people obtain two levels of knowledge, descriptive and procedural knowledge. Descriptive knowledge explains the cause and effect of phenomena for example, consumption of too much paper would destroy forests. No action is prescribed. However, procedural knowledge gives instructions to act, for example, what type of paper can be recycled to minimize the destruction of forests. How could the paper be collected to be recycled? In the case above, it seems the differences in environmental attitudes and actions

among male and female students could have been a manifestation of the type of knowledge that each sex was given during their family or societal roles.

In terms of culture and roles in society, the girl students take after their mothers' roles and the boys after their fathers' roles. Mothers prioritize welfare and health of family which closely associate with the local environmental quality such as water, air and solid waste while fathers prioritize economic and material well being of the family (George & Southwell, 1986, quoted in Dietz, Stern & Guagnano, 1998). Decision to conserve the environment is therefore taken on the basis of how the individual is expected to behave in society. The female students were also more inclined towards participation in environmental action than their male counterparts because it is generally believed that women are more concerned about environment than men. "Women are potentially more environmentalist than men due to biospheric orientation" (Diamond & Orenstein, 1990; Griffin, 1978; Merchant, 1979 quoted in Stern, Diez & Kalof, 1993). This is supported by the Harris survey (1991) which showed that more women are concerned about the environmental quality, critical about policy taken by government and willing to accept lower standard of living for fewer health risks (Economic Commission for Latin America and the Caribbean, 2000).

This research project on the influence of environmental knowledge on students' attitudes toward conservation in Kenya would hence complement the findings cited here to help establish the discrepancies in gender and conservational attitudes among high school students in the Central division of Machakos district.

### 2.6 Environmental Activities that Secondary School Students Engage in

A major objective of environmental education is promotion of individual environmental conservation activities addressing various environmental problems such as global

warming, air pollution, water pollution, waste and so on (Fukushima, & Urashima, 2006). Environmental Action Learning (EAL) approach to environmental education recognizes the fact that schools are set up to meet this objective through practical activities that harness both students' and community knowledge to solve real environmental problems.

Toili (2007) carried out a descriptive survey on secondary school students' participation in environmental action in Bungoma district. He used a modified stratified sampling technique to come up with 22 secondary schools and 272 fourth form students, aged between 16-18 and who studied biology and geography. He used interview schedules and document analysis to collect data which he analyzed using percentages. The results revealed that most secondary school students rarely engaged in activities to assist in protecting and improving the quality of the environment in the surrounding community. Those students who participated in some activities did so through coercion as part of punishment (12.1%), routine manual work (26.4%), through clubs (2.5%) and as part of the learning process (1.5%). On average 42.5% participated in environmental conservation activities while at school, 16.9% while at home and 5.3% in the community surrounding the school.

The results indicated that the implementation of environmental education in schools could be ineffective as students' knowledge level was limited hence they could not establish a concrete line of action even when they were faced with environmental problems (Toili, 2007).

Elsewhere, students' involvement in environmental conservation activities has proved effective in solving local environmental problems. According to Kimbute (2007), secondary school students in Tanzania have started a conservation activity project around Pare Mountain Reserve. The students have mobilized 'the local community in conservation

activities which among others include formation of conservation groups, conducting transect walks to establish the status of the forest, formation of conservation committees for regular patrol of the forest reserve, establishing tree nurseries, raising conservation awareness, essay, art and school quiz competitions on issues of environmental conservation as well as preparation and distribution of posters, car stickers and banners giving messages on environmental education and attitudes toward conservation. This research project was to investigate the influence of environmental knowledge on students' attitudes toward conservation in order to establish reasons for the differences in the levels of students' involvement in environmental activities such as those cited in the studies above.

## 2.7 Challenges that Students and Teachers Face in their Effort to Improve the Local Environment

Although there is a general perception that schools should be instrumental in realizing the goals of environmental education, past studies have shown that there are many barriers in schools which impede progress in environmental education (Ham & Sewing, 1987; Lee, 1993; Maher, 1986; Samuel, 1993).

Challenges that secondary school students face in their effort to improve their local environment are related to environmental policy and environmental programmes. Bhandari, & Osamu (2000) observe that with the exception of a few countries, no country has formulated a national policy on environmental education. As a result, environmental education receives no priority action, no allocation of resources, no budget and no support and thus marginalized from the national mainstream. This action has local ramifications at school levels where students and teachers lack financial support to initiate viable environmental conservation projects.

Other challenges relating to environmental programmes include limited practical exposure of students to issues of environmental concern. Bhandari, & Osamu (2000), observe that conventional teaching methods such as lecture methods reduce the quality of environmental education as there are no opportunities for students to observe directly the environment or to be exposed to real life situations. Consequently students lack knowledge, practical skills and positive attitudes toward environmental conservation. Attitudes formed on the basis of experience exert stronger influence on behaviour than those formed through hearsay (Tamara, 2004).

Schools also operate within a fairly rigid timeframe. Lack of time and opportunity towards environmental action is therefore a major challenge to students. Ali (2002) observes that students and parents too are focused on the curriculum and concerned about its implications for the national examinations. As a result, students do not have time to spare for environmental action at school.

Due to lack of time, teachers too, find it easier to assign students environmental tasks rather than involve them in practical conservation. Those who participate in environmental activities do so through use of coercion or use of punishment and routine manual work which do not encourage students' critical evaluation of environmental problems, their causes and solutions (Toili, 2007).

Students also lack role models in environmental conservation. Tamara (2004) observes that persons form attitudes by observing and then imitating models they like and admire. As a result of lacking role models, students' attitudes toward environmental conservation seem dampened. Most of these challenges are more acute in developing countries or rural schools where there is lack of material resources and teacher expertise (Chi Kin Lee & Williams, 2001).

## 2.8 Theoretical Basis of the Study

A theory is a description that explains why a phenomenon occurs (Drew, 1980). This study was guided by the functional theory of attitudes. Functional theory of attitudes hold that attitudes serve a variety of purposes important to psychological functioning (Katz, 1960; Katz & Stotland, 1959; Kelman, 1961; Smith, Bruner & White, 1956).

According to the dictionary of marketing terms (American Marketing Association, 2007), a functional theory of attitudes is based on the idea that attitudes develop to satisfy-certain functions. As stated by Katz (1960), four attitude functions exist. They are utilitarian function which allows one's attitudes to help one maximize benefits or rewards while minimizing costs or punishment; knowledge function which allows one's attitudes to help one to know and understand the people and things with which they come in contact; ego-defensive function which allows one's attitudes to help one to distance oneself from threatening things or objects; and the value expressive function which helps one to solidify and express those values that appeal to one's lifestyle and outlook.

Other attitude functions include a social identity function (Shevitt, 1989) which allows one's attitudes to help one express oneself and interact with the others. A social identity function of attitudes therefore helps one to convey a particular social image to gain social approval. For example, attitudes towards western brands of certain products is a social identity function of attitude in developing countries (Batra, Ramaswamy, Alden, Steenkamp & Ramchander, 2000). The other attitude function is the self esteem function which helps one to associate with successful groups in order to boost ones self esteem through a process of basking in reflected glory (Cialdin, 1976). Attitudes therefore reflect the underlying motives of the individual, thus the functional theory is sometimes referred to as a motivational approach to attitudes (American Marketing Association, 2007).

Functional attitude theory may offer a useful framework for examining personal perception processes (Sharon, & Michelle, 2002). Although the functional theory of attitudes is applicable across cultures, the importance and categories of such functions may vary across such cultures.

Personality and cultural differences tend to predict differences in the functions that one's attitudes tend to serve (Sharon, & Michelle, 2002). For example in individualistic societies such as the United States of America, personal goals take precedence over the goals of one's group. In such situations attitudes and perceptions tend to link rather closely to behaviour.

On the other hand, in collectivist societies such as those in Africa and the Far East, the group is of greater importance than the individual and as a result, personal goals are secondary to group goals (Triandis,1995). It is often norms rather than attitudes that drive behavior in those societies (Bontempo & Rivero, 1992; Ybarra & Trafimow, 1998). Therefore personal attitudes may have less functional value in collectivist cultures than in individualistic cultures.

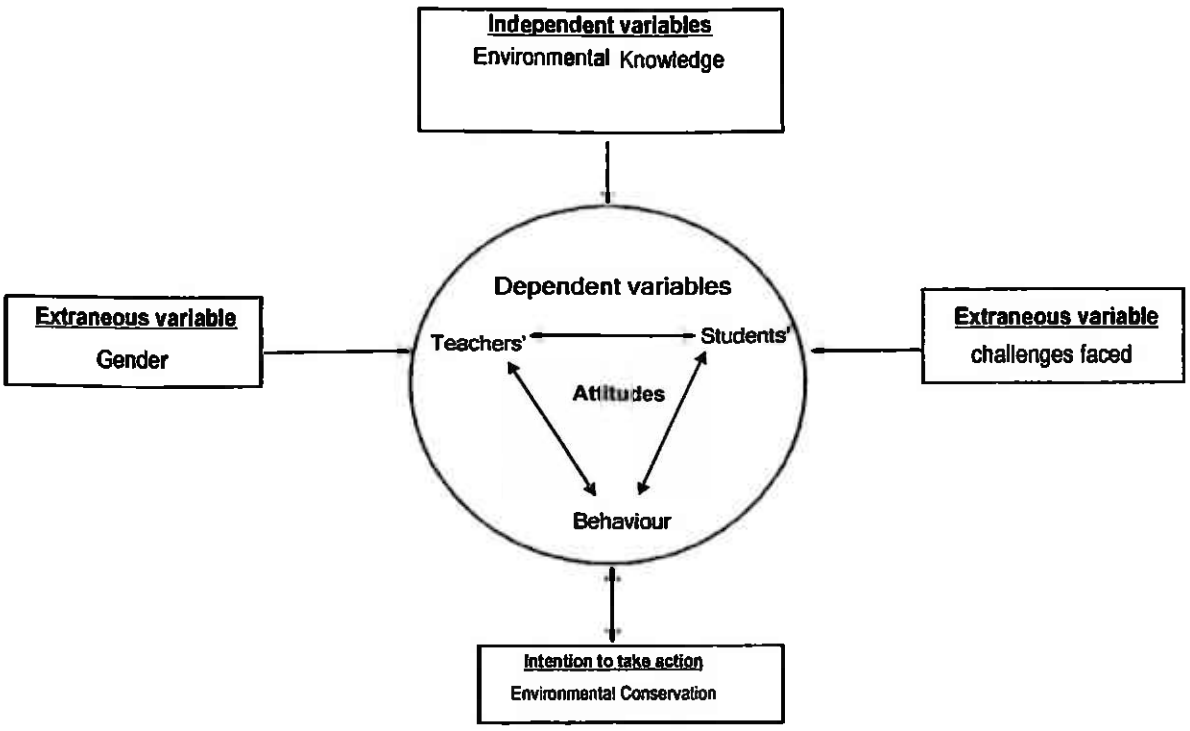
Whether in individualistic or collectivist societies, people struggle to meet their goals and will always adjust attitude to meet such goals. People will tend to adjust attitudes to minimize harm and maximize happiness (Katz, 1954). According to Sharon, & Michelle (2002), attitudes serve different functions and will change in response to different types of appeals. Attitudes serve a useful purpose and when it is no longer useful, a new one will be adopted. If these ideas based on functional theory of attitudes are applied to attitudes toward environmental conservation in public secondary schools, then it is expected that secondary school students should reflect them in their daily lives.

## 2.9 Conceptual Framework of the Study

This research project investigated the influence of environmental knowledge on students' attitudes toward conservation. Several factors that were identified as important to this study included environmental knowledge which was the independent or the main variable of investigation and students' and teachers' attitudes and conservation actions as the dependent variables or factors that were measured. The extraneous variables that were inbuilt in the study as secondary independent variables were gender and challenges that students and teachers face in their conservation efforts.

These were diagrammatically illustrated in figure 2.

**Figure 2: The Influence of Environmental Knowledge on Conservation Attitudes.**




Source : Mandila (2008)

From figure 2, Chin Kin Lee & Williams (2001), observe that as individuals become knowledgeable, they become more aware of environmental problems and thus, become more

motivated to act towards the environment in more responsible ways. Progression is from knowledge through attitudes (feelings and convictions) to action.

Although attitudes are concealed and not directly observable in themselves, they cause behaviours that lead to observable actions (Cross, 2004). According to Arul (1997), attitudes may influence behaviour and, in turn, be influenced by it hence the double arrows in the diagram.

The more informed the students are on the topic, the stronger the attitude typically predicts behaviour (Tamara, 2004). Stronger attitudes are usually more accessible to consciousness and can more easily regulate behaviour (Tamara, 2004). Besides, the more the topic affects the student, the stronger the attitude behaviour (Tamara, 2004). Attitudes formed on the basis of direct experience tend to exert stronger influence than those formed through hearsay (Tamara, 2004).

However, attitudes don't always determine behaviour (Lapiere, 1934). Inglehart (1997) further observes that attitudes do not determine behaviour in any one-to-one fashion but combined with situational factors, will become an indicator of behaviour since behaviour requires both motive and opportunity. Therefore having environmental concern and behaving accordingly is quite another matter. Sometimes students' attitudes toward environmental conservation are positive yet their intentions to conserve are low. This research project therefore set out to investigate such discrepancies with the aim of complementing study findings cited here.

# CHAPTER THREE

## RESEARCH METHODOLOGY

### 3.0 Introduction

This chapter focuses on the methodology used in this research. The chapter describes the following; location of the study, the research design, the target population, sample size and sampling procedures, research instruments, validity and reliability of the research instruments, data collection procedures and data analysis techniques.



### 3.1 The Research Design

The research design that was employed in this study was descriptive survey. This is a research method by which data is collected from component members of a targeted population by use of questionnaires. The descriptive survey attempts to identify independent and dependent variables and describes their characteristics in terms of frequencies, percentages, means, modes, standard deviations and correlations.

In such a study design, the researcher has no control over the variables and therefore they are described the way they are in a natural setting (Ary, Jacobs & Razavie, 1972). The aim of using this research design in this study was therefore to determine and describe the status of issues that were being addressed thus environmental knowledge, and attitudes toward conservation the way they were in - situ in order to gain more information upon which research questions would be answered and conclusions to the study made.

This design was suitable for the study because the target population of school teachers and students had already been exposed to environmental knowledge within the carrier subjects. In addition, students' attitudes toward conservation had already been determined and therefore the researcher could not manipulate them but took them the way they were hence the choice of the design that took advantage of the already set situation as the direct source of data.

The independent variable in this study was environmental knowledge and the dependent variables were students' and teachers' attitudes. Gender and challenges faced were extraneous variables.

### 3.2 Location of the Study

The study was conducted in Machakos district. The district is situated on the east-facing slopes of Kenya's Eastern plateau. Machakos district was selected for the study because the district has diverse landscape and climate. Environmental problems unique to this largely semi-arid district and their resultant effect on the physical and human environments merited a study of this nature. The Central division of the district was selected because it has a critical mass of secondary schools, teachers and the student population which were easily accessible.

The division was purposively selected because of its varied surroundings. Some schools are located within the urban settings in Muputi Zone while others are surrounded by basically rural neighbourhoods especially those within Kimutwa and Mua Hills. Those schools that are located within the Muputi Zone have cosmopolitan characteristics in such a way that the influence of varied cultures on teachers' and students' specific attitudes towards the environment could be investigated to strengthen conservation efforts. Purposive sampling technique concurs with what Patton (1990) refers to as the "intensity sampling technique where cases are selected for being rich in information that manifests the phenomenon of interest intensely.

### 3.3 Target Population

The target population comprised of all form four students and all the teachers in public secondary schools in Machakos district. Form four students were selected because they had already made their subject choices and had stabilized. Teachers were selected because their teaching approaches to environmental education might have had some influence on their

own attitudes and their students' attitudes toward conservation. Chemistry, biology, geography and agriculture were selected because they were the main carrier subjects of environmental topics. The subject one taught in school was important in this study because the close the subject was related to environment the better equipped the teacher was to impart knowledge on environmental conservation.

### 3.4 Sample Size and Sampling Procedures

According to the report from the Machakos district Education Office (2008), there are 12 divisions, 164 secondary schools, and 9134 form four students in the district. Due to time and financial constraints, divisions, schools, form four students and teachers were sampled for the study.

According to the Machakos District Education Office, there are 23 public secondary schools, 390 secondary school teachers and 1520 form four students in the Central division of Machakos district. Mungai (1995) argues that there does not seem to be a universally accepted sample size that can be drawn from this population. However according to Fisher (1973), in Mugenda and Mugenda (1999), a sample from a population greater than 10,000 is 384. Mugenda and Mugenda (1999) further observe that if the target population is less than 10,000 the desired sample size will be smaller and is calculated using the formula:

$$nf = \frac{n}{I + (n/N)}$$

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

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

N = the estimate of the population size.

Using the formula, a sample size of 22 public secondary schools in the Central division of Machakos district was determined. Out of the 22 secondary schools, one of them was

picked for pretesting the research instruments. The remaining 21 secondary schools were selected on a stratified sampling technique. The stratification variables were girls, boys and mixed public secondary schools. Since there were three (3) strata, there was to be a proportionate allocation of 7 schools to each strata, thus $\frac{21}{3} = 7$

The seven (7) secondary schools from each strata were therefore sampled using the simple random sampling technique. For each of the strata, names of the twenty one (21) secondary schools were written on pieces of paper, folded, put into a container and thoroughly mixed to ensure equal chances of being picked. Once picked, the name of the school was returned into the container. The process continued until a sample size of 7 secondary schools in each strata were picked.

Using the formula, $nf = \frac{n}{1 + (n/N)}$ of 306 form four students was determined. Out of a sample size of 306 form four students, 14 or $\frac{306}{21}$ students were expected to be randomly sampled from each of the secondary schools in each strata thus boys, girls and mixed secondary schools. However instead of selecting 14 students per sampled school the researcher proposed to select 20 students in order to further reduce the sampling error.

Each sampled public secondary school was therefore treated as a cluster with a size of 20 students. The form four students in each boys and girls secondary schools were picked using both simple random sampling and stratified sampling techniques. Stratification variables were the subjects that carried topics on the environment and which the students studied. During the simple random sampling process in each school, class lists for each form four class were obtained. Names of form four students studying each of the subjects, chemistry, biology, agriculture and geography were written on pieces of paper and folded not to expose the names. The pieces of paper were put into a container and thoroughly shuffled to ensure

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equal chances of being picked. Once a name was picked, it was returned into the container. The process was then repeated until the cluster size of 20 form four students in each sampled public boys or girls secondary school was arrived at.

Form four students in each sampled mixed secondary school were selected using simple random sampling and stratified sampling techniques. Stratification variables were sex and subjects that carried topics on environmental education and which the students studied. The students studying the subject's chemistry, biology, agriculture and geography were therefore selected on the basis of sex, thus male or female. From each strata (male or female), ten (10) students were randomly sampled using the simple random sampling technique described above until a total of 20 students was arrived at.

Teachers in each public secondary school were selected using simple random and stratified sampling techniques. Stratification variables were the subjects that carried topics on environmental education and which the teachers taught in the school thus chemistry, biology, agriculture and geography. From each subject area, a list of teachers (sampling frame) was subjected to the simple random sampling technique by which only one teacher per subject was selected. In total four teachers from each school were selected for the study.

### 3.5 Research Instruments

Research instruments consisted of an observation schedule (OB), and two questionnaires, thus Students' Attitude Questionnaire (SAQ) and Teachers' Attitude Questionnaire (TAQ). The instruments were developed by the researcher to correspond to the research objectives and questions.

### 3.5.1 Students' Attitude Questionnaire (SAQ)

The students' attitude questionnaire consisted of 15 items divided into two parts. Part one addressed general information. Part two consisted of open ended and closed ended items that addressed students' attitudes toward conservation.

Closed ended items asked respondents to indicate the extent to which they agreed or disagreed with each statement on a Likert scale to show their strength of feeling. The attitude statements provided were both positive and negative. Each statement was measured on a five-point Likert response scale, with alternatives running from one extreme, strongly agree (SA), through a central point, undecided (U), to the other extreme, strongly disagree (SD). All negative statements were scored from 1 -5 and all positive statements were scored from 5 – 1, thus strongly agree = 5, agree = 4, undecided = 3, disagree = 2 and strongly disagree = 1. The values that were assigned to each statement were summed up. The lowest total score for strongly disagree on students' attitude questionnaire (SAQ) was equal to 20 representing perfectly negative attitude. A perfectly positive attitude (strongly agree) was represented by a maximum score of 100 points and neutral response (undecided) was represented by a maximum score of 60.

| Scores | Attitude rating |
|---|---|
| 20 – 59 | Negative (N) |
| 60 | Neutral (NR) |
| 61 – 100 | Positive (P) |

Means for the responses were also calculated and analysed qualitatively and quantitatively to corroborate students' environmental attitudes established earlier.

Open ended items sought to elicit information on students' environmental knowledge. The information was analysed quantitatively and qualitatively to find out students' understanding

of environmental concepts presented in the curricula. Students' knowledge and their attitudes toward conservation were then subjected to regression analysis to investigate their relationship. The open ended items were also analysed qualitatively to establish the challenges that students faced in their effort to conserve the environment while at school, at home and within the community.

### 3.5.2 Teachers Attitude Questionnaire (TAQ)

The teachers attitude questionnaire consisted of 11 items which fall into two parts. Part one addressed general information. Part two consisted of both open ended and closed items on teachers' attitudes toward teaching and learning of environmental education. Closed ended items asked respondents to indicate the extent to which they agreed or disagreed with each statement on a Likert scale to show their strength of feeling.

The attitude statements provided were both positive and negative. Each statement was measured on a five-point Likert response scale, with alternatives running from one extreme, strongly agree (SA), through a central point, undecided (U), to the other extreme, strongly disagree (SD). All negative statements were scored from 1 -5 and all positive statements were scored from 5 – 1, thus strongly agree = 5, agree = 4, undecided = 3, disagree = 2 and strongly disagree = 1. The values that were assigned to each statement were summed up. The lowest total score for strongly disagree on teachers' attitude questionnaire (TAQ) was equal to 10 representing a perfectly negative attitude. A perfectly positive attitude (strongly agree) was represented by a maximum score of 50 points and a neutral attitude (undecided) was represented by a maximum score of 15 points.

| Scores | Attitude rating |
|---|---|
| 10 – 14 | Negative (N) |
| 15 | Neutral (NR) |
| 16 – 50 | Positive (P) |

A high value therefore represented positive attitude towards teaching and learning of environmental education and a central value indicated neutrality while low scores indicated a negative attitude towards teaching. Means for the responses were also calculated and analysed qualitatively and quantitatively to corroborate teachers' environmental attitudes established earlier.

### 3.5.3 Observation Schedule

The observation schedule sought for evidence on conservation of resources, promotion of environment aesthetics, executing environmental health practices and checking for visible pollution. This was completed by the researcher at each study unit.

### 3.5.4 Validity of Instruments

Validity of the research instruments was reviewed by the experts in education to determine whether the set items accurately represented the study-objectives or not. This also tested acceptability of the items by the respondents. The researcher also went over the items in the instruments and decided for himself if they covered all the objectives in the study hence appeared to measure what they were supposed to measure (face validity). Validity was also checked by pretesting the instruments in Ngomeni secondary school. Based on feedback, the researcher was able to estimate the time taken to administer the instruments; was able to identify sensitive and confusing items and carefully reworked them by making necessary adjustments to improve clarity and format. To improve validity of research findings, triangulation (multi-strategy) technique was also employed, thus questionnaires and observation schedules were used to supplement each other. This allowed the researcher to corroborate the data obtained. MacMillan and Schumacher (2001) observe that a multi-strategy technique increases the credibility of a study.

The internal validity of the study was ensured through randomization of data. Selltiz, Wrightsman and Cook (1976) in Mugenda and Mugenda (1999) observe that randomization is an important component in the internal validity of a study.

### 3.5.5 Reliability

The questionnaires were pretested in Ngomeni Secondary School for reliability. The school was therefore not included in the actual study. Twenty (20) form four students in the school were sampled using the simple random sampling and the stratified sampling techniques. The respondents were then asked to complete the students' attitude questionnaire (SAQ).

Four (4) teachers who taught, biology, chemistry, geography and agriculture in form four were also sampled using the simple random sampling and the stratified sampling techniques. They were then asked to complete the teachers' questionnaire (TAQ). After analyzing the findings, the items on the questionnaires were reassessed to make them more specific to the objectives of the study and therefore made more reliable.

## 3.6 Data Collection Procedures

A research permit was obtained from the Ministry of Science and Technology. The permit was taken to the Machakos District Commissioner (DC), then to the District Education Officer (DEO) requesting them to allow the researcher to conduct research in their schools, in March 2008.The District Education Officer (DEO) introduced the researcher to the Education Officer (EO) in charge of the Central division of Machakos district, which was the study unit. Under the guidance of the Education Officer, the researcher sampled a total of 21 public secondary schools in the categories, boys, girls, and mixed schools.

Principals of the sampled public secondary schools were conducted to allow the researcher to carry out research in their schools on specified dates. Arrangements were made when to visit

each school in order to meet the principals and then the respondents to distribute to them the questionnaires and also to carry out an observation for evidence of environmental conservation in the schools. On arrival in each sampled secondary school, the researcher called on the school principal or the deputy principal if the former was absent. The researcher identified himself and drew the principal's attention to the letter requesting for permission to carry out research in his/her school. After consent was obtained, the principal was further requested to provide lists for each form four class and also to help in identifying the teachers of chemistry, biology, agriculture and geography for the purpose of sampling. After the target population in each sampled school was identified, the researcher introduced himself to the students and the teachers and stated the purpose for the visit. He requested them to co-operate with him during the sampling procedure.

Twenty (20) form four students studying chemistry, biology, agriculture and geography in each sampled secondary school were selected using simple random sampling and stratified sampling procedures explained under topic 3.4, sample size and sampling procedures. The respondents were assured of strict confidentiality in dealing with their responses. The students' Attitude Questionnaire (SAQ) was then distributed by the researcher to the 20 sampled form four students in each sampled school.

Four (4) teachers in each sampled secondary school were also selected using simple random sampling and stratified sampling procedures. Stratification variables were the subjects that the teachers taught and which carried topics on environmental education. The Teachers Attitude Questionnaire (TAQ) was distributed to the four (4) sampled teachers who taught form four biology, chemistry, geography and agriculture in each sampled school.

Instructions on how to fill the questionnaires were given to the respondents before they were allowed to complete them. The researcher waited for the questionnaires to be completed and then collected them immediately to ensure a high return rate. An observation schedule was also completed by the researcher to corroborate information on environmental conservation in each sampled school.

### 3.7 Data Analysis Techniques

The collected questionnaires and the observation schedules were edited to ascertain their completeness and consistency of information. Data obtained from all the research questions were organized as per research question. A code sheet for the data was then prepared. Data was coded, cleaned, tabulated and stored in a coded form.

For each category of data, techniques of analyzing it were identified (Table 3). Data was entered into the SPSS software package to build a data base that was analyzed using descriptive statistics such as frequencies, percentages, means, cross tabulations and graphs. Simple regression analysis was also used to investigate the relationships between students' environmental knowledge and their attitudes toward conservation and between students' and teachers' gender and attitudes toward conservation.

On the basis of this analysis, descriptions were presented in attempt to answer the research questions. Drawing on further information from the literature review, conclusions and recommendations were made.

**Table 3 : Specifications for Data Analysis**

| Objectives | Independent Variables | Dependent Variables | Data Analysis |
|---|---|---|---|
| 1. Find out secondary school students' environmental knowledge | Environmental knowledge levels | Students' Attitudes toward conservation | Frequencies, means percentages, and cross tabulations. |
| 2. To determine the attitudes of the secondary school students toward environmental conservation. | Students' attitudes | Activities environmental conservation | Frequencies, means, percentages, simple regression analysis and cross tabulations. |
| 3. To establish environmental activities that secondary school students engage in and out of school. | Students' attitudes | Activities in environmental conservation. | Frequencies, percentages, cross tabulations |
| 4. To determine the extent to which teaching approaches and gender influence students' attitudes toward environmental conservation. | Teaching approaches and gender | Students' attitudes toward conservation | Frequencies, means , percentages, cross tabulations and simple regression analysis. |
| 5. To discuss challenges that students face in their effort to improve and protect the local environment | Challenges | Activities in environmental conservation | Frequencies, percentages, and cross tabulations. |

# CHAPTER FOUR

## DATA ANALYSIS AND INTERPRETATION OF FINDINGS

### 4.0 Introduction

This chapter presents the research findings. The findings consist of general information, teachers' and students' perspectives on environmental education, methods used in teaching environmental education and obstacles encountered while promoting environmental conservation.

### 4.1 Response Rate

The survey sought to investigate attitudes of secondary school students toward environmental conservation within the framework of the established school curriculum. The study targeted a sample of 420 student respondents and 84 teachers in Central division of Machakos district. The study used a structured questionnaire to collect the primary data. The researcher managed to collect data from 400 student respondents and 78 teachers representing 94.84% response rate. The researcher did not achieve100% response rate as some questionnaires were spoilt or could not be responded to on time.

### 4.2 Data Analysis and Interpretation

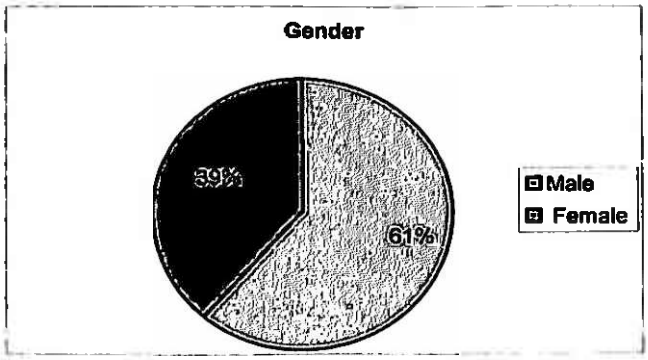
The collected data was coded, cleaned and entered into the Statistical Package for Social Sciences (SPSS) software to build a database that was subjected to data analysis. Descriptive statistics such as percentages, cross tabulations, and graphs were used to describe, analyze and present the study findings, which follow.

### 4.3: General Information on Respondents' Gender and Type of School

#### 4.3.1 Gender of Teacher Respondents

Figure 3 illustrates the number of respondents in terms of gender. There were a higher (61.5%) number of male respondents as compared to female at 38.5%.

**Figure 3: Gender of Teacher Respondents**

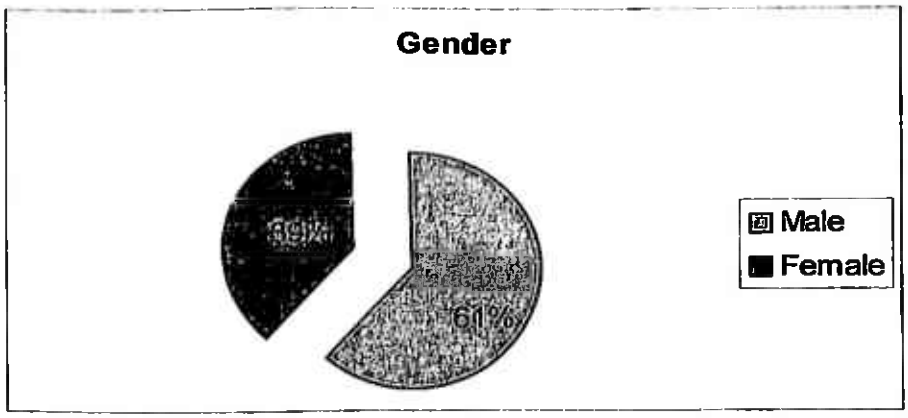



As figure 3 illustrates, a majority (61%) of the respondents were male while female made up 39% of the teachers' respondents sample.

### 4.3.2 Gender of Students

Figure 4 illustrates the number of respondent students in terms of gender. There were a higher (61.5%), number of male respondents, as compared to female respondents at 38.5%.

**Figure 4: Gender of Student Respondents**




As illustrated in figure 2, there were more (61.2%) of the male students respondents recorded as compared to female students at 38.8%. This is probably because the general school population has more male students as compared to female students.

### 4.3.3 Type of School

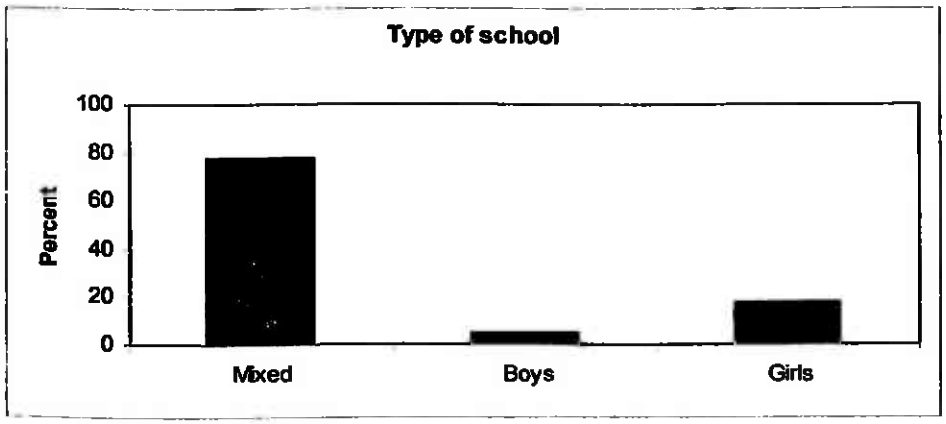
**Table 4: Type of School**

| | Frequency | % |
|---|---|---|
| Mixed | 13 | 61.9 |
| Boys | 4 | 19.1 |
| Girls | 4 | 19.0 |
| **Total** | **21** | **100.0** |

As table 4 shows, 61.9% of the schools were mixed schools while 19.1% were boys schools and 19% girls schools.

The figure 5 shows the number of respondents from each type of school.

**Figure 5: Number of Respondents from each Type of School**




As shown in figure 5, mixed schools registered the highest percentage at 76.9% while girls schools were 17.9% .The boys schools were the least represented at 5.2%.

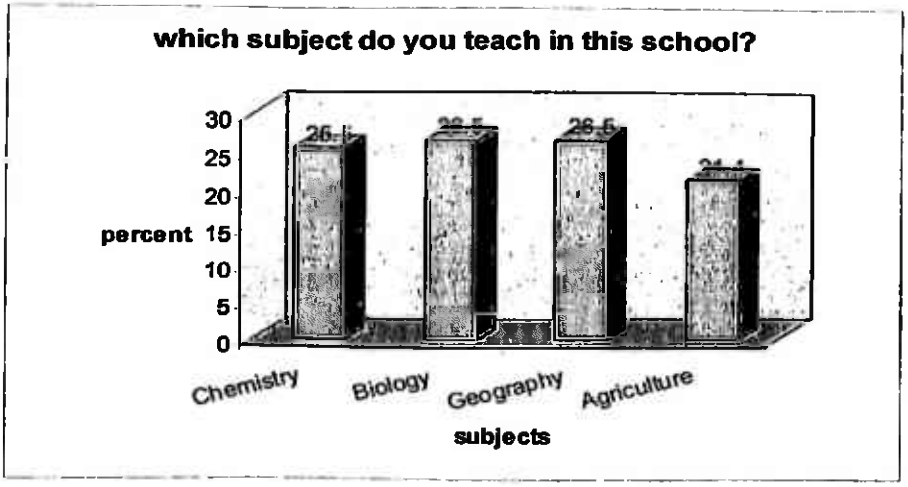
## 4.4 Knowledge on Environmental Conservation by Secondary School Teachers and Students

### 4.4.1 Subjects Taught by Teachers in School

The respondent teachers indicated the subjects they instruct in school as shown in figure 6. The subject one teaches in school is important in this study because the closer the subject is related to environment, the better equipped a teacher is to inculcate knowledge on

environmental conservation. Ryans (1969) & Watson (1993) observe that basic determinants in teaching any subject are teachers.

**Figure 6: Subject the Teacher Instructs in School**




As shown in figure 6, most (26.5%) of the teachers were biology, geography (26.5%), chemistry (25.5%), and agriculture (21.4%). All of the above subjects are inherently related to environmental knowledge and therefore conservation. This means that the teachers in this study are well informed on issues of environment and conservation.

### 4.4.2 Duration as a Teacher

Work experience is an important indicator of whether a teacher is well versed in his/her areas of speciality.

**Table 5: Teacher Respondents on Work Experience**

| | Frequency | % |
|---|---|---|
| 0-2 years | 18 | 23.1 |
| 3-5 years | 22 | 28.2 |
| 5-10 years | 5 | 6.4 |
| 10 years and over | 33 | 42.3 |
| **Total** | **78** | **100.0** |

It can be inferred from table 5 that most (42.3%) of the respondents had been teaching for ten or more years. Those with 3 –5 years were at 28.2%, while those with 5 –10 years were at 6.4%.

Findings of the present study indicate that those teachers who taught chemistry, biology, geography and agriculture were adequately informed on issues of environment and conservation. However most (51.3%) of the teachers were inexperienced as they had taught for under 5 years. The rest (48.7%) had taught for over 5 years.

### 4.4.3 Knowledge on Environmental Conservation by Secondary School Students.

#### 4.4.3.1 Definition of Environment

**Table 6: Student Respondents on the Meaning of the Word "Environment"**

| | Frequency | % |
|---|---|---|
| One's surrounding | 390 | 97.5 |
| Conditions in which you live, work etc | 2 | 0.5 |
| No response | 8 | 2.0 |
| **Total** | **400** | **100.0** |

As illustrated in table 6, a majority (97.5%) of the students correctly defined the environment as being one's surrounding. This response implies that the students knew what their environment was, and are prime candidates for environmental conservation.

#### 4.4.3.2 Definition of Non-renewable Resources

**Table 7: Student Respondents on the Meaning of Non-renewable Resource**

| | Frequency | % |
|---|---|---|
| Can not be recycled | 223 | 55.8 |
| Can not be restored to their previous state | 132 | 33.0 |
| No response | 45 | 11.2 |
| **Total** | **400** | **100.0** |

As shown in table 7, majority (55.8%) of the students defined non-renewable resources as those that cannot be recycled while some (33.0%) defined non-renewable resources as those that can not be restored back to their previous form after use.

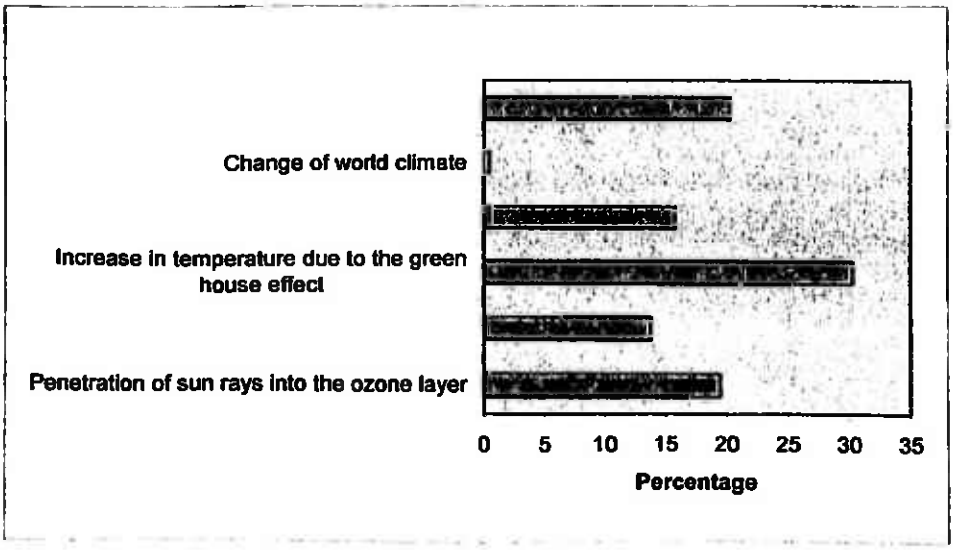
#### 4.4.3.3 Definition of Global Warming

**Table 8: Student Respondents on the Meaning of Global Warming**

| | Frequency | % |
|---|---|---|
| Penetration of sun rays into the ozone layer | 78 | 19.5 |
| Destruction of ozone layer | 55 | 13.8 |
| Increase in temperature due to the green house effect | 121 | 30.3 |
| Pollution by gases | 63 | 15.8 |
| Change of world climate | 2 | 0.5 |
| No response | 81 | 20.1 |
| **Total** | **400** | **100.0** |

As table 8 and the accompanying figure 7 illustrate, 30.3% of the students defined global warming correctly as the increase in temperatures due to the greenhouse effect. Majority (67.7%) of the students did not define global warming correctly. Definitions given were; penetration of suns rays into the ozone layer (19.5%), destruction of the ozone layer (13.8%), and pollution by gases (15.8%), change of world climate (0.5%) no response (20.1%).

**Figure 7: Student Respondents on the Definition of Global Warming**



#### 4.4.3.4 Which One of the Following Dates Coincides with the World Environmental Day?

**Table 9: Student Respondents on the Date of the World Environmental Day**

| | Frequency | % |
|---|---|---|
| April 3 | 86 | 21.5 |
| June 5 | 70 | 17.5 |
| August 10 | 68 | 17.0 |
| October 12 | 68 | 17.0 |
| No response | 108 | 27.0 |
| **Total** | **400** | **100.0** |

Table 9, shows that only 17.5% correctly identified June 5 as the World Environmental Day. Other students (27.0%) were not sure when the day was held. Some students (55.5%) were not aware of the date when World Environmental Day is held.

#### 4.4.3.5 Environmental Problems in School

Student respondents listed environmental problems as shown in table 10.

**Table 10: Student Respondents on Environmental Problems**

| Category label | Frequency | % |
|---|---|---|
| Deforestation | 192 | 28.3 |
| Noise pollution | 29 | 4.3 |
| Poor garbage disposal | 106 | 15.6 |
| Soil pollution/poor drainage | 112 | 16.5 |
| Water pollution | 90 | 13.3 |
| Air pollution | 125 | 18.4 |
| Aridity | 25 | 3.6 |

As illustrated in table 10, students were aware of environmental problems in their schools. A majority (28.3%) of the students mentioned deforestation as an environmental problem in the

school while 18.4% mentioned air pollution. Other problems mentioned were soil pollution (16.5%), poor garbage disposal (15.6%), water pollution (13.3%) and aridity (3.6%).

The study findings reveal that in the overall, secondary school students in the Central division of Machakos district already had some environmental knowledge albeit inadequate as only a mean of 45.88% of the students scored correctly on knowledge questions. This concurs with the observation by Lee & Tan (1994) that students' environmental knowledge in developed and developing countries seem to be rather poor. George (1997) further observed that despite twenty five (25) years of experience with the curriculum, surveys on knowledge about environmental concepts among American students was still lacking. The study by Ali (2002) on the issue of Parks and Wildlife among secondary school students of Moi Isinya Girls secondary school in Kenya indicated that among the eleven (11) environmental issues studied, 41.85% of the students were on average more knowledgeable on wildlife and cultural issues.

However, these findings were conflicting with those from studies conducted by Holger (1997) among Chinese students and by Grodzinska – Jurczak and Friedlein (2001) among polish students and the National Environment Agency (2006) among Singapore's students which showed that secondary school students were knowledgeable and generally aware of environmental issues and problems after experiencing environmental curriculum. This seems to be the case where school curricula were comprehensively infused with environmental topics and the students and teachers were highly motivated, supported and encouraged in their endeavour to learn and conserve the environment.

## 4.5 Secondary School Students' Attitudes Toward Environmental Conservation

### 4.5.1 Findings on Students' Attitudes Toward Environmental Conservation

In checking for attitudes, the researcher had a Likert response scale of 1 to 5. A score of five (5) meant that the respondent strongly agreed with the statement while a score of one (1) implied that the respondent strongly disagreed.

**Table 11: Results of the Students' Attitude Test Towards Environmental Conservation**

| Range of scores | Category of attitudes | Frequency | % |
|---|---|---|---|
| 20 – 59 | Negative | 87 | 21.8 |
| 60 | Neutral | 24 | 6.0 |
| 61 – 100 | Positive | 289 | 72.2 |

The results in table 11 indicate that most (72.2%) of the students in the sample had a positive attitude towards environmental conservation. Those with a negative attitude were only 21.8% and the neutral ones were 6.0%.

Table 12 shows mean scores by students on a Likert Scale. The maximum score on each response was 5 and the minimum score was 1.

**Table 12: Students' Means Responses of Attitude Items Toward Conservation of Environment**

| | Mean |
|---|---|
| I am interested in environmental issues | 4.47 |
| Environmental problems affect me too | 4.28 |
| I want to be actively involved in environmental conservation | 4.51 |
| It is my responsibility to campaign for the improvement of my local environment | 4.33 |
| Each of us can make a significant contribution to environmental conservation | 4.29 |
| Lifestyle that generates more garbage should be changed | 4.19 |
| I am willing to volunteer my free time to help out in environmental conservation at school | 4.14 |
| It is my responsibility to report bad environmental habits at school | 4.11 |
| I am willing to pay more for recycled products to help save natural resources | 3.93 |
| Polluting companies should be closed down for environmental reasons | 3.12 |
| Priority should be given to economic growth over environmental conservation | 3.06 |
| The benefits of science are greater than the harmful effects it could have on the environment | 3.00 |
| It is God's will that man exploits nature for his survival | 2.86 |
| It is the responsibility of rich countries to solve environmental problems of the world | 2.79 |
| People have a right to take whatever they want from the environment | 2.52 |
| Environmental problems are exaggerated | 2.41 |
| Animals should not have the same right to life as people | 2.37 |
| There are more important things to do than deal with environmental issues. | 2.19 |
| Threats to environment are not my business | 1.99 |
| Environmental problems should be left to experts | 1.76 |

As illustrated in table 12, a majority of respondents agreed that they wanted to be actively involved in environmental conservation (4.51), they were interested in environmental issues (4.47), it was their responsibility to campaign for the improvement of their local environment (4.33), each of them can make a significant contribution to environmental conservation (4.29), environmental problems affect them too (4.28), lifestyle that generates more garbage should be changed (4.19), they were willing to volunteer their free time to help out in environmental conservation at school (4.14), it was their responsibility to report bad environmental habits at school (4.11), they were willing to pay more for recycled products to

help save natural resources (3.93), polluting companies should be closed down for environmental reasons (3.12),priority should be given to economic growth over environmental conservation (3.06), the benefits of science are greater than the harmful effects it could have on the environment (3.00).

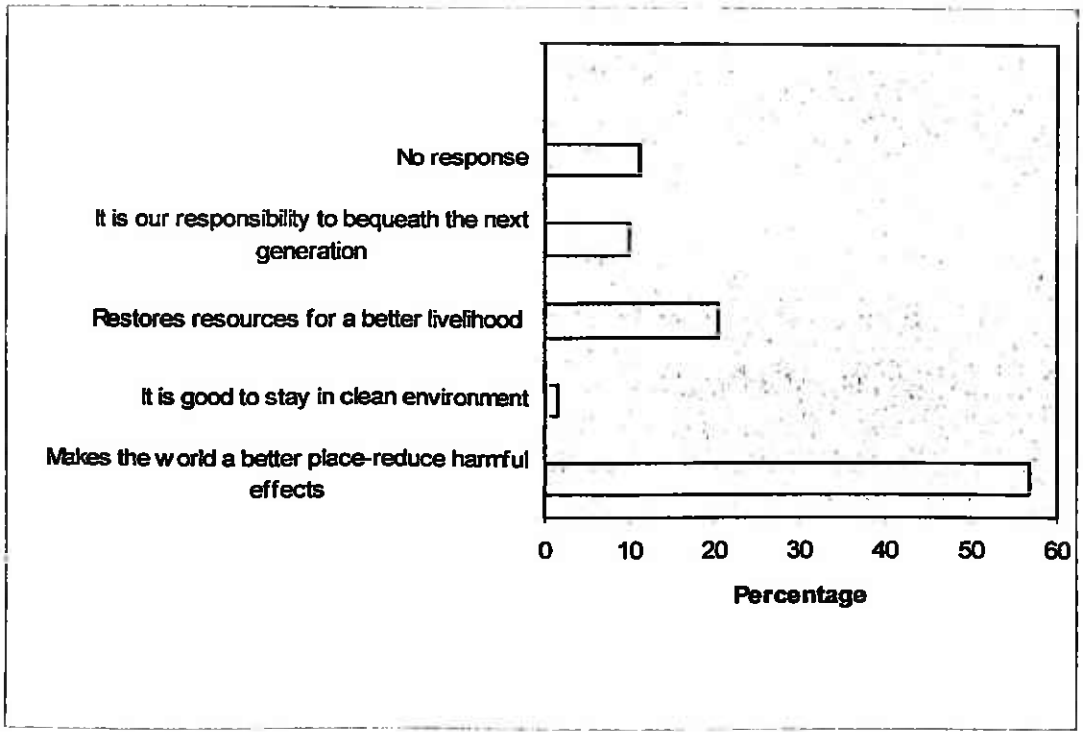
These student respondents disagreed with the statements that it was the responsibility of rich countries to solve environmental problems of the world (2.79), people have a right to take whatever they want from the environment (2.52), environmental problems are exaggerated (2.41), there are more important things to do than deal with environmental issues (2.19), environmental problems should be left to experts (1.76).

**Table 13: Importance of Conservation as Expressed by Students**

| | Frequency | % |
|---|---|---|
| Makes the world a better place-reduce harmful effects | 227 | 56.8 |
| It is good to stay in clean environment | 6 | 1.5 |
| Restores resources for a better livelihood | 82 | 20.5 |
| It is our responsibility to bequeath the next generation | 40 | 10.0 |
| No response | 45 | 11.2 |
| **Total** | **400** | **100.0** |

Table 13 and the corresponding figure 8 indicate what student respondents regarded to be the importance of environmental conservation. Majority (56.8%) indicated environmental conservation would reduce harmful effects of human activities hence making the world a better place while 20.5% said that conservation will restore resources for a better livelihood. Ten percent were of the view that it was their responsibility to bequeath the next generation and that one way of doing this was through conservation. A minority (1.5%) appreciated conservation because it ensures a clean environment. Some (11.3%) did not give reasons as to why they thought conservation was important.

**Figure 8: Students' Responses on the Importance of Conservation**




### 4.5.2 Do you Think Environmental Education Can Help Improve Environmental Conservation?

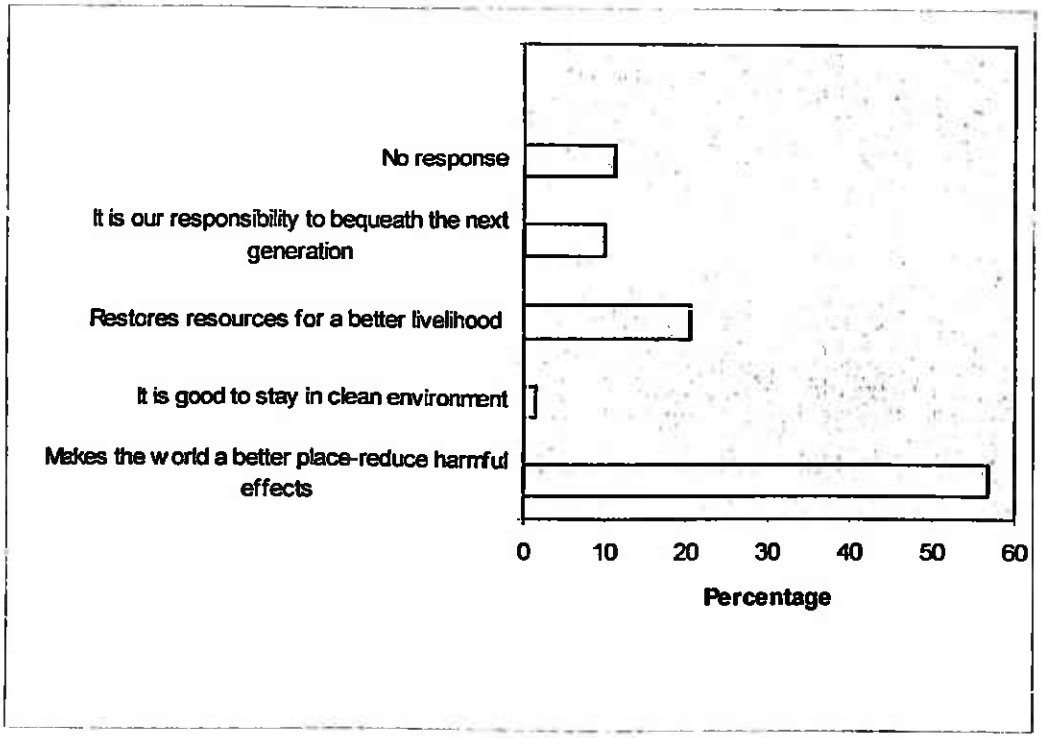
**Table 14: Students' Responses on Whether they Thought Environmental Education Would Improve Conservation.**

| | Frequency | % |
|---|---|---|
| Yes | 389 | 97.2 |
| No response | 11 | 2.8 |
| **Total** | **400** | **100.0** |

As the table 14 shows, 97.2% of the students believed that environmental education could help improve environmental conservation. The other 2.8% of the students did not respond.

In the overall, results of the study in the Central division of Machakos district found that secondary school students' attitude towards environmental conservation was mostly positive (72.2%). The students had a conviction of their own role in environmental conservation. A

**Figure 8: Students' Responses on the Importance of Conservation**

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In the overall, results of the study in the Central division of Machakos district found that secondary school students' attitude towards environmental conservation was mostly positive (72.2%). The students had a conviction of their own role in environmental conservation. A

majority (97%) of them thought environmental education would improve conservation. Some (56.8%) of them indicated that environmental conservation would reduce harmful effects of human activities therefore making the world a better place to live.

These findings concur with those in other scholarly studies carried out by Holger (1997) among Chinese students that revealed high positive students' attitudes toward environmental conservation. However the results of the present study do not agree with findings from studies by Grodzinska – Jurczak and Friedlein (2001) among Polish students; by Fukushima & Urashima (2006) among Japanese students; and by the National Environment Agency (2006) among students' of Singapore that indicated generally low attitudes toward conservation. Such negative environmental attitudes among students demonstrate that understanding of environmental issues within the education sector of the countries in question seemed to be lacking.



Mixed environmental attitudes may also be explained in terms of the functional theory of attitudes on which the present study is grounded. According to this theory, attitudes develop to satisfy certain functions (American Marketing Association, 2007). The functions include the use of the environment (utilitarian function) that helps one maximize benefits while minimizing costs; the value of the environment (value expressive function); whether the environment posses a threat to one's life (defence function); the urge for knowledge (knowledge function) of one's surroundings; whether the environment conveys a social image (social identity function) for social approval.

Environmental attitudes therefore seem to develop variably in response to one or more of such purposes resulting into varied environmental attitudes among students. According to Sharon & Michelle (2002) attitudes serve different functions and will change in response to different types of appeals.

### 4.5.3 Influence of Environmental Knowledge on Conservation Attitudes

The researcher further sought to investigate the influence of students' environmental knowledge (definition of environment) on students' environmental attitude (I am wiling to volunteer my free time to help out in environmental conservation at school). Simple regression analysis was employed to establish the relationship (Table 15).

**Table 15: Regression: Students' Knowledge versus Attitude**

**Coefficients (a)**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 4.204 | .357 | | 11.780 | .000 |
| | What is the meaning of the word environment | -.068 | .350 | -.010 | -.194 | .846 |

a) Dependent Variable: I am willing to volunteer my free time to help out in environmental conservation at school

In table 15 calculated 't' (11.780) is greater than significant 't' (0.000) meaning that students' knowledge on environment (definition of environment) greatly determines their attitude towards conservation.

The study by Arcury (1990) supports a consistent and positive relationship between environmental knowledge and environmental attitudes. These findings concur with study findings by Holger (1997) among Chinese students which showed correspondingly high students environmental knowledge and environmental attitudes.

However, the current study findings are not consistent with study findings by Grodzinska-Jurzak & Friedlein (2001) among Polish students; Fukushima & Urashima (2006) among

Japanese students and the National Environment Agency of Singapore (2006) which showed high environmental knowledge and awareness among the students although their environmental attitudes were mostly low.

Findings from the literature review seem to suggest that there were factors other than knowledge on environmental issues that are likely to affect more strongly students' attitudes. Knowledge which is regarded as a way to overcome psychological barriers such as ignorance and misinformation is viewed as a necessary although generally an insufficient condition for successful action (Frick, Kaiser & Wislon, 2004).

According to the theory of functional attitudes, attitudes develop to serve various purposes of which knowledge is one among many purposes. It seems therefore that knowledge is not the only factor but one of the many other factors influencing environmental attitudes.

## 4.6 Teachers' Attitudes Toward Teaching and Learning of Environmental Education

### 4.6.1 Findings on Teachers' Attitudes Toward Teaching and Learning of Environmental Education

In checking for attitudes, the researcher had a Likert scale of response 1 - 5. A score of 5 meant that respondents strongly agreed with the statement while a mean of 1 implied that the respondent strongly disagreed.

**Table 16: Results of the Teachers Attitude Test Towards Teaching and Learning of Environmental Education**

| Range of scores | Category of attitudes | Frequency | % |
|---|---|---|---|
| 10 – 14 | Negative | 1 | 1.3 |
| 15 | Neutral | 1 | 1.3 |
| 16 – 50 | Positive | 76 | 97.4 |
| **Total** | | **78** | **100** |

Results in table 16 indicate that an overwhelming majority (97.4%) of the teachers had a positive attitude towards teaching and learning of environmental education. Those with a negative attitude were only 1.3% and the neutral ones were 1.3%.

Table 17 shows teachers' mean scores on a Likert scale. The maximum score for each response was 5 and the minimum score was 1.

**Table 17: Teachers' Means Responses of Attitude Items Toward Teaching and Learning of Environmental Education**

| | Mean |
|---|---|
| I like teaching environmental issues because of their relevance to environmental conservation | 4.50 |
| Environmental education topics teach students about the environment | 4.24 |
| I clearly understand the objectives of environmental education | 4.23 |
| I am willing to volunteer my free time to help out in environmental conservation at school | 3.99 |
| Students learn little in environmental education within the given time | 3.42 |
| Its demanding to prepare environmental education lessons | 2.91 |
| Environmental topics are logically organized in the syllabus | 2.88 |
| It's difficult for students to apply what environmental education teaches to daily life. | 2.38 |
| Environmental education is an overload in the school curriculum | 1.92 |
| Environmental education topics are irrelevant | 1.54 |

As illustrated in table 17, it is evident that teachers liked teaching environmental conservation (4.50); they clearly understood the topics and objectives of environmental conservation (4.24), they would volunteer to teach environmental conservation (3.99), felt there was little time for students to learn environmental education lessons (3.42).

### 4.6.2 Relevance of Environmental Education

The researcher sought to know whether teachers regarded environmental education as relevant. The results are shown in table 18.

**Table 18: Teacher Respondents on Relevance of Environmental Education**

| | Frequency | % |
|---|---|---|
| Yes | 76 | 97.4 |
| No | 1 | 1.3 |
| No response | 1 | 1.3 |
| **Total** | **78** | **100.0** |

A shown in the table 18, a high percentage (97.4%) of the respondents, agreed that the teaching of environmental education was relevant in the contemporary world. Only 1.3% of the respondents thought it was irrelevant.

**Table 19: Teacher Respondents on Reasons for Relevance of Environmental Education**

| | Frequency | % |
|---|---|---|
| It influences/affects our day to day life | 23 | 29.5 |
| Gives us skills that helps us conserve our environment | 35 | 44.9 |
| Conservation is our responsibility | 15 | 19.2 |
| No response | 5 | 6.4 |
| **Total** | **78** | **100.0** |

Table 19 shows that a majority (44.9%) of the teacher respondents said that environmental education was relevant because it impacts skills that help conserve their environment while 29.5% said it affected their day to day life, yet another 19.2% said that environmental conservation was their responsibility thus the need to know how to do it.

### 4.6.3 Adequacy of Curriculum in Inculcating Environmental Ethic Among Secondary School Students

**Table 20: Teacher Respondents on Adequacy of School Curriculum**

| | Frequency | % |
|---|---|---|
| Yes | 32 | 41.0 |
| No | 46 | 59.0 |
| **Total** | **78** | **100.0** |

As illustrated in table 20 above, majority (59.0%) of the teacher respondents thought that environmental education topics in the school curriculum were not adequate in inculcating environmental ethic among students against 41.0% who thought they were adequate. This implies that more should be done to inculcate environmental ethic amongst students.

#### 4.6.3.1 Reasons for Perception of Inadequacy in School Curriculum

Those respondents who saw the curriculum as being inadequate gave the reasons below;

**Table 21: Perception of Inadequacy by Teachers**

| Reason for perception of inadequacy | Frequency | % |
|---|---|---|
| Summarized topics-need to be broadened | 33 | 42.3 |
| Few practical classes | 5 | 6.4 |
| Less time allocated | 5 | 6.4 |
| No response | 35 | 44.9 |
| **Total** | **78** | **100.0** |

As shown in table 21, a majority (42.3%) of the teachers respondents suggested that the topics should be broadened, while others (6.4%) mentioned few practical classes and less time allocated for the classes.

Study findings indicate that in the overall, teachers regarded teaching of environmental education highly (64.02%). Ninety seven percent of the teachers acknowledged that teaching of environmental education was relevant because it imparted skills that helped conserve the environment. Some (59%) of them felt that environmental education topics were inadequate and needed to be broadened.

The role of the teacher in students' attitude formation is critical to environmental conservation. Evidence from the literature review indicates that students' attitudes in Kenya to a large extent are influenced by attitudes of parents and teachers (Curtis, 1996). Nkosana (1998) observes that if teachers' attitude towards a subject is negative, students form the same attitude. Teachers can therefore play an important role in educating their students about the environment, which is possible only if the teachers themselves have the necessary level of environmental attitudes and at the same time their attitudes to the subject are positive.

## 4.7 Teaching/Learning Approaches and Students' Attitudes Toward Environmental Conservation

The researcher sought to know which methods were commonly used by teachers to pass knowledge in environmental education and how these influenced students' attitudes toward conservation.

### 4.7.1 Methods Used to Teach Environmental Education

The tables 22 to 28 indicate what methods are used in teaching environmental education.

**Table 22: Teacher Respondents on Assignments**

| | Frequency | % |
|---|---|---|
| Used very often | 11 | 14.1 |
| Often used | 24 | 30.8 |
| Occasionally used | 26 | 33.2 |
| Rarely used | 8 | 10.3 |
| Never used | 8 | 10.3 |
| No response | 1 | 1.3 |
| **Total** | **78** | **100.0** |

In table 22, an accumulative majority (44.9%) of the teachers often use assignments as a method of teaching environmental conservation. This compared to 33.2% who used assignments occasionally, and 10.3% who never or rarely used assignments respectively.

**Table 23: Teacher Respondents on Lecture**

| | Frequency | % |
|---|---|---|
| Used very often | 27 | 34.6 |
| Often used | 22 | 28.2 |
| Occasionally used | 17 | 21.8 |
| Rarely used | 7 | 9.0 |
| Never used | 4 | 5.1 |
| No response | 1 | 1.3 |
| **Total** | **78** | **100.0** |

In table 23, an accumulative majority (62.8%) of the teachers often use lectures as a method of teaching environmental conservation while 21.8% use lecture occasionally. Some (9%) of the teachers rarely used lectures while 5.1% never used lectures.

**Table 24: Teacher Respondents on Resource Persons**

| | Frequency | % |
|---|---|---|
| Used very often | 2 | 2.6 |
| Often used | 5 | 6.4 |
| Occasionally used | 15 | 19.2 |
| Rarely used | 30 | 38.5 |
| Never used | 25 | 32.0 |
| No response | 1 | 1.3 |
| **Total** | **78** | **100.0** |

In table 24, an accumulative majority (70.5%) of the teachers rarely use resource persons as a method of teaching environmental conservation while 19.2% use resource persons occasionally.

**Table 25: Teacher Respondents on Dramatization**

| | Frequency | % |
|---|---|---|
| Used very often | 1 | 1.3 |
| Often used | 2 | 2.6 |
| Occasionally used | 21 | 26.9 |
| Rarely used | 16 | 20.5 |
| Never used | 37 | 47.4 |
| No response | 1 | 1.3 |
| **Total** | **78** | **100.0** |

In table 25, an accumulative majority (67.9%) of the teachers rarely use dramatization as a method of teaching environmental conservation while 26.9% use dramatization occasionally.

**Table 26: Teacher Respondents on Role-play**

| Use of role-play | Frequency | % |
|---|---|---|
| Often used | 8 | 10.3 |
| Occasionally used | 25 | 32.1 |
| Rarely used | 21 | 26.9 |
| Never used | 22 | 28.2 |
| No response | 2 | 2.5 |
| **Total** | **78** | **100.0** |

In table 26, an accumulative majority (55.1%) of the teachers rarely use role-play as a method of teaching environmental conservation while 32.1% use role-play occasionally.

**Table 27: Teacher Respondents on Education trip**

| Use of education trips | Frequency | % |
|---|---|---|
| Used very often | 3 | 3.8 |
| Often used | 9 | 11.5 |
| Occasionally used | 30 | 38.5 |
| Rarely used | 21 | 26.9 |
| Never used | 13 | 16.7 |
| No response | 2 | 2.6 |
| **Total** | **78** | **100.0** |

As shown in table 27, an accumulative majority (43.6%) of the teachers rarely use education trip as a method of teaching environmental conservation while 38.5% use educational trips occasionally.

**Table 28: Teacher Respondents on Use of Life Examples**

| | Frequency | % |
|---|---|---|
| Used very often | 24 | 30.8 |
| Often used | 24 | 30.8 |
| Occasionally used | 17 | 21.8 |
| Rarely used | 11 | 14.0 |
| Never used | 1 | 1.3 |
| No response | 1 | 1.3 |
| **Total** | **78** | **100.0** |

As shown in table 28, an accumulative majority (61.6%) of the teachers often use life examples as a method of teaching environmental conservation while 21.8% use life examples occasionally.

### 4.7.2 Reasons for the Use of the Above Methods

Respondents gave reasons for their use of the above methods as illustrated in table 29 below

**Table 29: Teacher Respondents on Reasons for Using the Above Methods**

| Category label | Frequency | % |
|---|---|---|
| Interesting and practical | 11 | 15.3 |
| Easy to understand and apply | 16 | 22.2 |
| Less time consuming | 24 | 33.3 |
| Less costly resources that are easily available | 21 | 29.2 |
| **Total** | **72** | **100.0** |

As shown in the table 29, majority (33.3%) of the teacher respondents liked the methods listed above because they consumed less time were less costly (29.2%), easy to understand and apply (22.2%) and that they were interesting and practical to the learners (15.3%).

### 4.7.3 Teacher Respondents on Reasons for Not Using the Listed Methods

Teacher respondents who did not use the above methods listed the reasons in table 30.

**Table 30: Teacher Respondents on Reasons for Not Using the Listed Methods**

| Category label | Frequency | % |
|---|---|---|
| Lack of time | 34 | 43.5 |
| Lack of resources/finances | 36 | 46.2 |
| Teacher centered-learner not involved | 8 | 10.3 |
| **Total** | **78** | **100.0** |

A shown in table 30, those teacher respondents who did not use the methods listed above, indicated lack of resources/finance (46.2%), lack of time (43.6%), and that the learners were not involved (10.3%)

### 4.7.4 Methods Often Used by Teachers

**Table 31: Students' Responses**

| | Frequency | % |
|---|---|---|
| Through video | 23 | 2.5 |
| Dramatization | 6 | 0.7 |
| Group discussion | 199 | 21.8 |
| Field Trips | 201 | 22.0 |
| Note taking as the teacher talks | 232 | 25.4 |
| Project work | 121 | 13.2 |
| Assignments | 132 | 14.4 |

As illustrated in table 31, a majority (25.4%) of the students indicated that they took notes as the teacher talked, while 22.0% indicated that teachers used field trips, 21.8% indicated group discussion. Some (14.4%) of the students indicated use of assignments while 2.5% indicated use of video and only 0.7% indicated use of dramatization.

Study findings from tables 22 to 31 indicate that teachers mostly (62.8%) used lectures and assignments (44.9%) to impart knowledge on environmental conservation. Student respondents who mentioned lectures as often used were 25.4%, followed by field trips (22.9%) and dramatization (0.7%).

Teachers gave reasons for using such less practical methods as requiring less time (33.3%) and being less costly (29.2%). These findings are not consistent with those of studies carried out by Bhandari & Osamu (2000) who observed that conventional teaching methods such as lecture methods reduce the quality of environmental education as there are no opportunities for students to be exposed to real life situations. This approach obviously discouraged students from developing a genuine regard for the environment as they remained passive recipients instead of users of the knowledge they had acquired.

The New Horizons for Learning (2006), states that practical action projects engage students and give them hope, feelings of accomplishment, involvement and responsible behaviour, what John Dewey called "the most important attitude that can be formed, the desire to go on learning". Kavagi (2002) further noted that students in Peru had found interactive teaching and learning initiatives entertaining, more interesting and democratic way of learning.

### 4.7.5 Making Environmental Education Practical

Table 32 lists suggestions on how to make environmental education practical.

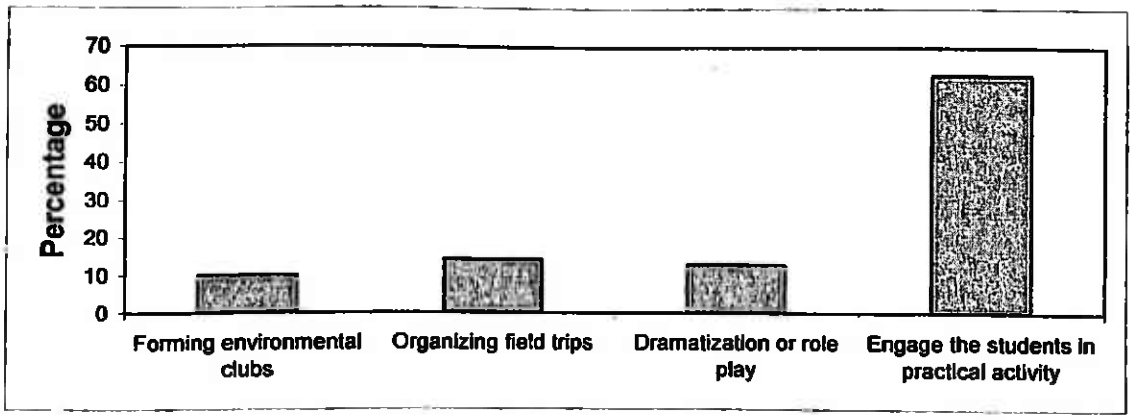
**Table 32: Teacher Respondents on Making Environmental Education Practical**

| Category Label | Frequency | % |
|---|---|---|
| Forming environmental clubs | 7 | 10.0 |
| Organizing field trips | 10 | 14.2 |
| Dramatization or role play | 9 | 12.9 |
| Engage the students in practical activity | 44 | 62.9 |
| **Total responses** | **70** | **100.0** |

As illustrated in table 32 and the corresponding figure 9, it was suggested that engaging the students in practical activities would make environmental education interesting (62.9%). This was followed by organizing field trips at 14.2%. Dramatization or role-play was third with 12.9%. Forming environmental clubs came fourth with 10%.

Teachers seemed to be aware that practical activities made environmental education interesting. Activities provide students with out -of-classroom opportunities to relate their knowledge to practice (Bhandari & Osamu, 2000). If the presentation is too academic the audience would probably not pay attention (Ham, 1992). It can be concluded from this that environmental education as a topic should be practical rather than theoretical and this means allocating more time and resources to it, than is the case now.

**Figure 9: Teacher Respondents on Making Environmental Education Practical**




### 4.7.6 Difficult to Apply Environmental Knowledge

Table 33 shows responses by teachers on the difficulties faced in applying environmental knowledge.

**Table 33: Teacher Respondents on Difficulties Faced**

| | Frequency | % |
|---|---|---|
| Yes | 24 | 30.8 |
| No | 53 | 67.9 |
| No response | 1 | 1.3 |
| **Total** | **78** | **100.0** |

As illustrated in table 33, a majority (67.9%) of the respondents said that it was not difficult to apply the knowledge of environmental education to everyday life while only 30.8% considered it difficult to apply this knowledge. One respondent did not give his/her opinion.

### 4.7.7 Reasons for Difficulties in Application of Environmental Knowledge

Teachers listed the difficulties in table 34 as a reason to inefficient application of environmental knowledge.

**Table 34: Teacher Respondents on Reasons for Difficulties in Application of Environmental Knowledge**

| Category label | Frequency | % |
|---|---|---|
| Some topics are too complicated beyond the scope of students | 3 | 13.0 |
| Lack of resources | 6 | 26.2 |
| Lack of motivation/support/motivation | 10 | 43.5 |
| Lack of time | 3 | 13.0 |
| Need to make study more practical and comprehensive | 1 | 4.3 |
| **Total** | **23** | **100.0** |

As table 34 shows, those teachers who said it was difficult to apply environmental knowledge considered lack of motivation/support to be the main cause (43.5%). Twenty six percent (26%) of them thought it was lack of resources, thirteen percent (13%) saw the complexity of some of the methods as the problem, another thirteen percent (13%) said it was lack of time

that was holding the students back, a further four point three percent (4.3%) saw the need to make the study more practical and comprehensive as the reason why it was difficult to apply environmental knowledge to everyday life. A majority (67.9%) of the teachers however agreed that it was not difficult to apply environmental knowledge to every day life especially if they were supported and encouraged.

## 4.8 Gender and Attitudes Toward Environmental Conservation

### 4.8.1 Findings of Attitude Tests Toward Conservation for Gender Among Secondary School students.

The researcher sought to investigate the influence of students' gender on attitude towards conservation (priority should be given to economic growth over environmental conservation). Simple regression analysis was used to establish the relationship (Table 35).

**Table 35: Gender of Students versus Attitude to Conservation**

**Coefficients (a)**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 3.188 | .220 | | 14.497 | .000 |
| | Gender | -.094 | .150 | -.031 | -.628 | .530 |

a) Dependent Variable: Priority should be given to economic growth over environmental conservation

As shown in table 35, calculated t (14.497) is greater than asymptotic t (-0.628) meaning that there is significant relationship between gender of the students and their attitude towards conservation.

In checking for attitudes, the researcher had a Likert response scale of one (1) to five (5). A score of five (5) meant that the respondent strongly agreed with the statement while a score of

one (1) implied that the respondent strongly disagreed. Results of the attitude test towards conservation for male and female students in public secondary schools are shown in tables 36 and 37.

**Table 36: Male Students' Attitude Towards Conservation**

| Range of scores | Category of attitudes | Frequency | % |
|---|---|---|---|
| 20 – 59 | Negative | 76 | 31 |
| 60 | Neutral | 15 | 6 |
| 61 – 100 | Positive | 153 | 63 |
| **Total** | | **244** | **100** |

The results in table 36 indicate that most (63%) male students in the sample had a positive attitude towards conservation. Those with a negative attitude were only 31% and those with the neutral attitudes were 6%.

**Table 37: Female Students Attitude Towards Conservation**

| Range of scores | Category of attitudes | Frequency | % |
|---|---|---|---|
| 20 – 59 | Negative | 20 | 13 |
| 60 | Neutral | 9 | 6 |
| 61 – 100 | Positive | 127 | 81 |
| **Total** | | **156** | **100** |

The results in table 37 indicate that most (81%) female students in the sample had a positive attitude towards conservation. Those with a negative attitude were only 13% and the neutral ones were 6%.

### 4.8.2 Findings of Attitude Test Towards Environmental Conservation for Gender Among Secondary School Teachers.

The researcher further sought to investigate the influence of teachers' gender on attitude to conservation (I am willing to volunteer my free time to help in environmental conservation at school). Simple regression analysis was used to establish the relationship (Table 38).

**Table 38: Teachers Gender Versus Attitude**

**Coefficients (a)**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 3.726 | .355 | | 10.496 | .000 |
| | gender | .190 | .245 | .090 | .778 | .439 |

a) Dependent Variable: I am willing to volunteer my free time to help out in environmental conservation at school

As shown in table 38, calculated t (10.496) is greater than asymptotic t (0.778) meaning that there is significant relationship between the gender of the teacher and their attitude towards conservation.

In checking for attitudes, the researcher had a Likert response scale of one (1) to five (5). A score of five (5) meant that the respondent strongly agreed with the statement while a score of one (1) implied that the respondent strongly disagreed. Results of the attitude test towards conservation for male teachers in public secondary schools are indicated in table 39 and 40.

**Table 39: Male Teachers Attitude**

| Range of scores | Category of attitudes | Frequency | % |
|---|---|---|---|
| 10 – 14 | Negative | 1 | 2 |
| 15 | Neutral | - | - |
| 16 – 50 | Positive | 47 | 98 |
| **Total** | | **48** | **100** |

The results in table 39 indicate that most (98%) male teachers in the sample had a positive attitude towards conservation. Those with a negative attitude were only 2% and the neutral ones were 0%.

**Table 40: Female Teachers' Attitude**

| Range of scores | Category of attitudes | Frequency | % |
|---|---|---|---|
| 10 – 14 | Negative | - | - |
| 15 | Neutral | 1 | 3 |
| 16 – 50 | Positive | 29 | 97 |
| **Total** | | **30** | **100** |

The results in table 40 indicate that most (97%) female teachers in the sample had a positive attitude towards conservation. Those with a negative attitude were 0% and the neutral ones were 3%. In the overall comparison, both male and female teachers scored almost equally on the positive side of the scale. However male teachers scored more on the negative scale.

In the overall, the present study reveals that gender has influence on attitudes toward environmental conservation. Responses to the statements for both male and female respondents were more toward the agree end of the scale, although female respondents showed better attitude than male respondents. Female respondents leaned more than male respondents toward the agree response.

The results of this study support the inference that there are differences between the scores describing male and female attitudes toward environmental responsibility.

From tables 36 to 37, scores describing girls' attitudes toward environmental responsibility were higher (81%) than those of boys (63%) while the girls' scores describing negative attitudes were lower (13%) than those of the boys (31%). The results support the survey report by Holger (1997) that secondary school students in China had environmentally dichotomous attitudes, girls having more positive attitudes (63%) toward environmental responsibility than boys (49%).

When compared to the survey report by Uitto, Juuti, Lavonen & Meisalo (2004) which examined the environmental attitudes of boys and girls of median age (15 years) from Finnish comprehensive schools, the result was the same. Mixed attitudes may be explained in terms of the theory of functional attitudes which states that attitudes develop to satisfy certain functions. The functions include value expressive, utilitarian, knowledge, defence, self esteem and social identify. Since these functions are varied, environmental attitudes that are formed to serve them are also bound to be different.

Gender differences toward environmental attitudes could also be explained in terms of cultural and societal roles. Mothers, prioritize the welfare and health of the family which are closely associated with local environmental quality such as water, air and solid waste. Fathers on the other hand put greater importance on economic and material well being of the family (George & Southwell, 1986, quoted in Dietz, Stern & Guagnano, 1968). As a result, fathers seem to take advantage of the environment more than mothers. It is therefore believed that women are more concerned about the environment than men. Women are potentially more environmentalist than men due to biospheric orientation (Diamond & Orenstein, 1990; Griffin, 1978; Merchant, 1979 quoted in Stern, Dietz & Kalof, 1993). Female students and

teachers therefore take after mothers while male students and teachers follow the example of fathers.

### 4.9 Environmental Activities Carried out by Secondary School Students

The researcher sought to find out environmental activities that students engage in while at school, home and within the surrounding community. The results are shown in tables 41 to 45

**Table 41: Observation on Removing Cobwebs, Clearing Soot, Dust and Garbage**

| Category label | Frequency | % |
|---|---|---|
| School | 169 | 42.25 |
| Community | 49 | 12.25 |
| Home | 357 | 89.25 |

As table 41 and figure 10 that follows show, 89.25% of the students helped in removing cobwebs, clearing soot, dust and garbage at home. This compared to 42.25% who helped in removing cobwebs, clearing soot, dust and garbage while at school and 12.25% at the community level.

**Figure 10: Observation on Controlling Visible Pollution**

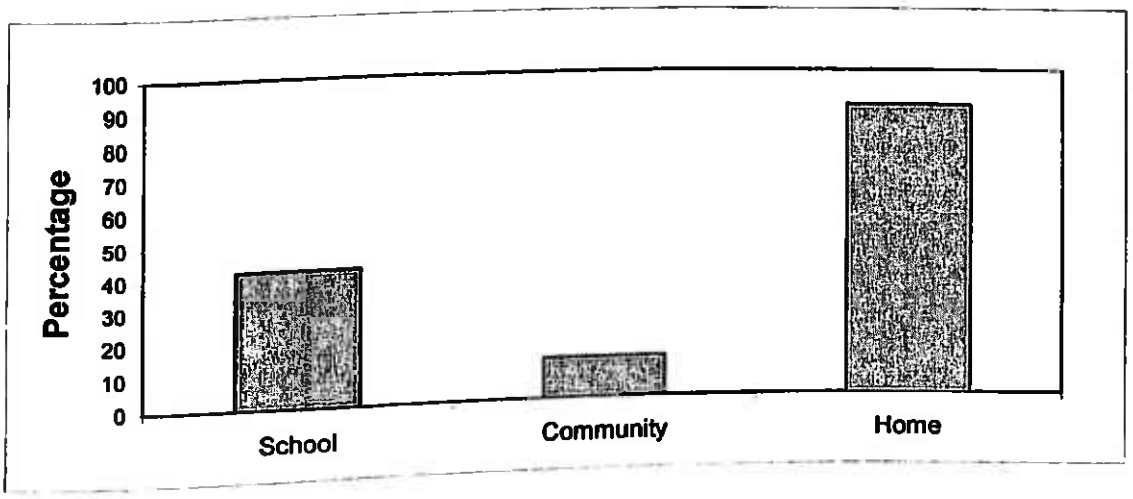


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**Figure 10: Observation on Controlling Visible Pollution**

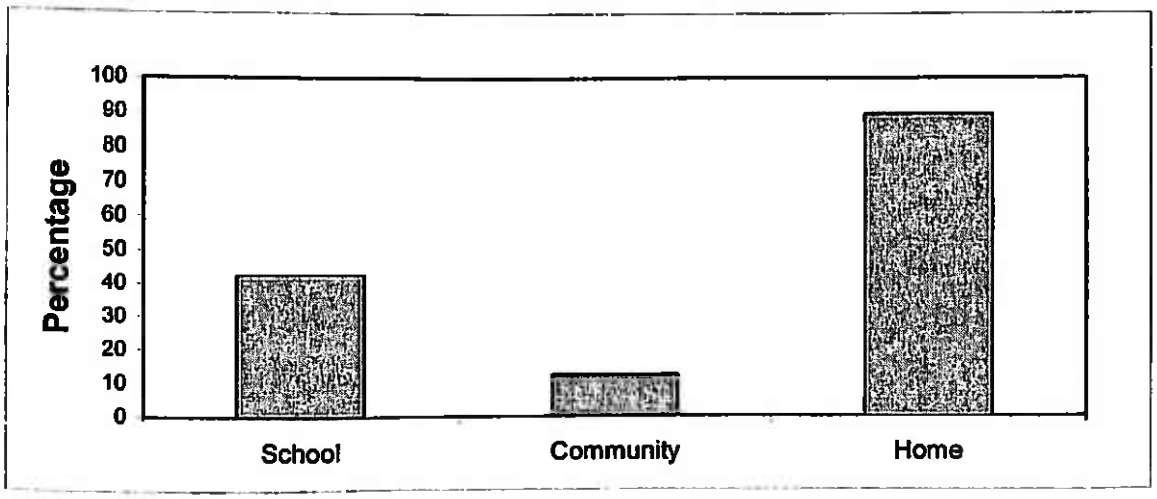


**Table 42: Observation on Taking Environmental Safety Measures**

| Category label | Frequency | % |
|---|---|---|
| School | 317 | 79.25 |
| Community | 70 | 17.5 |
| Home | 253 | 63.25 |

As table 42 and the corresponding figure 11 show 79.25% of the students helped in taking safety measures at school. This compared to 63.25% who helped in taking safety measures at home and 17.5% at the community level.

**Figure 11: Observation on Taking Environmental Safety Measures**

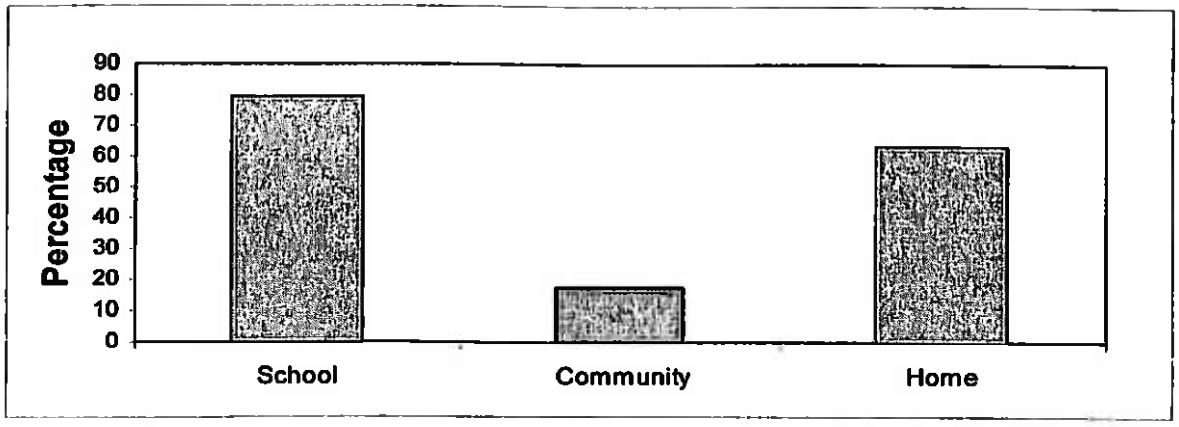



**Table 43: Observation on Promotion of Environmental Beauty**

| Category label | Frequency | % |
|---|---|---|
| School | 296 | 74.00 |
| Community | 71 | 17.75 |
| Home | 260 | 65.00 |

As table 43 shows, 74 % of the students helped in promoting environmental beauty while at school. This compared to 65% who helped in promoting environmental beauty at home and 17.5% at the community level.

**Table 44: Observation on Conservation of Resources: Conserving Electricity, Water, Soils, Planting and Caring for Trees.**

| Category label | Frequency | % |
|---|---|---|
| School | 199 | 49.75 |
| Community | 215 | 53.75 |
| Home | 252 | 63 |

As table 44 and the accompanying figure 12 show 63% of the students helped in conservation of resources at home. This compared to 53.75% who helped in conservation of resources at the community level and 49.75% at the school level.

**Figure 12: Observation on Conservation of Resources**

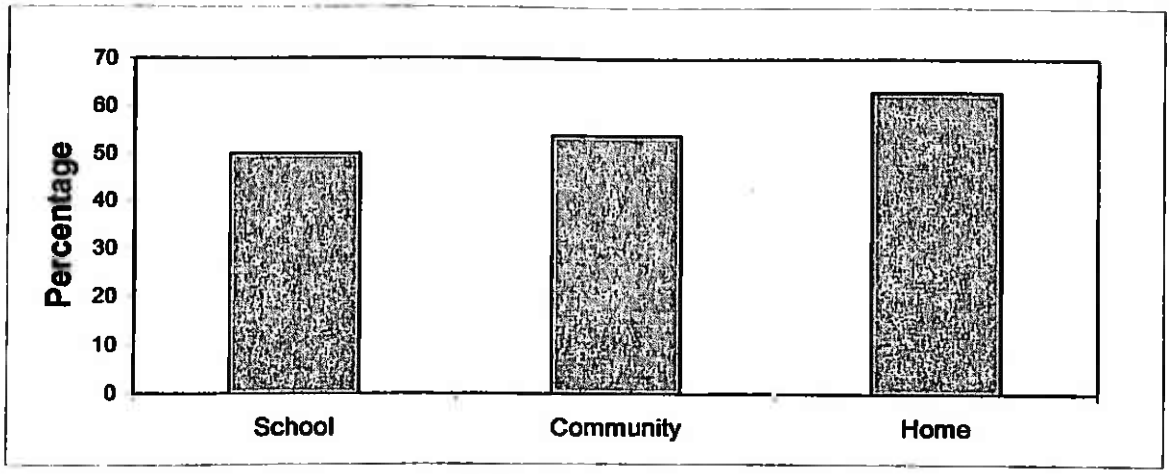



**Table 45: Students Approval of Common Environmental Activities**

| | Frequency | % |
|---|---|---|
| Yes | 368 | 92.0 |
| No | 5 | 1.2 |
| No response | 27 | 6.8 |
| **Total** | **400** | **100.0** |

Table 45 shows that 92% of the students sample approved of the environmental activities they engage in. This compared to 1.3% who did not approve and 6.8% who did not respond to the question.

The present study findings reveal that in the overall comparison, percentage distribution of students' involvement in environmental activities in the Central division of Machakos district was variable. More (70.12%) students were engaged in environmental activities while at home followed by school (61.3%) and then within the community (25.3%) surrounding the school. The findings are consistent with the study report by Toili (2007) in Bungoma district that secondary school students were engaged in environmental activities mostly (42.5%) while they were at school and home (16.9%), than within the community (5.3%) surrounding the school.

The findings further revealed that secondary school students concentrated more (89.25%) on removing visible pollution while at home; taking safety measures (79.3%) while at school; promoting environmental beauty (74%) while at school and conservation of resources (63%) while at home. Again there was lack of interest towards environmental action within the community (12.25%). This is for apparent reasons that students associate more closely with their homes and their schools than with the wider communities surrounding the schools.

In addition, emphasis by families and school authorities on keeping their homes and school surroundings tidy and therefore hygienic compelled the students to concentrate on their activities while at home and at school more than within the communities surrounding the schools. Removal of visible pollution was the most popular activity due to the fact that it presented itself more lucidly than the other forms of pollution hence easier to detect and deal with.

### 4.10 Evidence for Conservation of the Environment in Secondary Schools

To corroborate the information that the students gave about their involvement in environmental activities at school, the researcher carried out an observation in each sampled school. Findings showed that there was no evidence of tree planting in 90.5% of the schools.

Only 9.5% had evidence of tree planting. Evidence was also sought on conservation of soils and water within the school compound. Tables 46 to 47 and figures 13 to14 illustrate the findings.

**Table 46: Observation on Evidence of Conservation of Soils**

| | Frequency | % |
|---|---|---|
| Available | 15 | 71.4 |
| Unavailable | 3 | 14.3 |
| No response | 3 | 14.3 |
| **Total** | **21** | **100.0** |

As illustrated in table 46 and figure 13 that follows, majority (71.4%) of the schools had some activities for conservation of the soil while 14.3% had no evidence of soil conservation.

**Figure 13: Observation on Evidence of Soil Conservation**

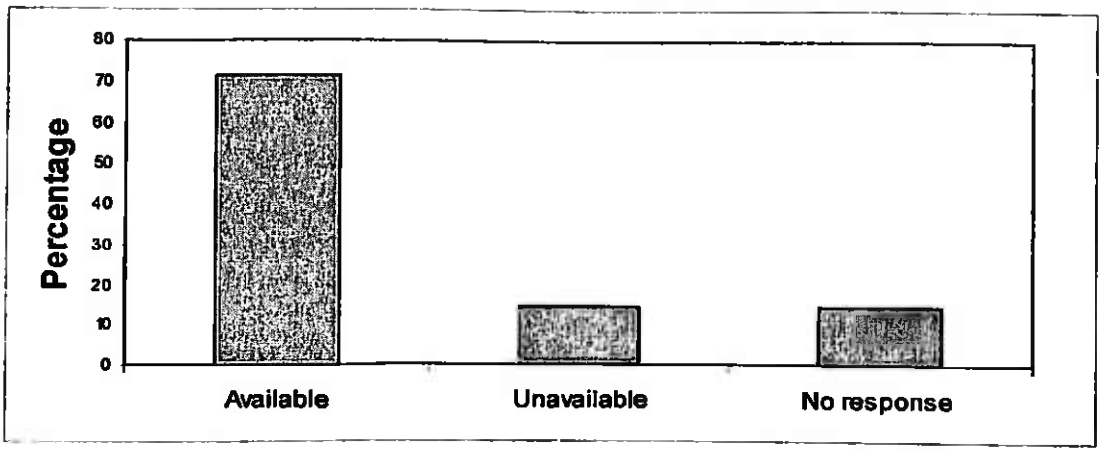
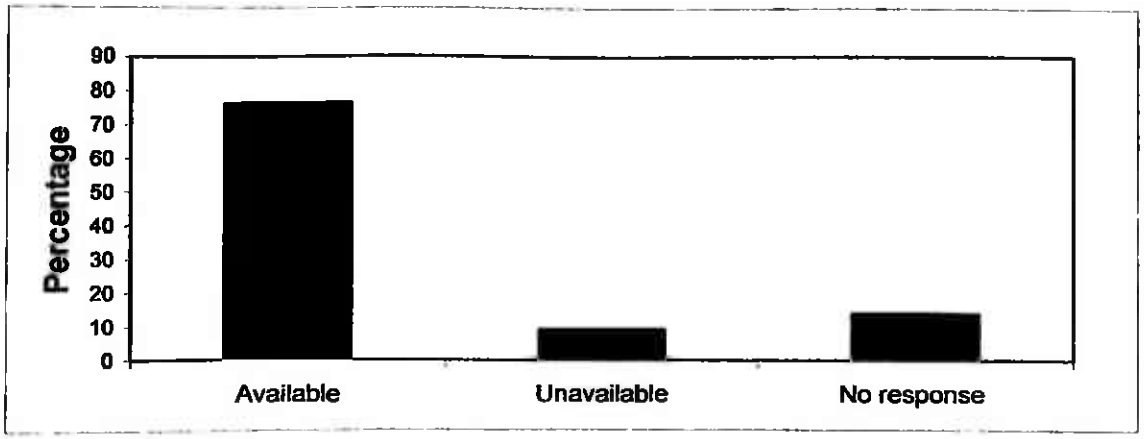


**Table 47: Observation on Evidence of Conservation of Water**

| | Frequency | % |
|---|---|---|
| Available | 16 | 76.2 |
| Unavailable | 2 | 9.5 |
| No response | 3 | 14.3 |
| **Total** | **21** | **100.0** |

Table 47 and the accompanying figure 14, show that most (76.2%) of the schools showed efforts in conservation of water, this compared to 9.5% who showed no indication of water conservation. Only 14.3% of the respondents did not answer this question.

**Figure 14: Observation on Evidence of Water Conservation**




However most (95.2%) of the schools had no evidence of electricity conservation while 4.8% had evidence of conservation efforts. In addition results showed that most (81%) of the schools did not prune their hedges as frequently as possible, while 19% did prune the hedges timely. Findings also indicated that most (71.4%) of the schools had no evidence of tendering their flowerbeds; this contrasts with 23.8% who cared for their flowerbeds. No response was received from 4.8% of the schools. It was also found that most (71.4%) of the schools had no evidence of tendering their lawns; this contrasts with 23.8% who cared for their school lawns. There was no response in 4.8% of the schools. In addition most (76.2%) of the schools had

no evidence of planting flowers while 19.0% showed signs of planting flowers in the schools. There was no response in 4.8% of the schools.

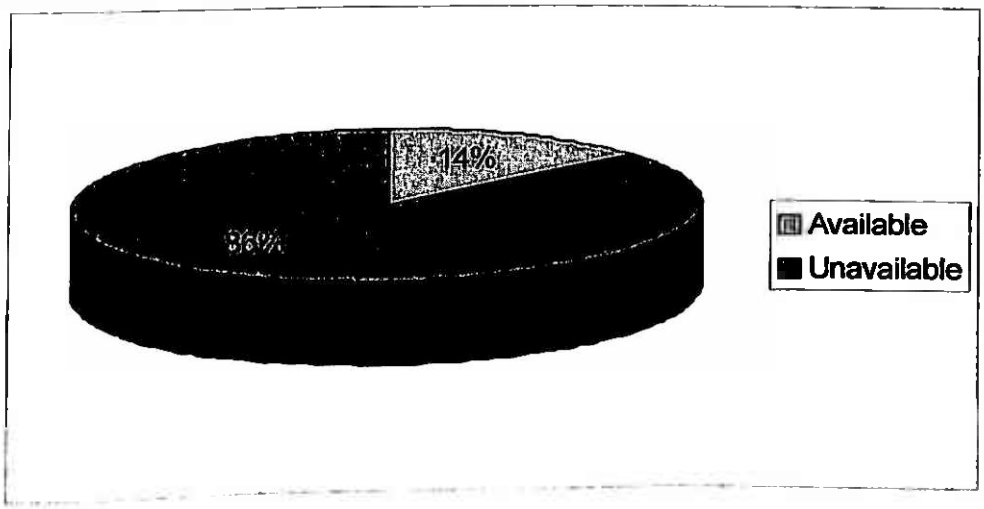
However most (71.5%) of the schools had evidence of cleaned toilets, compared to 19% who had no evidence. No response was received from 9.5% of the schools. Most (61.9%) of the schools also cleaned their classrooms, compared to 33.3% who showed no evidence of cleaned classrooms. There was no response from 4.8% of the schools. Evidence was also sought on slashing of grass within the school compound. Results are illustrated in table 48 and figure 15.

**Table 48: Observation on Evidence of Slashing Grass**

| | Frequency | % |
|---|---|---|
| Available | 3 | 14.3 |
| Unavailable | 18 | 85.7 |
| **Total** | **21** | **100.0** |

As illustrated in table 48 and the accompanying figure 15, most (85.7%) of the schools had no evidence of slashing grass compared to 14.3% who had evidence of slashing grass in the compound.

**Figure 15: Observation on Evidence of Slashing Grass**



Results also indicated that most (71.5%) of the schools repaired their leaking roofs; compared to 19% who did not attempt to repair leakages. Only 9.5% of the schools did not respond to this question. Most (76.2%) of the schools also cleaned cobwebs and soot from roofs while 19% showed no evidence of such practice. One (1) of the schools representing 4.8% did not respond to this question. Table 49 and figure 16 illustrate findings on garbage disposal.

**Table 49: Observation on Evidence of Disposing Garbage**

| | Frequency | % |
|---|---|---|
| Available | 1 | 4.8 |
| Unavailable | 20 | 95.2 |
| **Total** | **21** | **100.0** |

Table 49 and the corresponding figure 16 show that most (95.2%) of the schools had no evidence of garbage disposal, this contrasts to only 4.8% who showed signs of waste disposal.

**Figure 16: Observation on Garbage Disposal**

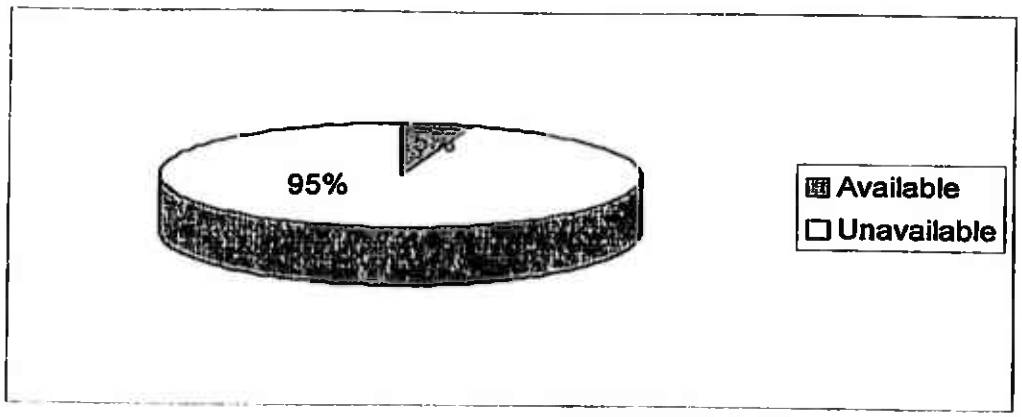


Table 50 illustrates findings on removal of drawings or writings from walls.

**Table 50: Observation on Evidence of Removal of Drawings or Writings on Walls**

| | Frequency | % |
|---|---|---|
| Available | 19 | 90.5 |
| Unavailable | 2 | 9.5 |
| **Total** | **21** | **100.0** |

As shown in table 50, most (90.5%) of the schools removed graffiti from the school walls, compared to a small percentage (9.5%) that did not remove the writings on the walls.

Overall study findings indicate that out of the 15 activities observed, available evidence reveals that most schools concentrated on only 7 activities representing 46.7%. The activities included removing graffiti (90%); removing visible pollution (76.2%); conserving water (76.2%); cleaning toilets (71.4%); repairing leaking roofs (71.4%); conserving soils (71.4%) and cleaning classrooms (61.9%).

The schools performed dismally in 8 out of the 15 activities observed, representing 53.34%. The activities included disposal of garbage (4.8%); planting trees (9.5%); slashing grass (14.3%); planting of flowers (19.0%); pruning hedges (19.0%); caring of flower beds (23.8%); and tending school lawns (23.8%).

The rather low level of school performance in environmental activities revealed in this study should be a matter of concern to environmental educators and the Ministry of Education of Kenya. This can be interpreted to mean that students were infrequently engaged in activities to assist in protecting and improving environmental quality especially while at school.

### 4.11 Challenges Faced in Environmental Conservation

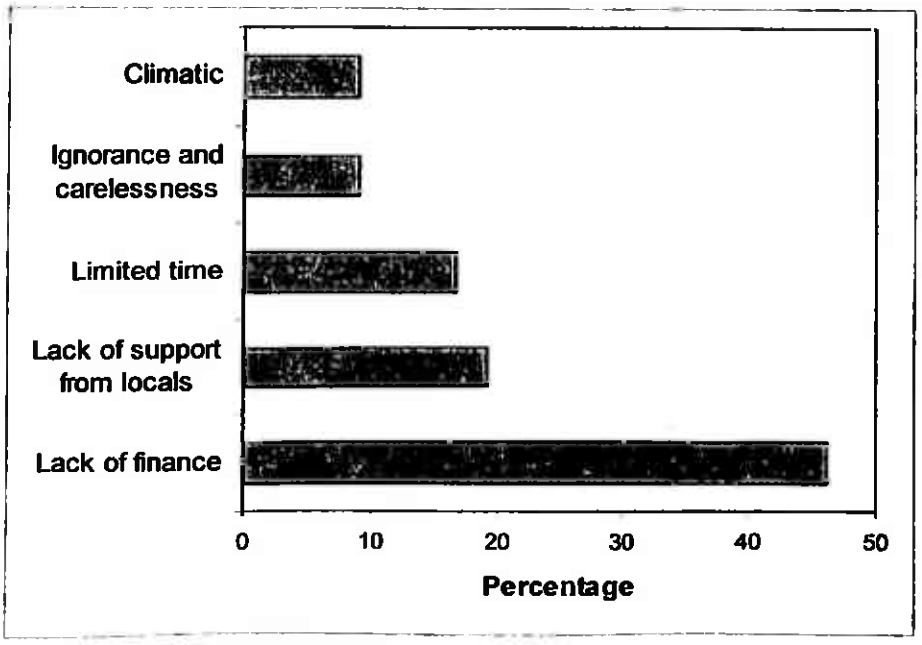
The researcher sought to establish the challenges that teachers and students encounter in their effort to protect and improve their local environment. Teachers listed the challenges in table 51 as obstacles in their quest to promote conservation.

**Table 51: Teachers' Responses**

| Category label | F | % |
|---|---|---|
| Lack of finance | 36 | 46.2 |
| Lack of support from locals | 15 | 19.2 |
| Limited time | 13 | 16.6 |
| Ignorance and carelessness | 7 | 9.0 |
| Climatic | 7 | 9.0 |
| **Total** | **78** | **100.0** |

As illustrated in table 51 and the corresponding figure 17, lack of finances seemed to be the main obstacle in environmental conservation (46.2%), lack of support from locals came second with 19.2%, this was followed by limited time at 16.6%, and ignorance/carelessness & climatic conditions at 9.0% respectively.

**Figure 17: Obstacles Encountered by Teachers**



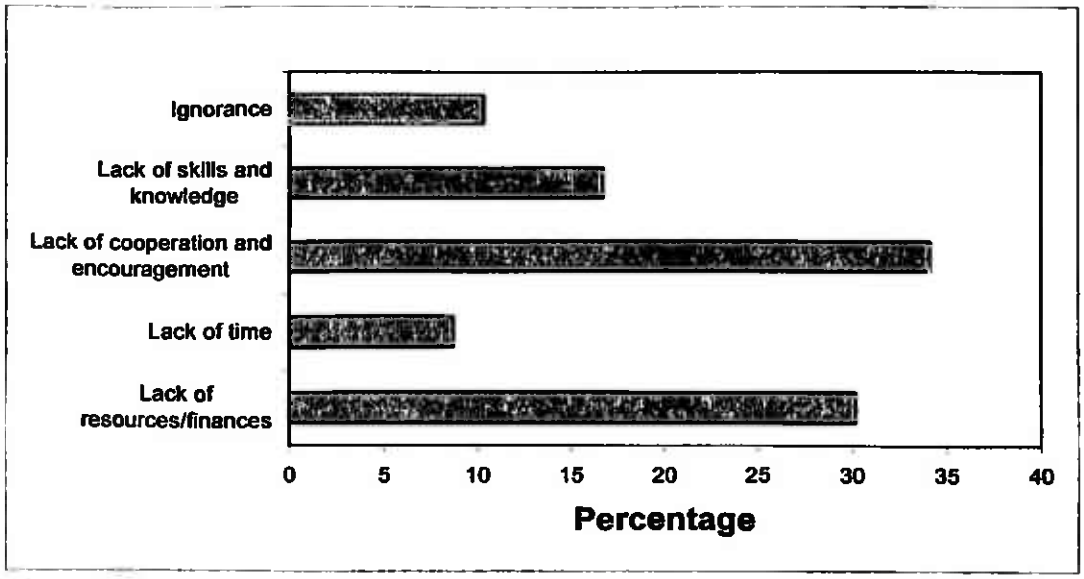
Students listed challenges encountered in environmental conservation as illustrated in table 52

**Table 52: Students' Responses to Obstacles**

| Category label | Frequency | % |
|---|---|---|
| Lack of resources/finances | 170 | 30.2 |
| Lack of time | 49 | 8.7 |
| Lack of cooperation and encouragement | 192 | 34.1 |
| Lack of skills and knowledge | 94 | 16.7 |
| Ignorance | 58 | 10.3 |

Table 52 and the corresponding figure 18 indicate that a majority (34.1%) of the students lacked cooperation and encouragement in their endeavor to conserve the environment, while 30.2% indicated lack of resources. Some (16.7%) of the students lacked skills and knowledge), were ignorant (10.3%), lacked time (8.7%).

**Figure 18: Obstacles Encountered by Students**




Study findings indicate that in the overall comparison, secondary school teachers and students in the Central division of Machakos district lacked cooperation and encouragement,

lacked resources especially finances, lacked environmental skills and had limited time to enable them participate fully in environmental conservation.

Environment is given low priority because of increasing levels of poverty, competing interest with social and economic issues, poor governance and ignorance (NEMA, 2003). These findings are consistent with the observation by Bhandari and Osamu (2000) that with the exception of a few countries, no country has formulated a national policy on environmental education with a result that environmental education receives no priority action, no resources, no budget and no support and thus marginalized from the national mainstream. This has local ramifications at school levels where teachers and students lack financial support to initiate feasible conservation projects. As a result, this may lower teachers' and students' morale hence their attitudes toward environmental conservation.

# CHAPTER FIVE

## SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

### 5.0 Introduction

In this chapter, the summary, conclusions and recommendations of the study coupled with openings for future research are presented.

### 5.1 Summary of Research Findings

The study aimed at finding out students' environmental knowledge and attitudes toward environmental conservation. The study established that the teachers and students had the requisite knowledge on environment and the conservation measures to undertake in order to conserve the environment. Most of the students were aware of the role they were expected to play in environmental conservation.

Findings further indicated that environmental knowledge is important in determining environmental attitudes albeit insufficient factor. The study established that most students and teachers regarded environment conservation highly. Students' attitudes toward environmental conservation were mostly positive.

Findings of the study also revealed that teachers showed positive attitudes toward teaching of environmental education. However most (51.3%) of the teachers were inexperienced as they had taught for a period under 5 years.

Although teachers seemed to be aware that practical activities made environmental education interesting (62.9%), most (62.8%) of them used lectures and assignments (44.9%) to impart environmental knowledge. They gave reasons for using these methods as saving time and cost. Such less practical methods of instruction are likely to discourage students from developing honest interest for the environment.

Study findings further indicated that there was a relationship between gender and environmental attitudes. Female students and teachers seemed more environmentally inclined than their male counterparts due to the fact that female respondents had a better environmental orientation arising from their roles in the family and in the environment hence more naturocentric than their male counterparts who were mostly anthropocentric.

The study also established that most students lacked cooperation and encouragement in their endeavor to conserve and raise awareness on conservation of resources. Some students lacked environmental skills and knowledge. It is not surprising therefore that most students concentrated more on removing visual pollution mostly at their homes and schools but seldom volunteered into the surrounding communities to assist in promoting the quality of environment.

Lack of finances seemed to be the main obstacle in environmental conservation according to teachers in this study. This was followed by limited time and lack of support from local community in getting involved in conservation.

The results also revealed that only 46.7% of the schools were meaningfully engaged in protecting and improving the quality of the environment within their compounds. In the overall comparison, there was poor commitment by majority (53.3%) of the schools in carrying out environmental activities within their precincts.

## 5.2 Conclusions

From this study it can be concluded that students from Central division of Machakos district were aware of the importance of environmental conservation and were eager to play their role as campaigners, change agents and advocates for environmental conservation. The students were however limited in this noble endeavor by lack of cooperation, support in finance,

management of projects and limited knowledge on what steps to take. As a result most students concentrated on the removal of visual pollution while at home and at school at the expense of the surrounding communities.

The teachers on the other hand had inadequate time to devote to conservation, though as can be explained they had done a good job in passing the knowledge on conservation to students. This notwithstanding, teachers employed common place and therefore inappropriate theoretical methods such as lectures and assignments instead of problem solving approaches to impart environmental knowledge. As a result, critical thinking and creativity did not seem to have developed fully among the students.

From this study, it can also be concluded that pure environmental knowledge is important in determining environmental attitudes although knowledge by itself is an insufficient factor. From the study it can also be concluded that students and teachers' environmental attitudes were mostly positive although majority of schools preformed dismally in environmental conservation within their precincts. This showed that attitudes by themselves did not seem to play a significant role in environmental action. Action requires both attitude and opportunity in terms of adequacy of time, skills, encouragement, availability of resources and freedom of choice as to which environmental action to take, since this is determined by variable functions that different attitudes seem to serve.

It can also be concluded from the study that there is a relationship between gender and environmental attitudes. Both sexes showed positive environmental attitudes although female respondents were more inclined than their male counterparts.

## 5.3 Recommendations

The following recommendations can be made regarding the study on environmental conservation in Central division of Machakos district:

1. The government should introduce and enrich environmental education programmes in both in service and pre-service teacher education programmes to enhance teachers' environmental knowledge.
2. Teacher training manuals on pedagogies to environmental education should be developed to enhance teaching methodologies of environmental education.
3. Schools should be encouraged to incorporate action learning programmes as part and parcel of the learning process to solve real environmental problems.
4. The syllabus on environmental conservation should be broadened to include all the aspects of conservation that will come in handy in day-today life of students
5. The government should harmonize environmental education topics in the curriculum as they are now incoherently scattered across various subjects hence gaps in the frequency with which different subjects address such topics.
6. Teachers and students should be empowered to contribute to curriculum development in conservation education so that they may localize the curriculum in line with their local needs and attitudes.
7. Teachers and students should be encouraged to engage in positive actions through clubs to protect and improve the quality of environment not only within their homes and schools but also within the wider communities.
8. Students should be used as change agents in the community to spread the information on the need for conservation of natural resources

9. Protection and improvement of environmental quality should be mainstreamed in the performance contract system currently being implemented in government institutions especially secondary schools to enhance environmental conservation.
10. The schools should be allocated resources especially funds for campaigns and awareness creation on environmental conservation.
11. Environmental conservation initiatives should be gender sensitive where the roles of women and men are duely recognized in all environmental conservation and management activities.
12. students and teachers should have the freedom of choice as to which environmental activity to engage in considering that attitudes serve different purposes and each of the actors would want to maximize benefits and at the same time minimize loses.

## 5.4 Recommendations for Further Research

The study established that environmental knowledge is important in determining environmental attitudes although an insufficient factor. It was also established that secondary school teachers' and students' attitudes toward environmental conservation were high yet their schools performed dismally in their conservational endeavours.

Areas for further research should include:

1. An investigation into factors other than environmental knowledge that are likely to influence more strongly students' and teachers' environmental attitudes.
2. An investigation into reasons for students' and teachers' positive environmental attitudes yet their schools perform poorly on environmental conservation.

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## APPENDIX A:

### COVER LETTER

Timothy Mandila,
University of Nairobi,
Department of Educational
Administration and Planning,
P.O. Box 30197,
NAIROBI

Dear respondent,

I am a postgraduate student in the University of Nairobi pursuing a Masters of Education Degree Course. I am currently carrying out a research on the attitudes of students towards conservation in public secondary schools in Central division of Machakos district.

The purpose of this study is to investigate the influence of environmental knowledge on students' attitudes toward conservation in public secondary schools. The study aims at contributing to the empowerment of teachers' and students' role in conservation education through enhancement of their positive attitude formation and environment ethic.

I am therefore kindly requesting you to respond to the questionnaires as honestly as possible. The information you give will be held in strict confidence. The questionnaire is anonymous and therefore it does not require you to identify yourself. Please complete all the items in the questionnaire.

I promise to share with you the findings of the study if you so wish. Thank you in advance for your co-operation.

Yours sincerely,

Timothy Mandila

## APPENDIX B:

### STUDENTS' ATTITUDE QUESTIONNAIRE (SAQ)

You are kindly requested to answer the questions below as sincerely as possible. Please respond by filling in the spaces provided, ticking or circling your choice of response where required. There is no correct or wrong answer. You are free to give any additional information where necessary. The information you give will be treated confidentially. Do not write your name anywhere on this questionnaire.

**PART I: General Information.**

1. What is the name of your school? .....

2. What type is your school?

1. Mixed ☐
2. Boys ☐
3. Girls ☐

3. What is your gender?

1.Male ☐

2.Female ☐

**Part II: Students' Knowledge of Environmental Education and Their Feelings Toward Conservation.**

4. In the table that follows, respond by circling the appropriate number against each statement that most represents your feeling to it, using the following key:

| | | Points |
|---|---|---|
| Strongly Agree | SA | 5 |
| Agree | A | 4 |
| Undecided | U | 3 |
| Disagree | D | 2 |
| Strongly Disagree | SD | 1 |

| | | SA | A | U | D | SD |
|---|---|---|---|---|---|---|
| 1. | I am interested in environmental issues | 5 | 4 | 3 | 2 | 1 |
| 2. | Environmental problems affect me too | 5 | 4 | 3 | 2 | 1 |
| 3. | I want to be actively involved in environmental conservation | 5 | 4 | 3 | 2 | 1 |
| 4. | I am willing to volunteer my free time to help out in environmental conservation at school. | 5 | 4 | 3 | 2 | 1 |
| 5. | It is my responsibility to campaign for the improvement of my local environment. | 5 | 4 | 3 | 2 | 1 |
| 6. | I am willing to pay more for recycled products to help save natural resources. | 5 | 4 | 3 | 2 | 1 |
| 7. | It is my responsibility to report bad environmental habits at school | 5 | 4 | 3 | 2 | 1 |
| 8. | Each of us can make a significant contribution to environmental conservation | 5 | 4 | 3 | 2 | 1 |
| 9. | Lifestyle that generates much garbage should be changed | 5 | 4 | 3 | 2 | 1 |
| 10. | Polluting companies should be closed down for environmental reasons | 5 | 4 | 3 | 2 | 1 |
| 11. | It is God's will that man exploits nature for his survival | 5 | 4 | 3 | 2 | 1 |
| 12. | People have a right to take whatever they want from the environment. | 5 | 4 | 3 | 2 | 1 |
| 13. | The benefits of science are greater than the harmful effects it could have on the environment. | 5 | 4 | 3 | 2 | 1 |
| 14. | Priority should be given to economic growth over environmental conservation | 5 | 4 | 3 | 2 | 1 |
| 15. | It is the responsibility of the rich countries to solve environmental problems of the world. | 5 | 4 | 3 | 2 | 1 |
| 16. | Environmental problems should be left to the experts | 5 | 4 | 3 | 2 | 1 |
| 17. | Threats to the environment are not my business | 5 | 4 | 3 | 2 | 1 |
| 18. | Environmental problems are exaggerated | 5 | 4 | 3 | 2 | 1 |
| 19. | Animals should not have the same right to life as people | 5 | 4 | 3 | 2 | 1 |
| 20. | There are more important things to do than deal with environmental issues | 5 | 4 | 3 | 2 | 1 |

5. In your opinion, is environmental conservation important in the world today?

1. Yes ☐ 2. No ☐

Please explain your answer _____

_____

_____

6. Do you think environmental knowledge can help improve environmental conservation?

1. Yes ☐ 2. No. ☐

Please explain your answer _____

_____

_____

7. Which of the following methods does your teacher often use in teaching topics in environmental education?

1. Teaching through video ☐
2. Dramatization ☐
3. Group discussion ☐
4. Field trips ☐
5. Note taking as the teacher talks ☐
6. Project work ☐
7. Assignment ☐

8. What is the meaning of the word environment?

_____

_____

_____

_____

5. In your opinion, is environmental conservation important in the world today?

1. Yes ☐ 2. No ☐

Please explain your answer _____

_____

_____

6. Do you think environmental knowledge can help improve environmental conservation?

1. Yes ☐ 2. No. ☐

Please explain your answer _____

_____

_____

7. Which of the following methods does your teacher often use in teaching topics in environmental education?

1. Teaching through video ☐
2. Dramatization ☐
3. Group discussion ☐
4. Field trips ☐
5. Note taking as the teacher talks ☐
6. Project work ☐
7. Assignment ☐

8. What is the meaning of the word environment?

_____

_____

_____

_____

9. What is a non-renewable resource?

_____

_____

_____

10. Have you heard about global warming?

1. Yes ☐ 2. No. ☐

If yes, what is it?

_____

_____

_____

11. Which one of the following dates coincides with the World Environment day?

1) April 3 ☐ 2) June 5 ☐ 3) August 10 ☐ 4) October 12 ☐

12. What are some of the environmental problems in your school today?

_____

_____

_____

13. The following are common environmental activities in secondary schools, within communities and at homes. In the blank spaces provided, tick against the common ones that you participated in, in your school, your community and your home.

| Environmental Activity | Type of Environment | | |
|---|---|---|---|
| | School | Community | Home |
| 1. Controlling visible pollution: Removing cobwebs, clearing soot, dust and garbage. | | | |
| 2. Taking environmental safety measures: Cleaning rooms, toilets, compound, and slashing grass. | | | |
| 3. Promoting environmental beauty: Maintaining flower beds, trimming hedges. | | | |
| 4. Conservation of resources: conserving electricity, water, soils, planting and caring for trees. | | | |

14. In your opinion, do you approve the above activities?

1.Yes ☐ 2. No ☐

15. List down some of the challenges you encounter in your effort to conserve your local environment.

_____

_____

_____

Thank you for your co-orporation.

## APPENDIX C:

### TEACHERS' ATTITUDE QUESTIONNAIRE (TAQ)

You are kindly requested to answer the questions below as sincerely as possible. Please respond by filling in the spaces provided, ticking or circling your choice of response where required. There is no correct or wrong answer. You are free to give any additional information where necessary. The information you give will be treated confidentially. Do not write your name anywhere on this questionnaire.

**Part I. General Information.**

Please Tick in the appropriate box.

1. What type is your school?

1. Mixed ☐ 2. Boys ☐ 3. Girls ☐

2. What is your gender?

1. Male ☐ 2.Female ☐

3. Which of the following subjects do you teach in this school?

1) Chemistry ☐ 2) Biology ☐ 3) Geography ☐ 4) Agriculture ☐

4. How long have you been teaching?

1) 0 – 2 years ☐ 2) 3 – 5 years ☐ 3) 5 – 10 years ☐ 4) 10years and over ☐

**Part II: Teachers' Feelings Toward Teaching and Learning of Environmental Education**

5. In the table that follows, respond by circling the appropriate number against each statement that most represents your feeling to it, using the following key:

| | | Points |
|---|---|---|
| Strongly Agree | SA | 5 |
| Agree | A | 4 |
| Undecided | U | 3 |
| Disagree | D | 2 |
| Strongly Disagree | SD | 1 |

| | | SA | A | U | D | SD |
|---|---|---|---|---|---|---|
| 1. | I clearly understand the objectives of environmental education | 5 | 4 | 3 | 2 | 1 |
| 2. | I like teaching environmental issues because of their relevance to environmental conservation. | 5 | 4 | 3 | 2 | 1 |
| 3. | Environmental education topics teach students about the environment | 5 | 4 | 3 | 2 | 1 |
| 4. | Environmental topics are logically organized in the syllabus | 5 | 4 | 3 | 2 | 1 |
| 5. | I am willing to volunteer my free time to help out in environmental conservation at school | 5 | 4 | 3 | 2 | 1 |
| 6. | Environmental education is an overload in the school curriculum. | 5 | 4 | 3 | 2 | 1 |
| 7. | It is demanding to prepare environmental education lessons | 5 | 4 | 3 | 2 | 1 |
| 8. | Students learn little in environmental education within the given time | 5 | 4 | 3 | 2 | 1 |
| 9. | It is difficult for students to apply what environmental education teaches to daily life. | 5 | 4 | 3 | 2 | 1 |
| 10. | Environmental education topics are irrelevant | 5 | 4 | 3 | 2 | 1 |

6. In your opinion, are the environmental education topics in the school curriculum adequate in inculcating environmental ethic among students?

1. Yes ☐ 2. No ☐

If No, briefly explain

_____

_____

_____

7. Show how frequently you use the following methods to teach environmental education, by putting a tick against each option.

| Method | Used Very Often | Often used | Occasionally used | Rarely used | Never used |
|---|---|---|---|---|---|
| 1. Assignment | | | | | |
| 2. Lecture | | | | | |
| 3. Resource persons | | | | | |
| 4. Dramatization | | | | | |
| 5. Role – Play | | | | | |
| 6. Educational trip | | | | | |
| 7. Use of life examples | | | | | |

1. For the methods used often, why do you use them frequently?

_____

_____

_____

_____

2. For those rarely or never used, why is this so?

8. Is it difficult for students to apply what is taught in environmental education to everyday life?

1. Yes ☐ 2. No ☐

If Yes, why?

9. What obstacles do you encounter in your effort to promote environmental conservation in the school?

10. How can a teacher make environmental education easier to practice in every day life?

11. Is teaching of environmental education relevant in the world today?

1. Yes ☐ 2. No ☐

Please explain

_____

_____

_____

Thank you for your co-operation

## APPENDIX D:
## OBSERVATION SCHEDULE

1. **Date:** _____
2. **Name of school:** _____
3. **Type of school:**

   1. Mixed ☐ 2. Boys ☐ 3. Girls ☐

| Environmental Activities | Evidence | | |
|---|---|---|---|
| | Unavailable | Available | Condition |
| **Conservation of Resources** | | | |
| ▪ Planting trees | | | |
| ▪ Conservation of soils | | | |
| ▪ Conservation of water | | | |
| ▪ Conservation of electricity | | | |
| **Promotion of Environment Aesthetic** | | | |
| ▪ Planting flowers | | | |
| ▪ Pruning hedges | | | |
| ▪ Caring for flower beds | | | |
| ▪ Tending school lawns | | | |
| **Executing Environmental Health Practices** | | | |
| ▪ Cleaning toilets | | | |
| ▪ Cleaning classrooms | | | |
| ▪ Slashing grass | | | |
| ▪ Repairing leaking roofs | | | |
| **Checking Visible Pollution** | | | |
| ▪ Cleaning out Cobwebs and soot from roofs | | | |
| ▪ Disposing garbage | | | |
| ▪ Removal of drawings or writings on walls (graffiti) | | | |

# UNIVERSITY OF NAIROBI
## COLLEGE OF EDUCATION AND EXTERNAL STUDIES
## SCHOOL OF EDUCATION

Telegram: "CEES"
Telephone: 020-2701902

P.O. BOX 30197
NAIROBI
OR P.O. BOX 92
KIKUYU

22nd February, 2008

The Permanent Secretary,
Ministry of Education,
P.O. Box 30040,
Nairobi.

**RE: RESEARCH PERMIT TIMOTHY MANDILA REG. NO. E55/P/8342/05**

This is to confirm that the above named is a Master in Education student in the Department of Educational Administration and Planning. He plans to proceed to the field to collect data for his research project titled "The Influence of environmental education on Secondary Schools Students' Attitudes Toward Environmental Conservation in Central Division, Machakos district".

He has applied for research permit to enable him collect the data. His application and proposal for the study has our full support.

Any assistant given will be highly appreciated.

**PROF. G. N. KIMANI**
**CHAIRMAN**
**DEPARTMENT OF EDUCATION ADMIN. & PLANNING**

REPUBLIC OF KENYA

# MINISTRY OF SCIENCE & TECHNOLOGY

Telegrams: "SCIENCE TEC", Nairobi
Telephone: 02-318581
E-Mail:ps@scienceandtechnology.go.ke

JOGOO HOUSE "B"
HARAMBEE AVENUE,
P.O. Box 9583-00200
NAIROBI

When Replying please quote

Ref. MOST 13/001/ 38C42/2

5th March 2008

Timothy Mandila
University of Nairobi
P.O. Box 80197
**NAIROBI**

**RE: RESEARCH AUTHORIZATION**

Following your application for authority to carry out research on, ***'The Influence of Environmental Education on Secondary Schools Students Attitudes towards Environmental Conservation in Central Division, Machakos District'***

I am pleased to inform you that you have been authorized to carry out research in Machakos District for a period ending 30th May, 2008.

You are advised to report to the District Commissioner and the District Education Officer Machakos District before embarking on your research project.

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

**A. O. TULI**
**FOR: PERMANENT SECRETARY**

Copy to:

The District Commissioner
Machakos District
**MACHAKOS**

The District Education Officer
Machakos District
**MACHAKOS**

CONDITIONS

1. You must report to the District Commissioner and the District Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit.
2. Government Officers will not be interviewed without prior appointment.
3. No questionnaire will be used unless it has been approved.
4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.
5. You are required to submit at least two(2)/four(4) bound copies of your final report for Kenyans and non-Kenyans respectively.
6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice

**REPUBLIC OF KENYA**

**RESEARCH CLEARANCE PERMIT**

GPK 6055—3m—10/2003

(CONDITIONS—*see* back page)

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THIS IS TO CERTIFY THAT:

Prof./Dr./Mr./Mrs./Miss TIMOTHY MANDILA

of (Address) UNIVERSITY OF NAIROBI P.O.BOX 30197 NAIROBI

has been permitted to conduct research in

.....Location,

MACHAKOS .....District,

EASTERN .....Province,

on the topic THE INFLUENCE OF ENVIRONMENTAL EDUCATION ON SECONDARY SCHOOL STUDENTS ATTITUDES TOWARD ENVIRONMENTAL CONSERVATION IN CENTRAL DIVISION

for a period ending 30TH MAY, 2008

PAGE 3

Research Permit No. MOST 13/001/38C 42

Date of issue 5.3.2008

Fee received SHS.500.00

PERMANENT SECRETARY
SCIENCE & EDUCATION
A.O.TULT TECHNOLOGY

Applicant's Signature

FOR: Permanent Secretary
Ministry of
Science and Technology

# OFFICE OF THE PRESIDENT

Telegrams: "DISTRICTER" Machakos
Telephone: Machakos 21009 and 21983
P.O. BOX 1-90100
When replying please quote

DISTRICT COMMISSIONER
P.O. BOX 1
MACHAKOS

Ref. No:ADM.15/31/VOL.V/

17TH March, 2008

The District Officer,
**CENTRAL DIVISION**

**RESEARCH AUTHORIZATION**

The bearer, Timothy Mandila, has been authorized to undertake research on the influence of **Environmental Education on Secondary Schools students, attitudes towards Environmental Conservation** in Central Division, Machakos District to a period ending 30th May, 2008.

Provide the necessary support.



G.O. OMODING
For: DISTRICT COMMISSIONER,
**MACHAKOS**

c.c.

Mr. Timothy Mandila