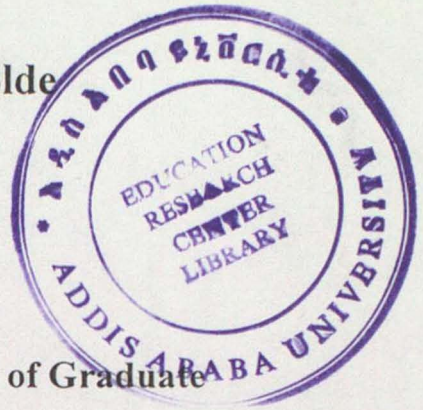
AN ASSESSMENT OF THE INTEGRATION OF ENVIRONMENTAL EDUCATION INTO SELECTED SECONDARY SCHOOL SUBJECTS TOWARDS SUSTAINABLE DEVELOPMENT

By: Damtew Wolde



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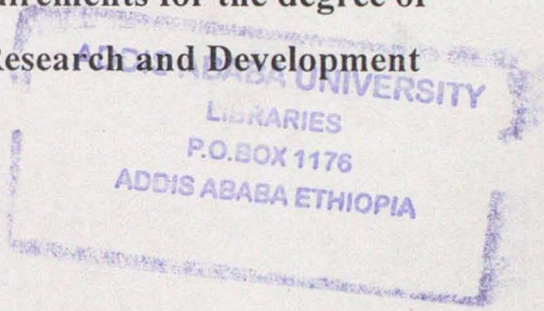

Institute of Educational Research
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Table of Contents **Page**

List of Tables **Page**

List of Figures

Page

Abbreviations

EE-Environmental Education

EPA-Environmental Protection Authority

ESD-Education for Sustainable Development

ESDP- Education Sector Development Programme

FDRE-Federal Democratic Republic of Ethiopia

ICDR – Institute of Curriculum Development and Research

IEEP – International Environmental Education Progarmme

IUCN – International Union for the Conservation of Nature and Natural Resources

MOA –Ministry of Agriculture

MOE- Ministry of Education

NAAEE – North American Association for Environmental Education

UN – United Nations

UNEP – United Nation Environment Programme

WCED – World Commission for Environment and Development

Abstract

The main objective of this study was to assess the integration of EE into both grade nine and ten biology and geography curriculum guides and students' textbooks, and in the actual teaching and learning process at North Shoa. On the one hand, to assess the integration of EE into curriculum guides and students' textbooks of grade nine and ten biology and geography, both qualitative and quantitative data were collected through content analysis. On the other hand, to assess the integration of EE into the teaching and learning process, both qualitative and quantitative data were collected form 373 students of which 225 (60.3 %) were grade nine and 148 (39.7%) were grade ten. From these students, data were collected using criterion-referenced test, open-ended questions, and Likert type scale. Then, the data collected from these participants were analyzed both qualitatively, and quantitatively (using descriptive statistics, parametric and non-parametric tests). The result showed that EE objectives (knowledge, skills, attitudes and participation), contents, teaching methods, and evaluation techniques were not adequately integrated. The result from the test also showed that the majority of the students performed below the standard set (70%) by their teachers. However, when their achievement scores were analyzed in terms of sex and grade level, statistically significant mean difference was obtained, t (371) = 2.26, $p <$ 0.05, t (371) = 2.00, $p < 0.05$ respectively. On the other hand, the mean difference between urban and rural students were found insignificant, t (371) = 0.05, $p > 0.05$. And the ANOVA summary did not show significant mean difference in the schools as a whole, F (3,369) = 1.97, $p > 0.05$. Moreover, regarding their attitudes to utilizing and protecting their environment, students were found having inappropriate view. The analysis made based on the independent variables also showed insignificant mean attitude score difference between male and female students, t (371) = 1.04, $p > 0.05$, grade nine and ten students, t (371) = 0.11, $p > 0.05$, and urban and rural ones, t (371) = 0.39, $p > 0.05$. The ANOVA summary also did not show statistical significant mean difference in the schools overall, F (3,369) = 1.96, $p > 0.05$. Finally, the assessment made on students` problem solving skills showed that students failed to identify serious environmental problems including their causes, solutions and participants to implement the solutions in their local area leave alone problems in Ethiopian and global contexts. Thus, based on the above results it can be concluded that EE was not integrated into grade nine and ten biology and geography curriculum guides revised in 2004, and students` textbooks written based on the revision in 2005/2006 in line with its objectives, contents, teaching methods and evaluation techniques that prepare students to contribute to sustainable development of Ethiopia. It was not also integrated in the actual teaching and learning process although it was integrated in the new education and training policy developed in 1994. Based on the findings, it is recommended that integrating EE into different subjects typically biology and geography is vital to develop students' environmental knowledge, skills, attitudes and participation to make them contributors for sustainable development of our country.

Chapter 1: Introduction

Background of the Study

People in this world have been deteriorating the planet Earth very rapidly due to their interaction and interference with the immediate environment to fulfill their economic, social and political needs in the twenty first century. This is mainly caused by the bidirectional relationship between people and their environment: the environment provides resources to them, and the process of transforming the resources into usable form destroys it. These relationships result in serious local, national and global environmental problems. The local environmental problems are the outcome of a mismatch of local environmental conditions and the human efforts to generate resources from the environment such as hunting wild animals for food, cutting trees for lumber, farmland and fuel wood and so forth. These efforts result in a number of negative consequences like soil erosion, deforestation, desertification, flood, drought and poverty. On the other hand, global environmental problems are the results of the cumulative effects of the local ones, wastes generated in the transformation of resources into usable forms, and patterns of consumption of resources. These also result in environmental problems such as global warming, air pollution and ozone depletion (Ranjan, 1999).

In the twenty-first century, the above environmental problems in both developed and developing world have seriously changed the local, regional, national and global environment into worse, even the worst compared with the previous times. To overcome these environmental problems and to bring sustainable development, the international community has given due attention in changing the behavior and attitudes of peoples in the world through education. One of the most important solutions is integrating Environmental Education (EE) into different subjects (multidisciplinary model) or integrating different subjects so that they make EE (interdisciplinary model) at different levels of its education system. As a result, not only the young generation will have knowledge and understanding, skills, positive attitudes and values about and for their environment through formal schooling, but also they can change their parents' behavior and attitudes for their environment through discussion. However, the schools in most developing countries do not have such practices. Rather they focus on teaching common and fragmented facts through different subjects.

On the other hand, the need to search new context of education in both developed and developing countries has been arisen in this world in this century. The most significant factors for the new context of education are growth of knowledge and information; demographic changes in both developing and developed countries; increasing interdependence among countries(e.g. new information technologies and globalization); and new social community concerns are emerging and concern for the environment is the most universally felt (UNESCO, 1998).

Therefore, education, unlike the pervious eras should not focus on transmitting cultural values and preparing for work of life. Rather,"...education be constructed on four pillars: learning to know, learning to do, learning to be and learning to live together"(UNESCO, 1998, p.2). These are the peculiar characteristics of EE. Based on this rationale, different regional, interregional or governmental and international conferences, seminars and workshops have been conducted to search possible solutions for the rapidly accelerating environmental problems in this world. Among the solutions, EE is the one that was suggested in the International Union for the Conservation of Nature and Natural Resources (IUCN) in 1970. Following this, the first major conference on the human environment was held in Stockholm in 1972 that recommend establishing International Environmental Education Program (IEEP) that deals with interdisciplinary approach, in school and out-of-school, encompassing all levels of education and people at different age level and in different walks of life to manage and control their environment (United Nations, 1972). As a result, UNEP (United Nation Environment Program) and IEEP were established in 1975 having different objectives, duties and responsibilities (UNESCO-UNEP, 1976). To accomplish its objectives and responsibilities, IEEP organized many international and regional conferences and workshops such as the 1977 Tbilisi conference. More specifically, the concept and meaning of EE, its goals, objectives, guiding principles and strategies for implementation were precisely developed in the 1977 Tbilisi's conference (UNESCO-UNEP, 1978).

The second major conference of the United Nations, two decades after Stockholm, the United Nations Conference on Environment and Development (UNCED) – the Earth Summit was held in Rio de Janeiro, Brazil in 1992. The Earth Summit resulted in five major achievements. Among these, Agenda 21 is the one that focuses on action plans needed in order

to work towards sustainable development particularly with regard to the public awareness, training and education (UN, 1992 in Scott and Gough 2004, p. 22). This issue was described in the conference as:

> Education including formal education, public awareness and training should be recognized as a process by which human beings and societies can reach their fullest potential. Education is critical for promoting sustainable development and improving the capacity of the people to address environment and development issues.

The third major conference of the United Nations, three decades after the Stockholm, the World Summit for Sustainable Development (WSSD)-Johannesburg Summit was held in Johannesburg, South Africa in 2002. In the conference, the United Nations Decade of education for Sustainable Development International Implementation Scheme (UNDESD-IIS) was set up. It states that "... Education for Sustainable Development (ESD) has its roots in history of two distinct areas of interest of the United Nations: (1) quality basic education; and (2) environmental education for sustainable development" (UNESCO, 2005a).

From these major conferences and agreements reached, it is clearly implied that EE includes education about, in and for the environment is an education for our environment and sustainable development (Beck &Earl, 2000; Palmer, 1998; Rush, 1999). Understanding these typical characteristics, many developed and developing countries have been trying to introduce EE into their education system as a subject or in an integrated manner with other subjects at different levels in line with the efforts exerted in different conferences and seminars as discussed before.

In parallel with these major conferences and agreements, many countries in the world such as USA, Australia, Canada, China, South Africa, Spain, and Uganda have integrated EE in their formal education at different levels (Palmer, 1998). Further, in UK, for instance, relationship was established between EE and school subjects like geography and sciences in 1970s and 1980s (Beck &Earl, 2000). They also added that, according to the chair of the National Curriculum Council of UK, "Environmental education is an essential part of every pupil's curriculum. It helps to encourage awareness of the environment, leading to informed concern for and active participation in resolving environmental problems"(p.97). Similarly, the

assessment made on the progress and problems of EE in East Africa countries-Ethiopia, Kenya, Tanzania, Zambia and Uganda in 1992 showed that all of them integrated EE into their primary education and only Zambia and Kenya did in their secondary school level (Lindhe et al., 1993 as cited in Aklilu, 2006).

Specifically, according to MOE (1992), the ' Environmental Education Project in Ethiopia was carried out for six years in primary and secondary schools and in Teacher Training Institutions (TTIs) by Ministry of Education financed by Swedish International Development Authority (SIDA). The project was produced based on the environmental problem, severe drought, occurred in Wollo in 1984. To overcome these problems, the project focused on:

> the integration of environmental education into the formal school system and on activities aimed at familiarizing teachers and other education staff with vital concepts of environmental education and its methodological approaches. The project aims at introducing a more active process of learning, combining theoretical and practical knowledge relevant to the immediate environment. It also stresses the importance of practical community –oriented actions working towards the resolution of a local environmental problem. (p.1)

The project was also begun at North Shoa because of the serious environmental problems such as deforestation, soil erosion, drought and poverty occurred in the zone. According to MOE (1992), "The project expanded to North Shoa region in 1987 with the understanding that the environmental problems in the region are grave and need attention"(p.13). The project was expanded to Eastern Hararghe and Sidamo administrative regions where the state of the environment was fast deteriorating since 1989.

After six years of the project implementation in Wollo and North Shoa in some selected schools (primary and secondary) and Teacher Training Institutes, evaluation was made "...to sum up and analyze the results of the pilot project and provide information for planning a new phase leading to a National Environmental Education Program " (MOE, 1992,p.II).

The findings of the evaluation showed that there were encouraging students` achievements in applying the theoretical knowledge they learnt practically to manage their immediate environmental problems. However, the problems observed from the project implementation were lack of

understanding about the nature of environmental education within the formal school curriculum; the inappropriate level of academic training of many teachers, the large class size, the lack of teaching resources and the traditional teaching methods (MOE, 1992). To overcome these problems, the evaluation team of the project recommended to developing strategic framework and environmental education unit at a central level, audit the curriculum to integrate environmental education into the national curriculum and train teachers to be able to teach the integrated curriculum in Colleges of Education and Teacher Training Institutes in both pre-service and in-service mode (MOE, 1992).

However, unlike the efforts exerted in integrating and implementing EE in the world and particularly in Kenya and Zambia, there is hardly any attempt in doing this at a secondary level in Ethiopia although 'A Guiding Document on Environmental Education in Ethiopia' (Axen, Mulugeta and Mulu, 1995) and 'Environmental Policy' document (FDRE, 1997) that addresses "to promote the teaching of environmental education on a multidisciplinary basis and to integrate it into the ongoing curricula of schools" were developed.

Following the evaluation of the environmental education project, according to FDRE (1994), the New Education and Training Policy of Ethiopia was developed to solve the problems of our education such as access, equity, quality and relevance; and to solve problems that the objectives of the education were not related with the needs of the society; the contents were not related; the mode of presentation did not develop the students` problem solving ability and attitude. To solve these problems and make our education relevant to the society, some of the policy statements address that education "... has to be integrated with practice, research and development to contribute towards an all-rounded development of society"(p.2). In order to make the development of our society sustainable, our environment is playing and will play a great role if and only if it is utilized and protected wisely together with our social and economic aspects.

According to the policy, some of the general and specific objectives of education and training of our country explicitly state the contents, methodologies and evaluation techniques to be developed in different curricula materials. Some of them are to develop the physical and mental potential and problem solving capacity of individuals, to bring up citizens who can take care of and utilize resources wisely, to cultivate the cognitive, creative, productive and

appreciative potential of citizens by appropriately relating education to environment and societal needs, to provide education that can produce citizens who possess national and international outlook on the environment, protect natural resources and historical heritages (FDRE,1994,pp.7-11).

These objectives shows that the contents of the curricula materials should focus on our real problems; the methodologies should be problem solving, experimentation, field studies, and the like that should enable students active learner and problem solver by exposing them to first hand experiences and different environmental problems. Moreover, evaluation techniques should be developed in line with the objectives set in the policy. To accomplish this, EE should be part and parcel of our education system. Axen, Mulugeta and Mulu (1995) quoted some of the policy statements and underlined that "... environmental education is made an integral part of the teaching and learning processes in the country as a whole"(p.11). Therefore, students will have the right knowledge, skills, values plus positive attitudes to their environment so that they, together with the community, consume, preserve and protect it not only to leading quality life for them but also to handing it down from generation to generation.

However, the report of Environmental Protection Authority (EPA) of FDRE (2003) showed, "Environmental education has been incorporated into the elementary education curriculum, grades 1 to 4 and efforts are being made to do the same in the curriculum of higher grades"(p.7). On the other hand, Bishop (1986) underlined, "Any education system must be seen as an integrated whole and if one of its parts is modified the whole system will feel the repercussions and be affected"(p.102).

Moreover, research findings have shown the status of EE in developing countries including Ethiopia. For instance, UNESCO-UNEP (2000) research finding shows that "...trends in environmental education in the school curriculum, particularly in developing countries, is confronted with the problem of having to deal with a curriculum area which is relatively new and not well defined"(p.122). In addition, Melaku (1994) pointed out that the elements of EE observed in social studies course in Teacher Training Institutes did not match with the objectives and standards of the present day EE teaching. Further, Dessalegn (1998) found that although the major sources of EE for students were the subjects taught, our secondary school subjects lacked

adequate contents that invite students for fieldworks and practical activities with the surrounding community in his study area. Whether EE is integrated into secondary school subjects in a multidisciplinary model within its objectives, contents, teaching methods and evaluation techniques, however, remains an open question. Therefore, the main objectives of this study are to examine the revised curriculum guides and students' textbooks of grade (9-10) biology and geography in 2004 in terms of EE objectives, contents, teaching methods and evaluation techniques; and to assess the students` environmental knowledge, attitudes and skills in some selected schools at North Shoa.

Statement of the Problem

Different scholars have witnessed about our education typically about our curriculum since the beginning of modern education. It had been a tradition to copy the curriculum of various countries such as French, British, American, and East Germany education system. For instance, Tekeste (1990) witnessed that our secondary education curriculum was inappropriate and dysfunctional. This shows that our secondary education did not focus on our real regional and national context or environment. In other words, it was irrelevant.

Still the present curricula materials of different subjects such as curriculum guides and students textbooks at secondary level in our education system were criticized because of poor quality to address current social, economic and environmental problems and issues in an integrated manner (Dessalegn, 1998; Aklilu, 2001). These materials were criticized since they did not address issues and problems of our environment at local, regional, national and global contexts. So did the actual teaching and learning process. For instance, "the loss of agricultural value between 2000 and 2010 will be a huge $7 billion" without considering the indirect impact of land degradation in Ethiopia (Berry, 2003, p.2). He also found that "Forests in general have shrunk from covering 65% of the country and 90% of the highlands to 2.2% and 5.6% respectively"(p.4). Haile (2004) also discussed that "about 20,000-30,000 hectares of croplands in the highlands are being abandoned annually since cropping can no longer be supported by the soil. It is projected that land degradation at the present rates would destroy the farmlands of some 10 million highland farmers by 2010"(p.45). However, the curricula materials did not address such serious environmental problems (education for the environment) by integrating with education in or from the environment. Rather, they focused on fragmented facts that did

not help students to learn from their environment through first hand experiences by doing, observing, analyzing, and criticizing the interrelationship and interdependence between people with their environment. As a result, students are forced to memorize facts to pass from one grade level to the other. UNESCO (1980,) in Aklilu (2001)states that schools in developing countries including Ethiopia have been criticized because they do not address the problems of individual learners in particular and the society in general as they focus on disseminating factual knowledge.

On the other hand, the new education and training policy of Ethiopia focuses on developing students' creative, productive and problem solving ability and skills, and addressing the needs and problems of the society. In line with this, curriculum revisions have been made at secondary level (9-12) at national level to make education relevant to the students` lives in particular and the needs and problems of our society in general. This is performed by integrating EE into school subjects like biology and geography. Above all, as discussed in the back ground part before, in the twenty –first century, education is expected to prepare students to play their best for sustainable development of a nation.

Therefore, this study focuses on assessing whether EE is integrated in the newly revised secondary school curriculum guides and student textbook of grade nine and ten geography and biology (2004) and in the actual teaching and learning process at North Shoa towards sustainable development.

Objectives of the Study

The main objective of this study is to assess whether environmental education (education about, for, in or from the environment) is integrated into selected secondary school subjects towards sustainable development. The specific objectives are to:

1. identify whether or not the general and specific objectives developed in our education and training policy clearly integrate EE;
2. assess whether or not EE is integrated into grade nine and ten geography and biology curriculum guides and students' textbooks;
3. examine how these grade levels biology and geography teachers implement these materials in relation to EE in the actual teaching-learning process; and

4. assess students` environmental knowledge and understanding, attitudes and problem solving skills.

Research Questions and Variables

To achieve these objectives, the following leading questions are formulated:

1. Do the objectives developed in our educational and training policy incorporate EE?
2. Are the objectives, contents, teaching methods and evaluation techniques of EE integrated into grade nine and ten biology and geography curriculum guides and students` textbooks?
   A. Do these materials include the objectives of EE? Is there a significant difference among them?
   B. Do these materials integrate education about, for, in or from the environment?
   C. Do these materials incorporate EE teaching methods and evaluation techniques?
3. How do teachers of these subjects and grade levels implement the curriculum guides and students` textbooks by integrating education about, in and for the environment?
   A. Do teachers get training on how to integrate EE in their subject area?
   B. Do teachers have the right attitude to EE, the teaching and learned process, and their role in the school and in the nearby community?
4. Do students have the right knowledge, positive attitudes to their environment and problem solving skills?
   A. Is there any significant difference between students of urban and rural, male and female, grade nine and ten in relation to their environmental knowledge and attitudes to their environment?
   B. Is there any significant difference among the schools in relation to students` environmental knowledge and attitudes?

Variables. The dependent variables were students' environmental knowledge, attitudes to their environment and problem solving skills. The independent variables were students' place of residence (urban and rural), grade level (9 & 10) and sex (male and female). Moreover, the integration of EE into the policy document and curricula materials and the training of teachers on how to integrate EE were included.

Significance of the Study

Since EE is a local, regional, national and an international concern to alleviate environmental problems in their real contexts towards sustainable development, its relevance to developing countries like Ethiopia is unquestionable. As this study is concerned with the assessment of the integration of EE with grade nine and ten geography and biology curriculum guides and students textbooks by relating with our education and training policy, this paper may help: MOE and EPA to assess the gap between the policy documents and actual practices, and synthesis their efforts to integrate EE in different curricula materials; Curriculum designers to see the weaknesses, if there are, of integrating EE into subjects like geography and biology and to improve in the forth coming editions; Curriculum designers to see the weaknesses, if there are, of producing objectives, contents, methods and evaluation techniques of curriculum guides and students textbooks for secondary level courses typically for grade nine and ten geography and biology from the education and training policy; Teachers of these subjects to see their weaknesses, if there are, of implementing these materials in relation to EE objectives, contents ,teaching methods and evaluation techniques to develop students` knowledge, skills and attitudes as a whole.

Delimitation and Limitation of the Study

An assessment of the integration of EE into secondary school subjects includes several aspects such as objectives, relevant contents, teaching methods, evaluation techniques other curricular issues related to EE. In addition, EE should be integrated at all levels of the education system in different subjects in a given region or nation. However, this study focuses on assessing: objectives developed in our education and training policy; the integration of EE objectives, contents, teaching methods, evaluation techniques into grade nine and ten biology and geography curriculum guides and students textbooks; and the actual teaching-learning process using these materials.

The rationale behind choosing these subjects is that they are peculiar subjects to integrate EE. Aklilu (2006) mentioned Fortrei (1981) as quoted in Schleicher (1989) and described that "...about two thirds of all topics concerned with environmental problems fell in the domain of

biology and geography…." Moreover, biology and geography were among the subjects chosen for integrating EE during the pilot project in our country (MOE, 1992).

It is restricted to North Shoa because it is the nearest area that has been affected by environmental degradation due to its landscape. It is also characterized by both urban and rural features that has been exploited its natural resources for a long periods of time.

This study had some limitations. In the content analysis, teachers' guides were not included. Above all, the research would have been more comprehensive and conclusive if it had been carried out from 9-12 at a national level. However, it was limited to secondary Schools (9-10) at North Shoa zone due to many factors such as financial and time constraints to undertake the research.

Definition of Terms

- **Assessment** is the process of collecting, interpreting and synthesizing information about how EE is integrated in our education policy, selected subjects` curriculum guides and students' textbooks and in the actual teaching-learning process.
- **Integration** is the process of including EE objectives, contents, teaching methods and evaluation techniques into different subjects that are interrelated when developing or revising curriculum guides and student textbooks and /or in the actual teaching-learning process. It also refers to synthesizing education about, for, in or from the environment in these materials and in the teaching and learning process as well.
- **Environment** is viewed in its totality that comprises natural or biophysical and man made or socio-cultural systems in which man and other organisms live and interact.
- **Environmental education** is an education that interrelates education about, in and for the environment in both the planning and actual teaching and learning process.
- **Sustainable development** is development that meets the needs of the present without compromising the ability of the future generations to meet their own needs (Aklilu, 2006).
- **Problem solving skills** refers to the ability of students to identify environmental problems including their causes, consequences, solutions and participants that should take part to solve the problems.

Chapter 2: Review of Related Literature

The focus of this chapter is enriching the work both theoretically and practically. On the one hand, the theoretical part deals with environmental problems at Ethiopian, African and global contexts: the role of education to overcome these problems, typically Environmental Education (EE) including its historical development, philosophy, components and role for sustainable development. In parallel with these, philosophy of education at Ethiopian and global contexts is also discussed. Moreover, the place of EE in our education policy, peculiar subjects to integrate EE and factors hindering to integrate into school subjects will be thoroughly reviewed. On the other hand, the gap between education policy and its implementation, the actual practice of EE at global, African and Ethiopian context, and students' knowledge, skills and attitudes will be discussed from documents and research findings.

Environmental Problems: Global, African and Ethiopian Perspectives

Nowadays, environmental problems are serious at global, African and Ethiopian contexts although they might vary in kind and intensity. This is because people have caused immense environmental changes in their quest for survival and development (UNEP, 1988).These changes have global, African and Ethiopian perspectives.

Globally, according to World Commission for Environment and Development ([WCED], 1987), the planet Earth and its people are at the time of a matter of life and death because of the "failures of 'development' and failures in the management of our human environment"(p.2). The failures of the former result in having more people: who are hungry; who cannot read and write; who cannot get safe water; who cannot have safe homes; and who face shortage of wood fuel for cooking and warming themselves. So does the gap between developing and developed nations. On the other hand, the failures of the latter result in global warming, deforestation, ozone depletion, acid rain (UNEP, 2006; Kemp, 1990; WCED, 1987). Specifically, global warming is now the most threatening environmental problem in the world. As a result, it is one of the top sensitive agenda that needs immediate solutions from people in the world.

Poor resource and environmental management causes not only global environmental problems but also continental ones. Africa, for instance, as a continent has been facing different

serious environmental problems: population explosion, poverty, deforestation, desertification, soil erosion and health problems. For example, Africa experienced widespread food shortages, 22,000,000 in central Africa and 10,000,000 in Ethiopia alone in 2005 (Banton, 2005 in UNEP, 2006). This shows that most of the people in Africa might not satisfy their basic needs in the twenty first century.

As shown in the above data, poverty was and is one of the environmental problems in Ethiopia that causes resources degradation such as forest and soil. This is acute in the highland areas (Aklilu, 2001; Teller, 2005). Moreover, Specifically,

> The highlands of Ethiopia occupy approximately 45 percent of the country's total land area, and house over 85 percent of the population and 75 percent of livestock. Yet these crucial lands are among the most severely eroded areas in the world. Advanced deforestation and land degradation under increasing demographic pressure are the major causes. Some 50 percent of the land area is significantly eroded, 25 percent seriously eroded and five percent has lost the ability to produce. (UNEP, 2006, p.12)

Therefore, it is clearly implied that not only the living and non-living resources in this area but also people are endangered, at a matter of life and death.

In sum, environmental problems have been accelerating at rapid rate at global, African and Ethiopian context in this century. Hence, unlike the previous era, education has been given key and central role to overcome these problems and to bring sustainable development. According to Serageldin, et al. (1998), "Education was not absent...but it was assigned a supportive, even peripheral role. Not so today. In the course of 40 years, education has moved from the periphery to the center of thinking about development"(p.36). This can be achieved when there is a relationship between education and our environment.

The Role of Education in Addressing Environmental Problems

Education plays a significant role in changing the behavior of people towards their environment. To accomplish this task, it should be related with the environment. Rush, Wharfe, Collins and Thomas (1999) underlined that the "Fundamental to the development of EE has been the relationship between education and environment"(p.22). Furthermore, Sterling (1996), in Rush

et al. (1999), discussed the relationship and the need for the reorientation of education if education for sustainability is to succeed. He also underlined, "Education is proclaimed at a high level as the key to more sustainable society, and yet it daily plays a part in reproducing an unsustainable society. If it is to fulfill its potential as an agent of change towards a more sustainable society, sufficient attention must be given to education as the subject of change itself" (p.20).

Consequently, educators in general should understand this relationship while planning, implementing and evaluating education at different levels for sustainable development locally, nationally and globally. Education becomes all-rounded and meaningful for students, teachers and the community at large when it is given based on the real context of their environment.

Environment-based education is using the environment as a tool for achieving broader educational goals while EE focuses on building a base of environmental knowledge, skills and attitudes to be applied to solve environmental problems (North American Association for Environmental Education [NAAEE], 2001). This education brings the following effect on students: improved motivation, skills for lifelong learning, career preparation and attitudes of respect and responsibility. Above all, the benefits of environment –based education to students, teachers and communities are to produce: high performance lifelong learners, effective future workers, and problem solvers, thoughtful community leaders and participants, people who care about the people, creatures and places around them (NAAEE, 2001).

In short, integrated learning across disciplines, problem solving, decision making, independent and group learning, and issue–based instructional activities are the hallmarks of environment-based education (NAAEE, 2001).

Education for Sustainable Development. Unlike education in the previous centuries that mainly focus on teaching about and in the environment, education in the twenty first century should focus on addressing the present intense environmental problems to bring sustainable living in this world. This can be achieved when EE is given at different levels of education in an

integrated way. Education for the environment, which is one of the components of EE, is a key element of the teaching-learning process for sustainable development of a given country.

According to Scott and Gough (2004), "Education for sustainability means preparing everyone to care for the planet by respecting justice, local identity, and fundamental requirements for all well being"(p.33). They also discussed the characteristics of education for sustainable development as:

> Education for sustainability is a process of societal transformation in which all learners share and adjust. The classroom becomes the changing roles of experience for co-operation around managing for more well being via less resource use and recyclability. The tools for ensuring this should be tried out in the classroom and transferred to the community, that is the" community "becomes the child and parent learning form each other. Right now education is not preparing any of us for the perspective, so education for sustainability remains elusive and unfulfilled. (pp. 33-34)

As explicitly stated in the above paragraph, the right place to practice sustainable living should be classrooms. Students should identify and share problems of their environment at local, regional and global levels. They should also hypothesize, collect data, analyze, interpret and arrive at solution, test in their schools compound. Finally, they should share to the nearby community. Then, the communities share best experiences to other communities to solve their problems and address their needs in a sustainable manner. This is typically significant for countries like Ethiopia where most of their people are illiterate.

Moreover, the components of education for sustainable development, according to Aklilu (2006), are improving basic education, reorienting existing education to address sustainable development, developing public understanding and awareness, and training. Above all, sustainable development cannot be expected without environmental sustainability though the other factors such as social and economical are achieved in the desired level. Beck and Earl (2000) underlined, "Sustainable development emphasizes the need to reconcile economic development and conservation of the environment, and to place a consideration of environmental issues within a social, economic and political context. This concern with sustainability links

with education for the environment, and gave a new impetus globally to environmental education "(p.99).

Generally, education should play its role for sustainable development of a given country by integrating education for the environment. To accomplish this, educators such as curriculum experts, teachers and the like should be familiar with the relationship between learning and sustainable development (UNESCO-UNEP, 1994; Palmer, 1998; Scott & Gough, 2004). Therefore, they can give due attention for EE in an integrated manner across the curricula materials at different levels of education of a nation to bring not only environmental sustainability but also economic and social sustainability during planning and the actual teaching-learning process at different levels. However, in integrating EE at the planning and implementation processes at different levels of education, the theoretical basis, philosophy of education plays a significant role.

Philosophy of Education: Global, African and Ethiopian Contexts

Philosophy is one of the foundations of education that helps educators (e.g. educational planners, curriculum experts, researchers, teachers, etc.) to have clear understanding about the theoretical and practical aspects of education. It helps them how to choose and plan curriculum objectives, contents, teaching methods, teachers and students` roles in the teaching learning process. According to Ornstein and Hunkins (1998),

> Philosophy provides educators, especially curriculum workers, with a framework or base for organizing schools and classrooms. It helps them answer what schools are for, what subjects are of value, how students learn, and what methods and materials to use. It provides them with a framework for broad issues and tasks, such as determining the goals of education, the content and its organization, the process of teaching and learning, and in general what experiences and activities they wish to stress in schools and classrooms. (pp. 25-26)

To Smith (1990), educational philosophy has many functions. For instance, it helps to correct mistakes about educational policy and practice, and focus on educational activities that require resolutions.

There are four major educational philosophies that are derived from social philosophies: perennialism, essentialism, progressivism and reconstructionism having their own aim of education curricula focus, teaching methods, learning and teaching process and so forth (Ornstein & Hunkins, 1998; Smith, 1990; & Derebssa, 2004). Perennialim and essentialism focus on developing students' intellectual ability; progressivism focuses on developing students` problem solving skills; and reconstructionism stresses on bonding schools and the society.

Society has its own philosophy: the way it brings up its young generation; it hands downs its culture, customs, skills, values and attitudes. To accomplish these, parents, elders and other parts of the society played their roles during the ancient time. So does the present society though the practice might vary because of the introduction of traditional and modern education. Therefore, not only society starts to hand down its values from generation to generation through education but also it integrates itself with other societies by sharing best societal philosophies across the world. Hence, societal philosophy and education have close relationship. According to Mallison (1960), "Education …is a social force in the sense that any educational system must reflect closely the ethos of the people it is called upon to serve. To know what we want from education we must know what we want in general, and …our theories of education must derive from our philosophy of life"(p.2).

On the one hand, the society at each level has its own social structure and social philosophy so that its education system should match within its philosophy. On the other hand, globalization and the new information technology force the international society to share some common societal philosophy. Some of the pressures, according to UNESCO (1998), to have some commonalities, are serious environmental problems, market deregulation, the spread of new information technologies and the globalization of international market.

To plan and implement education in a given nation to accomplish its purpose at local, national and global level, treating the present educational philosophies individually might not be sufficient to develop students` knowledge, skills and attitudes in these levels. In this regard, Derebssa (2004) underlined, "Very few schools adopt a single philosophy. In practice most schools combine various philosophies ….no single philosophy, old or new, should serve as exclusive guide for making decisions about schools or about the curriculum"(p.38). This shows

that each educational philosophy lacks the quality of theoretical base for developing students' intellectual ability, problem solving skills and attitudes in an integrated manner as an individual and as a member of the society unless there are educators who can synthesis the four major educational philosophies at policy level, developing curriculum materials such as curriculum guides and textbooks and in the teaching and learning process. This problem is very serious in developing countries typically Africans where there is direct and /or indirect influence of the education philosophy of developed countries. The philosophy of education and the actual practice of education in Africa were and / or are influenced by the theories and practices in developed countries due to different factors like politics. According to Obanya (1999),

> In the context of today's global village ..., the international dimension of politics has also had its impact on Education in Africa....the African countries ... were able to evolve radical educational measures. Translating these into action however remained a problem, as dogmatism tended to replace reasoned arguments and as hero-worship and political witch\ -hunting stunted the inculcation of critical reasoning and creativity through education. (p.23)

Above all, the actual teaching and learning process and its outcome is very poor compared with developed countries. As a result, the formal schooling is unable to match with the present day scientific and technological innovations (Obanya, 1999). To him,

> In the formal sector, Africa has not been able to catch up with new scientific and technological ideas and products needed to enrich school curricula. The result is that the promotion of real learning in African schools has become very difficult and frontal teaching and memorization takes the place of investigations, experimentation, discussion. Labels (i.e. mere 'definitions' of concepts) are memorized in place of the real understanding of concepts themselves. This situation makes the application of classroom learning to real life situations impossible. (p.35)

Like other societies, Ethiopia has an educational philosophy that still serves within the society and /or that has been adapted from developed societal philosophy of education: indigenous and modern philosophies of education.

Based on the indigenous philosophy of education, traditional education has been given in line with ethnic and linguistic groups, and religious institutions such as the Ethiopian Orthodox

Church and the Mosques in the Moslem areas with its goals and teaching methods. Bekele (2001) identified, "... unity, the union of the individual and the community, moral goodness and solidarity constitute the core of the philosophy of education and children's upbringing. The methods and materials of teaching were similar (proverbs, rituals, stories, etc.)". More specifically, Derebssa underlined that the philosophy of ethnic and linguistic groups is "...to instill in children the attitudes and skills appropriate for male and male social roles, emphasizing the duties and privileges derived from cultural values"(p.73). He also added that the philosophy of Ethiopian Orthodox Church is to preserve Ethiopian culture and provide spiritual literacy, scientific and artistic life. This is the most conservative philosophy that causes the late introduction of modern education in Ethiopia.

When modern education was introduced during Menilik II, it was foreign oriented in terms of curricula, teachers and other aspects of education in particular and philosophy of education in general. As a result, it did not address the realities of ethnic and linguistic groups. Then the educational philosophy during the imperial periods was changed with the change of social values, faith and philosophy of the Derg Regime. For instance, in 1975, a new education policy focused on improving learning opportunities in the rural areas as opposed to the previous education system that restricted itself for the rich and urban society. Tekeste (1996) identified, "The Post-Revolution State is certainly more inclined to meet the social, economic, political and educational challenges than its predecessor"(p.108). However, he added that the education system of this state did not address the problem of access, equity, relevance and quality of education in different ethnic groups at local, regional and national contexts.

At present, following the development of the new education and training policy in 1994, attempts have been made to solve the problems of our education system. In other words, to address the needs and problems of our society at local, regional and national level, the education system has been interwoven with other development sectors like health and agriculture (ESDP-I, 1998; ESDP-II, 2001; ESDP-III, 2005). Above all, the present educational philosophy of Ethiopia is reflected on the aims and objectives of the new education and training policy. For example, the aim of education, according to FDRE (1994), is

> ... to strengthen the individual's and society's problem-solving capacity, ability and culture starting from basic education and at all levels. Education enables man to identify harmful traditions and replace them by useful ones .It helps man to improve change, as well as develop and conserve his environment for the purpose of an all-rounded development by diffusing science and technology into the society. Education also plays a role in the promotion of respect for human rights and democratic values, creating the condition for equality, mutual understanding and cooperation among people. (pp. 1-2)

Generally, both the indigenous and modern educational philosophies have their own places in our education system although the latter has been dominating in the present. As result, aims and objectives of education, and curriculum reform including making the content and the teaching methodology relevant to students` lives have been made through time to address the present needs and the problems of our society such as economic, social and environmental problems.

Philosophy and Components of EE

Like philosophy of education, EE has major philosophies: positivist, constructivist and critical paradigms (Robottom and Hart, 1993 in Rush et al., 1999; Green et al., 1993 & Tilbury, 1994 in Chi Kin Lee & Williams, 2001). These philosophies are discussed in terms of curriculum and its major concern, the focus of EE, the purpose of EE, the roles of teachers and students and the source of knowledge.

a) **Positivist Paradigm**

For this view, the curriculum is viewed as technical and it dominantly focuses on course or subject contents. Moreover, education focuses about the environment and the purpose of EE is to develop knowledge about the environment; the teachers` role is authority in knowledge; the students' role is passive recipients of disciplinary knowledge, knowledge and its power is systematic, objective, derived from experts.

b) **Interpretive paradigm**

According to this view, curriculum is viewed as practical that focuses on personal experiences and on the process of teaching learning. In addition, education emphasizes learning in the environment, and the purpose of EE is learning the reality by doing activities in the environment. The teachers are organizer and facilitators of experiences in the environment, and the students

are active learners. Knowledge and power is semi-structured, subjective and derived from experience.

c) **The Critical Theory paradigm**

To this view, the curriculum is viewed as critical and action- oriented. EE focuses on education for the environment, and the purpose of EE is to take action for the environment. Teachers' role is collaborative, participant, or inquirers, and students` role is active generators of new knowledge.

The above philosophical issues clearly show that the nature of curriculum and its emphasis, how knowledge is gained, its source, teachers and students` roles in the teaching learning process. On top of this, knowing the philosophical views of the above and other paradigms of EE help educators how to plan and implement EE as a discipline or in an integrated manner by focusing education towards our real environment and sustainable development. So does its components.

Students should have the right knowledge about their environment and this becomes more meaningful when learning takes place in the context of the given environment. But knowledge and experience from the environment are not useful unless they enable students to identify problems, take care of, find solutions for their environment now and in the future by taking the right action. In this regard, Powell (1997) in Fien (1993) and underlined that "Education about and through the environment are valuable only in so far they are used to provide skills and knowledge to support the transformative intentions of education for the environment"(p.150).

In general, EE should not focus on one of the above components alone. Three of them should be integrated (Tilbury, 1995 in Rush et al., 1999; Palmer, 1998). This is a distinct quality of EE compared with the major philosophy of education that each of them focuses on specific view in relation to the aim of education, the nature of knowledge and the way it is acquired, the roles of the teachers and students, contents, teaching methods, and so forth. On the other hand, nowadays, EE incorporates its major philosophy: positivist, interpretive and critical as one and an integrated unit when it is incorporated in different curricula materials in this century (Palmer, 1998). Therefore, it is very important to assess the curriculum materials such as curriculum

guides and students` textbooks of different subjects at different levels of education whether they include education about, in and for the environment in an integrated manner.

EE: The Cure for Environmental Problems and Sustainable Development

World Commission for Environment and Development (WCED, 1987) discussed the significance of education to overcome environment and development problems in an interrelated manner as," Education should ...provide comprehensive knowledge, encompassing and cutting across the social and natural sciences and the humanities ,thus providing insights on the interaction between natural and human resources ,between development and environment"(p.113). Education can play this role when EE is the parts of the formal education at different levels in the planning as well as in the actual teaching and learning process. In other words, the contents of education, typically curriculum materials such as curricula guides and students textbooks should integrate environmental problems, and the methods of teaching should coincide with these contents. According to Thomas (1990),

> Education is one of the most important instruments for correcting the damage that has already been done to the natural environment, and the content of education should reflect these questions: what present day environmental conditions threaten the quality of life on earth? If the forces producing such conditions continue unchanged, what consequences can be expected in future? What steps can be taken to reverse, or at least to retard, the deterioration of the environment? What can individuals such as students, do to alter the forces that endanger the quality of life? (p.314)

To Thomas, the above questions can be answered when the curricula materials address issues related the questions raised above. For instance, the first and the second questions can be answered when environmental problems like the green house effect, acid rain, ozone depletion, deforestation and waste disposal are included as a content of the curriculum. The third question can be answered by including contents such as legislation, incentives, exploration and invention, recycling and reclaiming in the materials and/ or in the actual teaching and learning process. Above all, the last question stressed on facilitating and developing citizens` (e.g. students) active participation to solve environmental problems. Therefore, according to Thomas (1990), students can learn to evaluate legislator's voting record, write effective letters to political figures, conduct peaceful demonstrations to publicize either damaging or constructive actions of public officials

and businesses, and boycott ecologically destructive commercial ventures, and improve their own daily treatment of the environment and organize campaigns to alter damaging practices with their school and community.

When planning education at different levels such as making curriculum revision and in the actual teaching-learning process, the three interrelated components of education, education about, in and for the environment, should be equally treated in an integrated manner (Dufour, 1990; Palmer, 1998; Beck & Earl, 2000; Scott & Gough, 2004). According to Palmer (1998), "...all are essential components of planning at every level of education" (p.143). Above all, these interrelated components of EE can address knowledge, skills and attitudes in an integrated manner if the right attention is given for all in the development and revisions of curricula materials, as well as in the teaching and learning process.

According to Palmer (1998, pp. 268-269), "Any curriculum review needs to consider whether the essential elements are adequately covered by asking questions as:"

a) Do students have as many opportunities as possible for empirical investigation in the environment, for observation, measuring, recording, interpreting and discussing what has been observed?
b) Are students aware of the complex nature of the environment (e.g. the inseparable nature of the various components of the environment and the unique position of human life in relation to other things)?
c) Is there a focus on aesthetic dimensions and qualitative study rather than quantitative ones? and
d) Are the students introduced to the ideas of personal responsibility for the environment by including ethical elements?

Hence, one can explicitly understand from the questions raised by Palmer that the model developed by him is not only crucial for EE but for different subjects at different levels of education. This is more significant when EE is integrated into different subjects for the holistic development of individuals` (knowledge, skills and attitude) and for making education play its part for sustainable development of a country. To having these qualities, EE passed different development stages.

Historical Development of EE. During its earlier ages, EE was given as subject, to teaching the science aspects (UNESCO-UNEP, 1994; Palmer, 1998; Scott & Gough, 2004). However, the term EE coined and practiced in different countries for many years, it found its base in 1970s in Stockholm conference in 1972, Belgrade Charter in 1975 and in Tbilisi Conference in 1977 in USSR (Palmer, 1998; Rush et al., 1999). According to these sources, the need of EE was identified in Stockholm. In the Belgrade Charter, IEEP announced the aims, objectives, key concepts, and guiding principles of EE. Meanwhile, the Tbilisi conference recommended how EE can be implemented in the formal and non-formal education.

According to the Tbilisi recommendation (UNESCO-UNEP, 1977 in UNESCO-UNEP, 1989; UNESCO-UNEP, 1994, Aklilu, 2006), EE, based on its guiding principles, should consider the environment in its totality; be a continuous life long process; be interdisciplinary in its approach; examine major environmental issues at local, national and global levels to give students insights into environmental conditions; focus on current and potential environmental situations and international cooperation in the prevention and solution of environmental problems; consider environmental aspects in plans for development and growth; enable learners to have a role in planning their learning experiences and provide an opportunity for making decisions and accepting their consequences; relate environmental; sensitivity, knowledge, problem solving skills and values clarification to every ages; help learners discover the symptoms and real causes of environmental problems; develop critical thinking and problem – solving skills; and utilize diverse educational approaches (education about, in and for the environment) to learning-teaching with stress on practical activities and first–hand experiences on environment.

In addition, the goals of EE are to: foster clear awareness of, and concern about, economic, social, political and ecological inter-dependence in urban and rural areas; provide every person with opportunities to acquire the knowledge, values, skills, attitudes needed to protect and improve the environment; and create new patterns of behavior of individuals, groups, and society as a whole towards the environment (UNESCO, 1977 in UNESCO-UNEP, 1989; UNESCO-UNEP, 1994; Palmer, 1998).

Furthermore, EE has the following objectives:

a) **Knowledge** - to help individuals and groups gain a variety of experiences in, and a basic understanding of, the environment and its associated problems;

b) **Awareness** - to create an overall understanding of the impacts and effects of behaviors and lifestyles - on both the local and global environments, and on the short-term and long-term;

c) **Skills** - to help individuals, groups and societies acquire the action competence or skills of environmental citizenship - in order to be able to identify and anticipate environmental problems and work with others to resolve, minimize and prevent them;

d) **Attitudes** to help individuals and social groups acquire a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection; and

e) **Participation** - to provide individuals and social groups with an opportunity to be actively involved at all levels in working towards environmental problems (UNESCO-UNEP, 1977 in UNESCO-UNEP, 1989; UNESCO-UNEP, 1994).

Moreover, in 1980s, EE was perceived and understood as means for sustainable development by establishing the World Conservation Strategy in 1980. In the strategy, the "importance of resource conservation through 'sustainable development', and the idea that conservation and development are mutually inter-dependent" were emphasized (Palmer, 1998, p.15). Following this Brundtland report, prepared by World Commission on Environment and Development, focuses on 'Our Common Future', focus on how to reconcile environment and development issues (Palmer, 1998, p.16). According to WCED (1987), people in the world have faced common challenges: alarming population growth, poverty, resource degradation, industrialization and its negative consequences that lead to local, national and global environment problems such as global warming, desertification, deforestation, air pollution and ozone depletion. To overcome these and other environmental problems at local, national and global levels, 'common endeavors' are urged throughout the world through education typically through EE that addresses the marriage between environment and education.

> Education must be improved in quality and in relevance to local conditions....Environmental education should be included in and should run throughout the other disciplines of the formal education curriculum at all levels – to

> foster a sense of responsibility for the state of the environment and to teach students how to monitor, protect, and improve it. These objectives cannot be achieved without the involvement of students in the movement for a better environment.... (WCED, 1987, p.113)

In 1990s, one of the major events in education, typically in EE is the second major conference of United Nation called 'The Earth Summit' held in Rio de Janeiro, Brazil in 1992 (UN, 1992; Rush et al., 1999; UNESCO-UNEP, 1994; Palmer, 1998). In the conference, the role of education for addressing sustainable development was emphasized through integrating environment and development issues. This shows that education for the environment, which is one of the major components of EE, should be integrated in the planning and actual teaching–learning process of the education process. That is why 'Agenda 21' of the conference gives one of its emphasis on developing awareness of the people about their interaction and interference with our environment through education and training.

In 2000s, the role of education for sustainable development laid its base on EE, together with quality basic education (Scott & Gough, 2004; UNESCO, 2005a; Aklilu, 2006).

Generally, the development of EE implicitly shows that there is a gradual improvement in terms of philosophy and components of EE. During its early stage, its component was mainly education about the environment based on the outlook that reality is the same everywhere. Then, the second component, education in and from the environment has been given additional emphasis based on the outlook that reality is subjective and context bound. Finally, in this century, education for the environment, the third component of EE, has been given due emphasis based on the outlook that education should be critical of political, social and economic activities for having sustainable environment that leads to sustainable development. Above all, in this century, due attention has been given integrating the three components of EE (education about, in and for the environment) into formal education curriculum, specifically in different subjects (Palmer, 1998; Scott& Gough, 2004).

Our Environment: One of the Foci Areas in the New Education and Training Policy of Ethiopia

To put societal philosophy into practice in different times, societies have developed different policies. Among these, educational policy is the one that has been given great emphasis having different functions. According to Taylor et al. (1997), the most important functions of educational policy are to organize and manage public calls for change, to provide an account of cultural norms that are considered by the state as desirable in education, and to institute a mechanism of accountability against which students and teachers performance could be measured. One of the definitions of policy also depicts its functions as, " An explicit or implicit decisions or group of decisions which may set out directives for guiding future decisions, or initiative, sustain or retard action, or guide the implementation of previous decisions"(Haddad, 1994, p.4).

Hence, educational planners, educational administrators, teachers typically curriculum experts use the policy document to develop and implement different curricula materials(curriculum guides, textbooks, teachers guides etc.) including their objectives, contents, methods and evaluation techniques at different level of the education system in line with the policy decisions.

In the new Education and Training Policy document, one of the foci area emphasized is relating our education to our environment, practice and development so that it can play its role for all rounded development of our society (FDRE, 1994). In the policy statements, typically in the general and specific objectives, the attempt of giving due attention for our environment is described, as education should: develop individual problem-solving capacity, bring up citizens who can take care of and utilize resources wisely, and who posses national and international outlook on the environment, protect natural resources and historical heritages of the country. This shows that the contents of our education have to include national and global environmental problems. So do the local ones. When these problems are integrated in the development of curriculum materials like curriculum guides and students` textbooks and in the actual teaching learning process, students try to identify and prioritize and try to solve environmental problems at local, regional, national and global levels. As a result, students not only develop problem-

solving skills but also can have positive attitudes to the local, national and global environment by protecting illegal acts and utilizing resources wisely. However, there is a problem of translating the policy objectives into practice in some African countries.

Scholars like Psacharopouls (1990) evaluated the gap between educational policy and the actual practices and failures in some African countries. He identified that:

a) the intended policy was never implemented because the policy intention was too vague and the intention was lip service or a political statement;
b) although there was an attempt to implement, it failed to be completed because prerequisite factors such as feasibility and rejection by the society.
c) although the policy was implemented, it did not have the intended effect due to invalid theoretical model and insufficient information and evidence in the policy development process (pp. 16-17).

Moreover, in most developing countries typically Africans, there is a problem of translating the policy statements into action plans, specifically into curricula materials (e.g. curriculum guides, student textbooks, teachers` guides) and the actual teaching-learning process.

For instance, in Ethiopia, in line with the New Education and Training Policy, a twenty-year education sector indicative plan has been translated into Education Sector Development Programmes (ESDPs: ESDP I from 1997/8 to 2001/2, ESDP II from 2002/03 to 2004/5 and ESDP III from 2005/6 to 2010/11). Each ESDP has its own issues, goals, strategies, crosscutting issues. For example, the main issue in ESDP II and ESDP III is poverty reduction having four major priority sectors: roads, education, agriculture and natural resource, health sectors (ESDP II, 2002 & ESDP III, 2005). However, these program action plans, like the policy statement, do not clearly show the role of education to fight against poverty by consuming, conserving and protecting our natural resources. Further, they do not show how the local, national and global environmental problems should be treated as a subject contents in an integrated manner at different levels of our education. Moreover, the role that education can play to overcome problems in relation to poor agricultural practices and resource management in line with population explosion, and their consequences like deforestation, soil erosion, desertification,

climatic change, poverty, drought, and so forth, is not clearly stated in an integrated manner into education at different levels.

Besides, unlike cross cutting issues like gender, HIV/AIDS, civic and ethical education, special need education, and quality of education stated in the ESDPs, one of the most significant components of sustainable development, our environment is not addressed. Hence, the above issues do not encompass the local, national and global environmental problems to develop students` problem solving skills and the right attitudes to take the right action individually and/ or collectively. This shows that the role of education for sustainable development, education for our environment, might not be given due attention in the ESDPs. However, it has been practised and agreed that education, typically learning, should play its role for sustainable development of a country (UN, 1992; UNESCO-UNEP, 2002; Scott &Gough, 2004). This shows that students` learning not only be affected by the lack of translation of policy statements into curriculum materials and students textbooks but also by the beliefs teachers have about their roles and students' learning.

Teachers' Beliefs about their Roles: Depositors of Knowledge versus Facilitators of Students` Learning

As social philosophy in general and educational philosophies in particular that affect the educational policy and practices in a given country, according to Smith (1990), "A teacher's philosophical beliefs, generally affect what occurs in classroom"(p.91). Specifically, the stand the teacher has like: what to teach (contents, facts or problems or by integrating both), how to teach (using single or varieties of teaching methods), the sources of knowledge (teachers, experts, students, textbooks, the real environment or all), the relationship between teaching and learning, and the interaction between teacher and his students, within students and their environment.

For instance, Walford in Beck and Earl (2000) compared the practice of classroom teaching and learning. Based on the philosophy that children's minds are empty vessels, Thomas Gradgrind stressed, "Now what I want is facts. Teach these boys and girls nothing but Facts. Facts alone are wanted in life. Plant nothing else and root out everything else...Stick to Facts Sir!"(p.36). On the other hand, unlike this passive rote learning, John Dewey (1859-1952)

identified the importance of students` engagement in their learning including "constructive play" and " problem solving" methods in primary and secondary education in all subjects. Walford further showed that Bloom in 1970s tried to address the above individual efforts by identifying three domains of learning: cognitive, psychomotor and affective that invited teachers to use different contents and teaching methods across and within these domains of learning in the teaching- learning process.

To develop students` knowledge, skills and attitudes, the beliefs that the teacher has about the relationship between teaching and learning, and the teacher's and students` roles in the teaching –learning process are indispensable. Freire (1972) discussed the passive role of students` as" Education…becomes an act of depositing in which the students are the depositories and the teacher is the depositor"(p.45). He further listed the attitudes and practices of the " banking concept" of education as: the teacher teaches and the students are taught; the teacher knows everything and the students know nothing; the teacher thinks and the students are thought about; the teacher talks and the students listen; the teacher acts and the students have the illusion of acting through the action of the teacher; the teacher confuses the authority of knowledge with his own professional authority which he sets in opposition to the freedom of the students; and the teacher is the subject of the learning process while the pupils are mere objects ,and so forth(pp. 46-47).

On the contrary, Freire underlined, "Education must begin with the solution of the teacher-student contradiction, by reconciling the poles of the contradiction so that both are simultaneously teachers and students"(p.46). Therefore, not only the teachers but also the students can teach, know something, think, talk, act and be the subject of the teaching-learning process. This can be fruitful when the teacher changes his beliefs from considering himself and/or herself as a source of knowledge to facilitator of students` learning. Above all, this becomes more effective and practical when the teacher learns about effective teaching –learning process through self and /or peer reflections.

A good example is Jantjes' long journey of teaching experiences: 'How Silent was my Voice: Four Decades of a Colored Female teacher Experience' in Morrow and King (1998). In forty years journey of teaching profession, her " passion changed from a desire to learn for

personal growth, to an urge to learn in order to become a more effective teacher to motivate youth and older persons;...showing them that learning is rewarding"(p.163). In doing this, she identified the following realities: First, when she was a child, she learned that "wisdom comes from one's 'brain box'...."(p.164). Next, when she began teaching, she "learned that school knowledge was what certain educators 'told' teachers to teach...I taught that knowledge so well that the children could repeat and know it well....Teaching I firmly told myself, was conveying 'knowledge' to these children..."(p.165). Meanwhile, she realized "...compartmentalizing teaching did not work "(p.165). Then, she also learned, "Teaching is not so much imparting knowledge; it is more about whetting the appetite of the learners, developing powers and moral forces, and exhibiting methods to do so"(Jantjes, 1987 in Morrow and King, 1998, p.166). She further learned, "the aims of teaching involve the development of the character of the learners by the character of the teacher ,and that this development should prepare learners for the service of the society; learners that are thoughtful and progressive guides in whatever act or thought they may be engaged"(Whitehead, 1949 in Morrow and King, 1998, p.166). Finally, she identified the roles of the teacher in the teaching-learning process. He/she should initiate the process of learning, "...the teacher provides the means, or leads the learner to an understanding of knowledge ,not as an end itself, but to enable the learner to become a student who can thereafter gain independent access to any knowledge"(p.171).

Therefore, as Freire (1972) pointed out the roles of teachers in the 'baking concept' of and ' liberating' education, and Jantjes' personal reflections, the teacher` beliefs highly affect students` learning. Typically, Jantjes' lessons showed that being effective teacher do not mean imparting knowledge, knowledge that is developed by educators such as curriculum experts, subject specialists. Rather effective teaching needs to motivate facilitate and lead students` learning. This becomes more effective when the teachers relate education to the real environment of the students. When the teachers invite students to share and /or reflect problems in their environment and to find possible solutions that are related to the topics under discussion, students not only become active learner but also develop problem solving skills and positive attitudes to their environment being the contents they share are problems and the methods utilized may be brain storming, discussion, debate, problem solving and so forth.

In addition to the efforts of individual teachers, according to Lea Filho and O`Loan (1996), teachers should get training on how to integrate and implement EE in their subject areas in both pre-service and in-service programmes. They added that the incorporation of EE in these trainings equipped the teachers to:

a) examine the major environmental issues from the local, national, regional and international point of view,
b) enable students to have a role in planning their learning experiences and provide an opportunity for making decisions and accepting their consequences,
c) relate environmental sensitivity, knowledge, problem solving skills and value clarification to every age but with special emphasis on environmental sensitivity to the students` own community,
d) help students` discover the symptoms and real causes of environmental problems,
e) emphasize the complexity of environmental problems and the need to develop critical thinking and problem solving skills ,and
f) use diverse learning environments and varieties of educational approaches to teaching and learning about and from the environment focusing on practical activities and firs–hand experience (pp. 5-6).

Above all, teachers are not only trained how to teach EE to develop students` environmental knowledge, skills and attitudes but on how to teach for sustainable development of a given nation (Lea Filho and O`Loan, 1996). According to Rush et al. (1999), the relationship between education and environment is the base for the development of EE. This is because EE helps to develop students` holistic development in terms of knowledge, skills and attitude that help them to solve environmental problems and to contribute their share for the sustainable development of their nation.

EE at All Levels of Formal Education: Global, African and Ethiopian Contexts

Even though the practice might vary, EE has been treated in different countries at different levels of education. Some countries treat it as a subject and some others integrate it into different subjects. The state of EE in schools has global, African and Ethiopian dimension although schools everywhere are known to have always been addressing some aspects of

environmental issues through various subjects that make up their curriculum (Aklilu, 2006). He also added that a report published in 1992 showed that 134 UN member states, including Ethiopia, had been conducting EE in one way or another.

For instance, EE was given due attention in USA since 1960s and reached a peak with the implementation of the 'Environmental Education Act 'of 1970. In Britain, it was in 1960s that the role of schools to improve its environment was realized. In general, EE gained emphasis in European countries through 1980s (Palmer, 1998).

Palmer discussed the practice of EE in the formal and non-formal education of fifteen developed and developing countries in the world. These countries are Australia, Canada, China, Ecuador, Greece, Honk Kong, Latvia, Romania, Slovenia, South Africa, Spain, Sri Lanka, Taiwan, Uganda and USA. For instance, at present EE in China is infused in different subjects such as math, social studies, geography, science, nature study, art, and so forth at primary schools. In the secondary level, teachers usually organize their students as geography lovers' group, biology lover's group, etc., to acquire environmental knowledge, to develop environmental skills and attitudes, and to disseminate environmental knowledge by holding exhibitions, lectures or forums on their environmental problems (Palmer, 1998). In addition, teaching methods like discovery learning, problem solving, experimental method, field study and simulation are practised to integrate EE into schools curricula. In short, beside the effort of integrating environmental contents at different levels of the education system of China, some of the right EE teaching methods have been incorporated.

Similarly, because of the ever-increasing environmental problems and the urgent need to address them, the government of Uganda has been developing a National Environmental Action Plan with the aim of providing a framework for integrating environmental issues into the country's overall economic and social development. Moreover, there is a responsible organ for EE in Uganda called National Environmental Management Authority (NEMA) having this power: to take measures necessary for the integration of EE into the school curriculum of education in collaboration with the Ministry of Education (Palmer, 1998). According to this organ, EE be made mandatory in all formal education, and should be taught on the multidisciplinary basis by integrating into the on-going curricula, not as a separate subject.

Above all, EE has research coverage. According to NEMA, research in EE is one of its programme areas that deal with research in EE curriculum formulation, pedagogy, teaching materials development (Palmer, 1998).

Specifically, the assessment made on the integration of EE in East Africa showed that all countries: Ethiopia, Kenya, Zambia, Uganda and Tanzania integrated at primary level and only Kenya and Zambia did at secondary level (Lindhe et al., 1993 in Aklilu, 2006).

More specifically, the report of "The Evaluation of Environmental Education Project in Ethiopia" showed that EE had been given at some primary and secondary schools, and Teacher Training Institutions (MOE, 1992). According to the report, EE was given across subjects like biology, geography, agriculture and home economics. Moreover, there were encouraging results observed: students began applying the knowledge they gained in classroom practically; schools became parts of the nearby community by addressing its current problems in project areas.

Generally, EE has been practiced in schools in the world as subject, interdisciplinary model or across different subjects, in a multidisciplinary model.

Models of Integrating EE into School Subjects

In order to make education relevant to the lives of students and the society, problems and issues of our environment should be integrated across the curriculum. According to Clarke and Agne (1997), "Problem based curricula engage students in proposing solutions to problems that are real for adult community as for any group of high school students"(p.210). Above all, nowadays, EE should be integrated to different subjects to make learning relevant for students' lives in particular and to addressing the needs and problems of the present society. They discussed the importance of integration of subjects in the teaching –learning process as "Most problems and experiences are interdisciplinary in nature; and we use multiplicity of skills to learn from experiences and to solve everyday problems, no matter how simple or complex they may be. The emphasis in school on subject matter serves only to make school irrelevant to students ,who see little connection between what they learn in school and they do outside of school"(pp.133-134).

However, "...many of the components of curriculum in education reflect only the goal for learners to acquire knowledge and cognitive skills "(UNESCO-UNEP, 1994, PP. 8). Hence, the integration of EE into different subjects makes the curriculum materials as well as the teaching -learning process, relevant to the lives of students and the society. In doing this, there are two models of integrating EE: interdisciplinary and multidisciplinary (UNEP, 1994).

On the one hand, interdisciplinary model deals with integrating issues from different disciplines to make a single subject, EE. On the other, multidisciplinary model deals with integrating EE into different subjects (UNESCO-UNEP, 1989; UNEP, 1994). The two models are adapted in the following diagrams respectively.

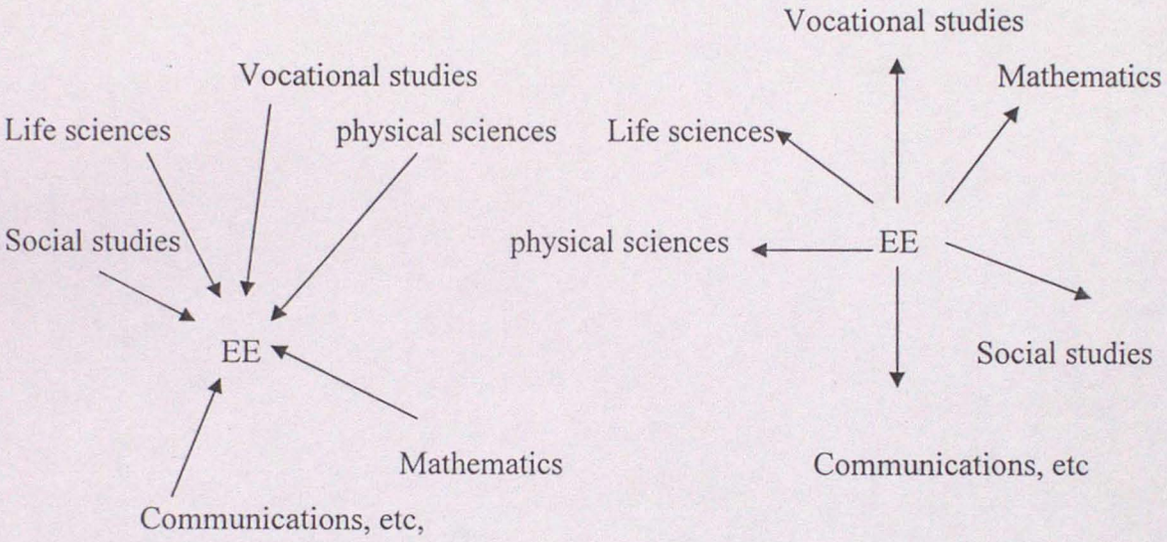

Figure 2.1: Interdisciplinary versus Multidisciplinary Models of Integrating EE, (UNESCO-UNEP, 1989; UNEP, 1994).

However, besides these models, adding special unit is an additional approach to integrate EE into different subjects or curricula materials like curriculum guides and students` textbooks. Nevertheless, it does not help to integrate EE in each units of a given subject fully (UNESCO-UNEP, 1987 in Dessalegn, 1998).

Each model has its own merits and demerits (UNESCO, 1989; UNSECO-UNEP, 1994). For instance, interdisciplinary model needs additional time in to" an already crowded

curriculum." Multidisciplinary model needs more trained teachers, and skills of integrating EE into the existing subjects in the school curriculum. However, "multidisciplinary infusion could allow students to apply EE concepts and problem solving skills in a great variety of situations over a long period of time" (UNESCO- UNEP, 1994, P.11). Moreover, many scholars recommended that developing countries, where there is crowded timetable, be advised to use multidisciplinary model that allows the incorporation of EE to the already existing curriculum materials or subjects. In addition, interdisciplinary model, which is not totally ignored, is appropriate "for higher levels and or where greater depth of comprehensive is desired" (UNESCO-UNEP, 1994, P. 21).

Peculiar subjects to Integrate EE. EE can be integrated of all levels of education in all subjects. However, there are peculiar subjects like biology and geography that include most of our environmental issues such as people interaction and interference with their environment (Dufour, 1990; Aklilu, 2001; Aklilu, 2006). In addition, biology and geography are among the most important subjects chosen to integrate EE in Ethiopian Secondary Schools and teacher training Institutions during EE project practiced in some areas for six years (MOE, 1992).

On the one hand, biology enables educators typically curriculum experts and teachers to show the relationship between and within living and non-living things. How the life of one living and /or non-living thing is dependent on the others. The importance of biodiversity and factors that threat is best dealt in biology. Typically, the necessity of keeping the balance of the ecosystem by utilizing and protecting plants and other living and non-living things in this world is also addressed in biology. So do how green plants can balance the amount of oxygen and carbon dioxide in the atmosphere, and the consequence of the inference and interaction of people to fulfill their daily subsistence can be best treated in biology. According to Institute of Curriculum Development and Research ([ICDR], 2004), grade 9 and 10 biology curriculum guides have "integrated societal issues that are related to environment, population, health and disasters"(p.3). However," The teaching of biology in our senior secondary schools is found to be subject-matter-centered although the biology curriculum claims to follow the inquiry model....teachers` unfamiliarity with the inquiry approach is one factor for the prevailing weakness"(Temechegn, 2000, p.19).

On the other hand, although biology and geography subjects have common contents that can be treated in the teaching-learning process, geography, like biology, has its own peculiar issues: the relationship people with the physical environment; the number of people and resource available in the planet Earth, the effect of population growth on natural resources such as soil, forest, water, air; climate and weather. In addition, the economic practices of the world such as agriculture, industry, fishing, and their positive and negative consequences can be best addressed in geography. So do the social and political interaction of people and its effect on plant Earth.

Moreover, according to Aklilu (2001), geography is not only very important to address the relationship between people with their environment, but also to develop students' environmental awareness and skills in the present and future. To effectively address environmental issues or problems created by people's interaction and/ or interference with their environment, the subject geography should emphasis on: " perception of the environmental hazards: mechanisms for adjustment to environmental hazards; degradation of the availability of human and natural resources; degradation of the physical environment; high technologies and their impacts on the environment; and development of technologies that benefit the environmental conditions of the under -developed world" (Mekete, 1996 in Aklilu, 2001, p.64).

Even though geography has been given as a subject in Ethiopian school since 1965 (Kedir, 1994 in Aklilu, 2001), nowadays, it has been given great attention to address environmental issues and problems that lead to sustainable development in Ethiopia (ICDR, 2004). This is stated in the Geography curriculum guides of Grade 9 and 10. In these documents, some of the outlined contributions of the revised geography curriculum are to:

- develop the intellectual capacity of the students by elaborating spatial relationships and peoples` interaction with their natural and social environment;
- help students to understand the impact of human activities on the environment, consequences and remedial measures; and
- assist the students to understand population–resource balance and the links between people, the environment and sustainable development (pp.1-2).

In general, even though EE can be integrated in all subjects, because of the convenience of biology and geography to address environmental issues and problems, different scholars and organizations witnessed that they are peculiar subjects to integrated EE (Aklilu, 2006; MOE, 1992; Chi Kin Lee & Williams, 2001).

Factors Hindering to Integrate EE into School Subjects

The integration of EE in developing countries has been affected by many factors such as the absence of strategic framework/guiding document and responsible unit. Educators such as policy makers, curriculum experts and teachers should address these factors. In addition, lack of trained teachers on how to integrate local, national and global environmental issues in the actual teaching-learning process has also great effects. The consequences of these problems are stated by 'A comparative survey of the Incorporation of EE into School curricula by UNESCO-UNEP (2000) as

> trends in EE in the school curriculum, particularly in developing countries is confronted with problems of having to deal with a curriculum area which is relatively new and not well defined..... Further, the element related to environmental concepts are so diffused and scattered in the curriculum that their identification becomes difficult. Due to these factors, there is no easy and clear-cut source of information about the exact status of EE in the school curriculum of most countries. (p.22)

This shows that every country has to have strategic framework, guiding document and EE unit that facilitate to address environmental issues and problems by integrating into school subjects, according to the priority areas of a given country (MOE, 1992; MOE, 195; Palmer, 1998; Scott & Gough, 2004). Among the factors, conceiving that curricula materials should include facts, and teachers do not get the right training are discussed.

Conceiving Curriculum as a Fact. Different educators (e.g. policy makers, curriculum experts, and teachers) conceive curriculum as the accumulation of facts (Scott and Gough, 2004). The problem lays on the ability of educators in selecting and synthesizing different philosophy of education that focus on facts, problems, and societal issues separately. Barrow and woods (1988) underlined, "One of the main problems facing as far as curriculum matters are concerned is the problem of selection. What we want is a principle or principles, by virtue of which we are in some way peculiarly relevant to education, those things that ought to be studied, taught, and

learnt, in schools, colleges and universities"(p.21). To overcome these problems, attempts have been made in developing different curriculum issues. Nowadays, there are three different curriculum issues: curriculum as a fact, curriculum as practical and curriculum as critical theory (Scott & Gough, 2004; Chi Kin Lee & Williams, 2001).

To them, technical curriculum highlights the process of pre-specifying behavioral objectives, and then delineates the specific subject content and instructional strategies that should be employed to produce those behavioral outcomes. According to this view, knowledge perceived as a commodity that is created by experts and transmitted by teachers to their students, rather than being constructed from the interactions between a teacher, students and materials in their own real context. The texts for instruction are the pre-existing sources of authoritative knowledge and the dominant curriculum concern is subject content. Such technical curriculum theorizing tends to support education about the environment (Scott & Gough, 2004; Chi Kin Lee & Williams, 2001).

Practical curriculum theorizing stresses the subjective meanings participants attach to their actions, especially their social interactions. And it is based on the assumption that the student is recognized as an active participant in the production and verification of meaning, rather than a reproducer of understandings developed by others. In this model, teachers are identified as facilitators and organizers of experience in the environment. The texts for instruction are the pre-existing sources of guidance about environmental experiences and the dominant curriculum concern is the process of teaching and learning. In this model, curriculum is viewed as something 'practical', created in the interactions among teachers, students and educational materials in the real environment (Scott & Gough, 2004; Chi Kin Lee & Williams, 2001).

In the critical curriculum perspective, knowledge is perceived as being socially constructed and the role of education as being to enlighten and empower individuals, particularly those who are disadvantaged or oppressed because of their race, class, or gender. Individuals are encouraged to engage in critical reflection on their experiences and actions with a focus on the critical analysis of the students' situation that is embedded in political, economic and cultural

ideologies in society. Teachers are defined as collaborative inquirers whilst students are perceived as active generators of new, working knowledge. Critical curriculum theorizing finds its support in education for the environment (Scott & Gough, 2004; Chi Kin Lee & Williams, 2001).

However, treating these curriculum issues individually has their own typical limitation. Hence, to overcome the problems of each issue, they should be seen as an integrated whole: education about the environment (technical), education in/through the environment (practical) and education for the environment (critical). These are the basic components of EE. Such a holistic approach should take fully into account the following propositions: EE is not a subject in itself but rather a function of education with a content that is drawn from across the whole of the school curriculum; investigation of environmental issues should range from local, regional, national to global scales; integration of education about, in and for the environment is required; EE should encompass the whole development of environmental awareness, knowledge, values, responsibility and action(.Sterling, 1990; Tilbury, 1995 in Chi Kin Lee and Williams, 2001).

Even though the above curriculum issues were treated separately in EE before, in the twenty first century, the principle of EE integrates education about the environment, curriculum as a fact; education in and from the environment; curriculum is as a practice; and education for the environment, curriculum as critical of social and other aspects (Scott & Gough, 2004; Palmer, 1998; Beck & Earl, 2000; Chi Kin Lee & Williams, 2001). This needs not only trained curriculum experts but also trained teachers in line of the present integrated philosophy of EE to make the planning and implementation of the teaching and learning process effective.

Not Training Teachers How to Integrate EE. Teaching integrated curricula materials, typically that incorporate EE needs flexible roles, an all- round knowledge of the subject matter in an integrated manner and the use of different teaching methods to make students active in the teaching learning process. This is because the three components of EE (education about the environment, education in the environment and education for the environment) necessitate different roles of the teacher. She /he may act as a source of knowledge, facilitate of learning and participant in the learning process simultaneously. Applying these roles in the actual teaching and learning process within a period needs the right training. Otherwise, although

curriculum materials such as curriculum guides and students textbooks might incorporate EE, there will be a huge gap in the implementation process.

According to Palmer (1998), the gap of the implementation of EE in school curriculum in the education practice of different levels is observed because the process of learning, the source of knowledge ,contents and teaching methods of EE create "for most teachers a conflict with their approach of teaching -learning" (P. 96). Moreover, to achieve the goals and objectives of EE, the contents and teaching methods of EE might not be related with the existing subject based curriculum in schools. Palmer (1998) also underlined that

> there are fundamental curriculum and pedagogical contradictions between environmental education and schooling. The goals, principles and guidelines of environmental education... suggest a particular orientation of curriculum and pedagogical practices in which students engage individually or in groups in problem-solving, action-based activities.... In contrast, however, school curricula tend to be discipline-based and emphasis abstract theoretical problems. 'The common curriculum emphasis can be described as the mastery of many fragmented facts, concepts and simple generalizations organized loosely within discrete bodies of fields of study. The predominant pedagogical process involves the teacher as dispenser of factual knowledge. (pp. 96-97)

These contradictions can only be solved, and the integrated curriculum materials become fruitfully implemented when teachers get the right training: how to be flexible actors or actress in the teaching and learning process, use different teaching methods in isolation or in combination to develop students' knowledge, skills and attitudes as a whole by engaging them in learning facts, identifying problems, and finding solutions and criticizing social, economic and political aspects of a given country.

What Research Findings Say on EE

In line with the practice of EE at global, African, and Ethiopian contexts, different researches have been done on the role of EE to develop students' environmental knowledge, skills, attitudes and practices. The contents and teaching methods of EE have also been assessed to evaluate the achievement of the goals and objectives of EE.

Globally, UNESCO-UNEP (2000) surveyed the incorporation of EE into school curricula in both developing and developed countries comparatively. The result showed that EE was not

well treated in the curricula of developing countries. As a result, elements of EE were found in the curricula of developing countries inappropriate fashion.

EE Contents and Teaching Methods. The contents of EE are the living and non-living things in the planet Earth plus the local, national and global environmental issues and problems observed by the interaction and interference of people with their environment. However, according to UNESCO-UNEP (1994), these contents might vary from nation to nation, and from school to school. That is why Aklilu (2001) recommended contents that can be incorporated in geography syllabi in global and Ethiopian contexts. Globally, issues like natural resources(water, air ,land) and their kinds(renewable and non- renewable), use of natural resources and their contributions for sustainable development, and energy as typical resource, its contributions and effects to development versus alternative energy sources are recommended to be developed in geography syllabi. In Ethiopian context, the contents recommended are natural resource base, natural resource degradation (extent, causes and consequences) and measures to be taken, and energy and development. This shows that global and our real environmental problems should be integrated not only in the curriculum guides of the subject geography but also in the actual teaching-learning process.

According to UNESCO-UNEP (2000) survey study on the incorporation of EE into schools curricula, EE contents focus on present and future environmental problems and issues. In the study, it was also found that the contents of EE at secondary education, for instance, included local, national and global environmental problem; they were also value oriented: the need to adjust life style, need for population control, need to balance development and resource consumption ,and individual responsibility for protecting his or her environment. Moreover, contents and learning activities were community oriented where teachers, students and parents participated and have to participate actively.

Because the goals and objectives of EE focus on relating education to our real environment, the contents should focus on our problems such as global warming, poverty and its causes, land degradation, soil erosion, water pollution and other environmental problems in general that hider sustainable development in our country and the world as a whole.

In addition to having relevant contents, appropriate methods are required to acquire and develop the necessary knowledge, skills, attitudes and values to make students not only inheritance, but also participant and contributors to overcome our individual and societal problems at large. Being methods are ways that the intended outcomes of education are met, the objectives of EE cannot be achieved without utilizing different methods of teaching and learning. Research findings and recommendations of UNESCO-UNEP (2000) suggest that EE teaching methods can be applied in isolation and / or in combination. They are problem solving, experimentation, field studies, projects, simulations and role-playing, brainstorming, discussion and debate, surveys and case studies.

Specifically, Beletu and Yosef (1990) showed that poor teaching methods, which focused on transmission of facts, were utilized to teach biology and geography before the introduction of EE in some Ethiopian schools curriculum. Hence, they discussed that learning from the environment, problem solving and interdisciplinary ways of teaching were forgotten. Above all, Tilbury, Coleman and Garlick (2005) found that learning for sustainability is not solely about integrating new contents into the curriculum, it is also challenging teaching and learning approaches. Besides teaching methods that contribute to the development of students` environmental knowledge, skills and attitudes, place of residence has its own line share for the development of students` environmental knowledge and attitudes (Chi Kin Lee and Williams (2001).

Evaluation Techniques. Although the methods of curriculum evaluation include teacher-made tests and examinations and informal devices (classroom observations, examining pupil's record and checking their projects), here it is focused on the methods of evaluation given in the curriculum document such as curriculum guides and students` textbooks. The key questions are whether the designed techniques in these documents (exercises, projects, questions…) are appropriate to evaluate whether the desired outcomes of EE are achieved or not particularly in an integrated curriculum. For Rush et al. (1999), evaluation on the achievement of the desired EE or interdisciplinary approach education objectives are based on:

a) **Interdisciplinary nature** -checking whether students` learning help them to see the interconnectedness of the environment,

b) **Behavior change**-tests were devised that measure the students' ability: to handle complexity such as evolution and change; to predict and evaluate consequences of an action; inclination towards the assumption of responsibility; and positive attitude towards the planning of the environment,

c) **Critical thinking**-do the learning enables students to explain, interpret and take action by having the following qualities: doing, knowing and being; knowledge, judgment and wisdom; and goodness with correctness with quality? (pp. 80-83).

Moreover, as the characteristics of EE include interdisciplinary nature of its contents, problem centered approach, value oriented nature, community oriented strategies, and student initiated activities and investigations, the usual paper-pencil tests that focus on cognitive domain are inadequate to evaluate EE (UNESCO-UNEP, 2000). Since, the objectives of EE integrate the three domains of learning, the outcomes psychomotor and the affective domains might not be evaluated using these tests. Rather, the right evaluation techniques like observation, awareness test, rating scale, personal reflections and reactions are recommended to identify students' attitudes, problem solving skills and participatory behavior (UNESCO-UNEP, 2000).

In short, an evaluation enables educators such as curriculum experts and teachers to check how much the objectives have been achieved. This in turn helps them to reassess and plan the right contents and teaching methods in the documents during curriculum revision and/ or in the actual teaching and learning process.

EE in the Ethiopian Schools

The incorporation of EE into the formal education system (primary and secondary schools, Teacher Training Institutions) of Ethiopia was witnessed in the report of 'An Evaluation of Environmental Education Project in Ethiopia '(MOE, 1992).The evaluation result showed the attempt to integrate EE had been made across some subjects like biology, geography, home economics and agriculture. And students, typically at secondary and institution levels found active participant by applying theoretical knowledge learned in the class practically. They were active participant in making terracing, developing seedlings, planting trees in the deforested areas, producing fruits and vegetables, and greening their school compounds (MOE, 1992).

Above all, according to the report, students at Combolcha high schools, for instance, did an encouraging experiment based on the local water pollution in their biology lesson.

Furthermore, after the introduction of the New Education and Training Policy, EPA (2003) reported that EE was integrated at primary level first cycle (1-4). On the other hand, Abera (2004) evaluated the implementation of environmental science syllabi of this level in Illubabur using descriptive survey. In doing so, his data sources were teachers, students, principals, department heads, woreda school supervisors and the region's curriculum experts. From these sources, 706 students and 36 teachers were randomly chosen as a sample. From the sample and key informants (principals, department heads, woreda school supervisors and the region's curriculum experts), the data were collected through questionnaire, observation checklist and interview. The data collected through these instruments were analyzed using chi-square, t-test and percentage. The result showed that teaching methods that are more relevant to environmental science syllabi such as field trip, song, play had been given less emphasis, and most of the teachers (88.2%) did not get pre-service and/ or in- service training to teach the integrated materials.

Moreover, Abishu (2002) tried to assess the place of EE in second cycle primary school curriculum (5-8) in Oromia using descriptive survey and content analysis. To achieve this, his data sources were students, teachers, science, and social study textbooks. Among these, 96 teacher and 73 students, and 50% of the chapters from the textbooks were chosen as sample of the study randomly and purposefully respectively. From these samples, the data were collected using coding sheets, questionnaire, focus group discussion and checklist. The data collected by these instruments were analyzed using percentage and triangulation. And the result showed that :environmental elements(e.g. vegetation, land, wildlife, air and the interaction of man with natural environment) were found in both textbooks; environmental problems such as clearing of natural vegetation, land degradation, overpopulation and erosion were found in these materials although their degree of presence vary; a particular topic was found in both grade five and six science books, which treated environmental issues; there was no particular topic that treated environmental issues in the social study textbooks; only 33.2% of the evaluation items developed in these materials focused on evaluating environmental knowledge; and only 4.2% o the items could help to evaluate practical activities.

Like at the primary level, there are some researches done on EE or related to EE. For instance, Dessalegn (1998) tried to identify students` practice of disseminating EE into the community in East Wollega zone. To accomplish this, he used descriptive survey taking students, homeroom teachers, deputy directors, unit leaders, and EE club leaders of grade 11 in the zone. 233 students among 1111 ones were selected based on their grade ten achievement, and all their parents were included in the study. In addition, 23 teachers and the other mentioned sources were taken as a sample and as key informants respectively. The data, from these samples, were collected through questionnaire, interview and documentary analysis. Data collected through these instruments were analyzed using mean, range, percentage, t-test and correlation matrix. Moreover, his findings showed that: the main sources of EE for students were subjects taught in schools. But these subjects were found having inadequate EE contents that invite field work and students` interaction with the nearby community; EE club member students were found more competent on the awareness test, and having more favorable attitudes to the conservation of natural resources than non-club students; rural students' showed more favorable attitudes than urban ones; and it was found that there was a positive significant correlation between students` awareness and practices

Aklilu (2001) assessed students' awareness and views about natural resource degradation and famine in Ethiopia. In doing so, he used document analysis and survey taking 433 grade eight and 492 grade 11 students, and 243 trainees from Awassa Teacher Training Institute as a sample from South Nation and nationalities. He collected data from the samples using awareness test and attitude scale, and analyzed using percentage and t-test. The objectives and contents of grade 8-12 geography textbooks, teachers` guides and syllabi were also analyzed. Finally, he found that: objectives developed in the teachers` guides did not address skills for protecting and using natural resources wisely; geography syllabi and textbooks of grade 8-12 did not incorporate environmental problems and issues as they could; there was a significant difference in students` awareness about natural resources use and management as their grade level increased; students were found having positive attitudes to natural resources; male students were found better achiever in awareness test than female. So did in their views about famine in Ethiopia; and there was no as such big difference identified between male and female students in using and managing natural resources. So did between science and art students.

Kassahun (2006) also studied on 'Population and Environmental Education in Ethiopia: A Case Study of North Gondar'. He researched the awareness of students and teachers about the effect of population growth on environment, and the place of population and EE in subjects like geography, biology, history and civics. To achieve these objectives, he used cross-sectional survey taking 200 students and 45 teachers chosen randomly as a sample. Although the instruments and data analysis techniques were not stated in the abstract, his finding stated in the abstract showed that "...population and environmental education has not been received due attention in the present curriculum in the way that help the ongoing efforts to change the prevailing situation of high population growth and its effects of environmental degradation"(p.32).

At teacher training level, Melaku (1994) tried to investigate the integration of EE into social study courses in some selected TTIs in Ethiopia. To achieve this objective, he used descriptive survey taking trainees, instructors and social study curricula materials as data sources. From four TTIs chosen purposefully, 321 trainees and all social study instructors were taken as samples of the study. From the samples, data were collected using achievement test, attitude scale, interview and document analysis, and analyzed using percentage, mean, standard deviation, analysis of variance (ANOVA) and inter-correlation matrix. Having analyzed the data, he found that: EE was not integrated in line with its objectives and teaching methods; there was no typical topic or EE teaching methods incorporated in geography and history syllabi; almost half of the trainees was found having poor environmental knowledge; and most of the trainees was found having very high favorable attitude to EE, environmental problems and the environment in general.

Besides researches done in environmental science, EE and environment related aspects at primary, secondary and TTIs levels, Fitzgerald (1994) studied the role of EE to overcome problems in relation to famine in Ethiopia. The result showed that the education system influenced the potential of EE "... to reduce people's vulnerability to famine"(p.135). This was because of the nature of the curriculum (centralized) and the pedagogical training teachers got. To him or her, on the one hand, being the centralized curriculum was assessed by national examinations; it did not motivate teachers to adapt their contents and teaching methods according to the local context and environment. This encouraged the rote learning of

information. On the other hand, the training that teachers got was "academically rather than practically oriented, stressing the academic content of subjects rather than teaching methodologies ....because they have no experience of learning by doing or learning through discussion, project work and so on, they lack the confidence to develop teaching styles which encourage problem formulation and problem- solving skills in their students"(p.125).

In a general way, Amare and Temechegn (2000) assessed the history of education and its role in Ethiopia on "Education in Ethiopia: A Development Perspectives". They discussed the perception of educators had and have had before and after the New Education and Training policy to the role of education for social and economic development of Ethiopia. Addressing the poor contribution of the curricula material of our education, typically their contents and teaching methods, they reflected their observation as "...creative, innovative and problem–solving graduates were rarely observed in the Ethiopian context"(p.104). According to these scholars, if education is expected to play its role for the social and economic development of Ethiopia, they recommended that we should: use knowledge for improving the life of the farmers and the urban poor, improve the quality of textbooks in addressing issues of food insecurity, relate the school curricula to social issues and immediate local concerns, identify the contribution of education to rural and national development, strength the school curricula to provide education that integrates the science-technology-society-environment interface, improve the quality of teaching and learning strategies in developing students` problem solving skills ,and make our education that enable students to appreciate truth, nature and the environment(Amare & Temechegn, 2000).

However, as found by different researchers and discussed before, to make these recommendation practical, EE, which interrelates education about the environment (empirical knowledge), education in the environment (aesthetic elements and skills to identify and solve our rural versus urban or local versus national problems) and education for the environment (attitudes plus actions to solve such problems), should be integrated in our education. Not only EE helps to incorporate the cognitive, psychomotor and affective domain, but also it invites both teachers and students to use dynamic teaching and learning methods (problem-solving, project, discussion, field study, etc.) beside the traditional ones (lecture, demonstration, etc.).

In summary, different scholars have researched on the influence of EE into students` knowledge, skills and attitudes. Bartosh (2003) identified that student in schools where EE programmer ran, were found achieving the highest scores compared with students where EE did not run. On the one hand, like the usual thinking, environmental knowledge and attitudes have direct relationships (Stamm & Bowes, 1972; Cohen, 1978 in Melaku, 1994). In addition, the integration of EE into the curricula materials and the actual teaching-learning process brings change in students` environmental knowledge, attitudes and behaviors (Leeming et al., 1993 in Chi Kin Lee and Williams, 2001; Ehrampoush &Baghiani Moghadam, 2005). Further, students` environmental attitudes can be developed if the affective domain is properly treated (Iverson, 1976 in Melaku, 1994) together with the cognitive and psychomotor ones.

On the other hand, some research findings contradict this trend. Knowledge alone cannot develop students` environmental attitudes and students who have positive attitudes to their environment may not necessarily have good environmental knowledge (Kinsey, 1979 in Melaku 1994; Makki, Abel-El-Khalick & Boujaoude, 2003). Moreover, students` positive attitude to their environment can be developed from experiences, from their place of residence (Chi Kin Lee and Williams, 2001). Above all, " A meta –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 in Chi Kin Lee and Williams, 2001).

Above all, the findings of Yencken, Fien and Sykes (2002) on the best way to prepare young people for the task of sustainability showed that learning: remained that separated cognitive from affect and behavior; did not give students the opportunities to relate the health of people to the health and sustainability of ecosystems. In addition, they identified that only rarely have students been asked to reflect upon the impacts of their activities, and those their families and the society on the functioning of ecosystems, and cognitive and practical skills for practising sustainability are mostly ignored in school curricula. They also recommended that reorienting education for sustainability not only achieved by changing the objectives, contents and teaching methods of each subject or the whole subjects, but it also requires reforming the curriculum design, assessment and teacher education. This shows that integrating EE objectives, contents, teaching methods and evaluation techniques alone is not suffice to prepare

students to play their best for sustainable development of a given nation. Teachers who are the main actors of the teaching and learning process should also get training in line with the reform made in pre-service and in- service programmes.

Chapter 3: Research Methods and Design

The primary objective of this research was to assess whether EE was integrated into grade nine and ten geography and biology curriculum guides and students textbooks towards sustainable development. To achieve this objective, the methods employed were content analysis and descriptive survey. The curricula materials of both grade 9-10 biology and geography curriculum guides and students' textbooks were assessed using content analysis, and the actual teaching and learning process using descriptive survey.

Fraenkel and Wallen (2000) stated that "Content analysis as a methodology is often used in conjunction with other methods"(p.470). They further discussed that content analysis is used to analyze curricula materials like textbooks, essays, novels, articles and so forth. Content analysis requires selection of unit of analysis and development of categories (Berelson, 1952 quoted in Amare, 1998; Mwiria & Wamahiu, 1995; Fraenkel & Wallen, 200).

According to Lewy (1977), to perform content analysis, the first step has to be defining a series of relevant categories based on consistently applied rules to eliminate analysis in which only materials supporting the researcher's hypothesis are admitted as evidence. Moreover, categorization is perhaps the most important part of the analysis because it is a reflection of the theory or hypothesis being tested (Kerlinger, 1986). Regarding this, Amare (1998) discussed that many curriculum evaluators have often used categories that demand descriptive, inferential or evaluative coding systems, and some of the frequently used categories are content (relevance of ideas, methods, and materials), coverage (knowledge, skills and attitudes) and so forth. Moreover, categories created by other professionals are also helpful if attention to three important points is given: categories must be pertinent to the objective of the study, should be functional and must be manageable (Amare, 1998). Based on this evidence, three categories were developed by the researcher and employed in the coding process. The categories are:

a) The integration of EE objectives into the curriculum materials. These are knowledge, skills, attitudes and participation
b) The integration of EE contents and teaching methods. This includes education about, for, in or from the environment, and

c) The integration of EE evaluation techniques that help to evaluate knowledge, skills and attitudes.

In addition, to code the right data using the categories developed above, the researcher need to specify the unit of analysis. The unit of analysis can be words, sentences, phrases, paragraphs, unit of book(s) or the entire book (Amare, 1998; Kerlinger, 1986). In line with this, the researcher chose three units of analysis. To assess the integration EE objectives, the objectives developed in both the curriculum guides and students' textbooks were taken as unit of analysis. To assess whether the three components of EE integrated in the materials, the contents presentation (education about and for the environment) and teaching methods developed in line of the contents were coded by taking the whole unit as unit of analysis. Finally, to assess the integration of EE evaluation techniques, the evaluation items developed in the materials were taken as a unit of analysis.

Besides, descriptive survey was employed to collect information about the popularity or success of a program or to evaluate the effectiveness of teaching and learning process in schools (Fraenkel & Wallen, 2000; Mwiria & Wamahiu, 1995; Cohen & Manion; 1994; Van Dalen, 1979).

Research design. Nowadays, there are three major research approaches: quantitative, qualitative and mixed (Creswell, 1994, 2003). To him, the choice of one from the others depends on three major factors: the research problem, personal experiences of the researcher and the audience. In line with these factors, the researcher chose mixed approach. This is the appropriate approach when the researcher tends to base knowledge claims on pragmatic ground, consequence- oriented, problem-centered and so forth (Creswell, 1994, 2003). As the purpose of this study is to assess the integration of EE into selected secondary school subjects toward sustainable development in line with our education policy, mixed approach also chosen for triangulating findings, elaborating on results, discovering contradiction (Greene et al., 1989 in Creswell, 1994, 2003). In line with the objective and the research approach, a model was adapted.

Model and Framework of the Study

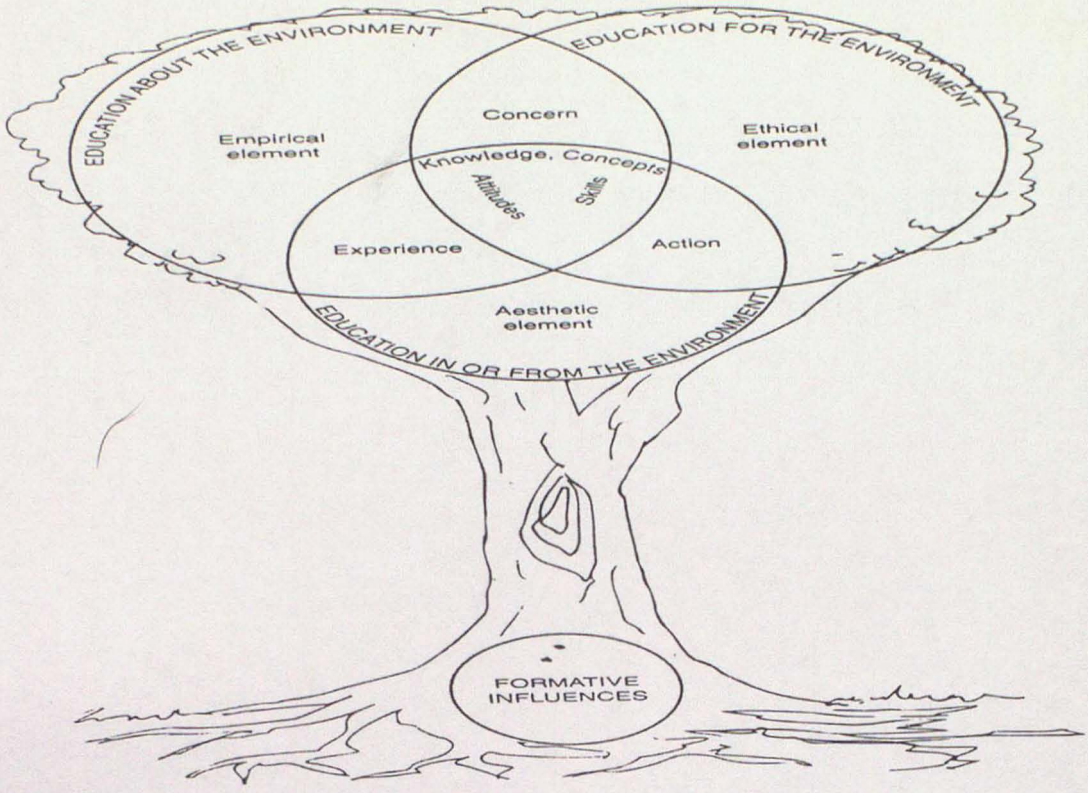

Figure 3.1. A Dynamic Model of Planning and Implementing Environmental Education, Adopted from Palmer (1998)

To make the rationale of assessing the integration of the three components of EE (education about, for, in or from the environment) into curricula materials and the intended outcomes, knowledge, skills and attitudes explicit, Palmer's (1998) dynamics model of planning and implementing EE in the twenty- first century was adapted.

Data Sources

To achieve the objectives of this study, students, teachers, the policy document grade nine and ten biology and geography curriculum guides and students` textbooks were the main sources of the study.

Moreover, ICDR biology and geography experts, MOE education programme and Teachers Professional Development expert, school principals, and EPA EE expert were also consulted for information.

Sampling Techniques

The site of this study is North Shoa zone, in Amhara Regional Government State, which includes twenty woredas. In the zone, there are fourteen secondary schools excluding the newly opened one because they only begin teaching grade nine. Among fourteen secondary schools (9-10) at North Shoa, four of them (28.6%): Molale, Debre Birhan, Debre Sina and Mehal Meda were chosen using purposeful sampling. The researcher decided to employ purposeful sampling for selecting these schools was due to the following reasons:

- The schools are not evenly distributed in the zone. Therefore, the researcher would like to include schools which have urban and rural features, and
- For convenience in terms of time, cost and access to transportation to collect the required data sufficiently.

Regarding this, Babbie (1973) advised that the researcher can select his samples based on his own knowledge of the population, its elements, and nature of his research aims.

Regarding students, being their number was large and unmanageable; they were chosen randomly from 2006-2007 academic year grade nine and ten students from the sample schools. Their sample size was determined using sample size formula (see Appendix I). Using the formula, from the population of 13,001 students in the four schools mentioned above, the sample size was 373 at 95% confidence level and 5% sampling error. This is almost similar with the number of population and sample size determined by Kerjcie and Morgan in Cohen, Manion and Morrison in 2000. To make the sample representative from the four schools, stratified sampling technique was employed (see Appendix J). Furthermore, regarding curricula materials, since the units in each subject are manageable in line with the categories developed and unit of analysis determined, all units were included.

Finally, four principals, 23 biology, and 17 geography teachers in the four schools were taken as a whole because they were manageable in size. However, 19 biology and 14 geography teachers were participated in the study. Because some were not found in their schools, and some were not volunteer to participate during data collection.

Data Collecting Instruments

Preparation of the Instruments. In this study, coding sheet, criterion referenced test, Likert-type scale, observation checklist and structured interview were developed to collect the right data from the curricula materials, the students, teachers and other key informants at different levels.

Coding sheet. Coding sheet was developed based on the categories identified to assess the integration of EE elements in line with each category: EE objectives, contents and teaching methods, and evaluation techniques (See Appendix B).

Criterion- referenced test. It is very difficult to get standardized test to measure students` knowledge or skills. Typically, to measure students` environmental knowledge where environmental problems and issues are different in degree of seriousness and type, although there are global ones, a researcher might not use an achievement test developed for American and European students. Therefore, the researcher might be forced to adopt if there is a test developed in the same context, develop himself or herself, or invite subject area specialists by telling them his or her purpose and study area covered (Cranton, 1976; Shycoft, 1979; Wiersma & Jurs, 1985). In line with the steps of constructing criterion-referenced test, grade nine and ten biology and geography, teachers were requested to develop the items based on the objective of the test defined by the researcher to measure students' environmental knowledge. The first properly produced test contains 26 questions. After it was tested on 39 students, 24 male and 15 female at Debre Brihan Secondary School, the items were refined based on the pilot result and comments from both the subject teachers and students.

Before the administration of the final test version, which contained 20 items, was translated into Amharic by English and Amharic teachers holding their MA. Then, the researcher made discussion on the translated version and agreement was reached. Before the test

was administrated, teachers were asked to set standard in line with their experts knowledge about their students` knowledge, and this is advised by Shycoft (1979), and Wiersma and Jurs (1985). And the cumulative standard from the four schools was computed and found 70%. Together with this test, the researcher developed four open-ended questions to assess students' problem solving skills and their participatory behavior. As the same time, to identify teachers` knowledge of EE objectives, contents, teaching methods and evaluation techniques, and the training and workshop they got to implement the curricula materials developed, open-ended questions were developed (see Appendix C).

Likert-type scale. To identify students' attitudes to their environment, especially in utilizing and protecting it, 24 attitude items were developed based on Likert-type scale ranging from strongly agree to strongly disagree. The items were worded both positively and negatively. After the pilot study, they were condensed to 19 items based on the pilot study result and comments given. Like the criterion-referenced test, the attitude items were also translated into Amharic to facilitate students` understanding. Likewise, to assess teachers attitude to EE, the teaching and learning process and their roles in the school and community, twenty items were prepared on the same manner that of the students ` attitude items (see Appendix C).

Observation. To crosscheck the data that were obtained through teachers` questionnaire and to observe the teaching and learning process, observation checklist was prepared. Using this checklist, the researcher observed the actual teaching and learning process in both subjects in the sampled schools three times. Morris and Gibbon (1978) support that "Because of the richness and credibility of the information, it can provide, on-site observation is a desirable part of implementation evaluation"(p.89).

Interview. To elicit the needed information from the experts who developed and monitor the curriculum materials, who have direct and indirect involvement to integrate and implement EE into school subjects, a semi-structured interview was prepared and interviewed ICDR geography and biology experts, MOE expert, and EPA EE expert. Schools principals were also interviewed about their managerial and academic contribution to make the teaching and learning process effective in line with our current educational philosophy, problem solving, and addressing the needs of our society (see Appendix E).

Reliability and Validity

After developing the instruments, the researcher has to check their reliability and validity since "The quality of instruments used in research is very important, for the conclusions researchers draw are based on the information they obtain using these instruments"(Fraenkel & Wallen, 200,p. 169).

In relation to the reliability of the instruments, attempts were made to collect consistent data through testing the reliability of the instruments. The researcher developed a coding sheet and the definition of categories developed. Then, he made a discussion with the coders chosen based on their experience and competence in their subject areas. Following this, two coders from each subject requested to do a pilot study. The result of the study was calculated statistically, according to Amare (1998) using the formula for estimating the coefficient of agreement, and found 85% and 90% for biology and geography curricula materials coders respectively (see Appendix B). To Fraenkel and Wallen (200), 80% agreement is a commonly criterion.

Regarding the criterion- referenced test, being the contents the test was prepared are heterogeneous, taken from biology and geography subjects, the researcher chose split-half as advised by Wiersma and Jurs (1985), and Linn and Miller (2005). The internal consistency of scores in test items from a pilot study on 39 students was calculated using Guttmann Split-half and Spearman-Brown Coefficient using SPSS 12.0 for Widows, and found 0.77 in both ways. This is above the benchmark set for classroom tests, 0.70 and higher by Fraenkel and Wallen (2000).

The reliability of the attitude scale was also calculated using Cronbach Alpha that is used to calculate the reliability of items for measuring attitudes and interests when respondents are asked to indicate their agreement or disagreement on three or more point scale where more than one answer is possible (Fraenkel and Wallen, 2000). In line with this, the reliability off the students` attitude scores result were calculated and found 0.86 that is reliable according to the standard set, 0.5 or higher are adequate for research purpose, by Caplan, Naidu, and Tripathi (1984) in Pedhazur and Schmelkin (1991). So did for teachers' attitude scale items, which is

0.66. Above all, to make the scores reliable, students in four schools were given enough time while doing the test. In doing so, the researcher administered the test in the schools face to face.

On the other hand, to make the data collected through coding sheet by the coders valid, the researcher prepared definitions for each category and introduced to the coders, and tried to read the whole document and analyzed the latent content besides the manifest ones analyzed by the coders (Fraenkel and Wallen, 2000). In addition, to make instruments appropriate and meaningful, the draft instruments developed by the researcher and subject teachers were commented by EE instructor in Addis Ababa University and by the advisor. In line with the comments collected, the researcher improved them. Above all, the researcher administered all the instruments in person to minimize errors caused by carelessness and not understanding the objective of the research in general and each instrument in particular.

Methods of Data Analysis

The data collected through different instruments were analyzed both qualitatively and quantitatively. On the one hand, the data collected from curricula materials through content analysis were analyzed using percentage, frequency and pie chart. Chi square for goodness of fit (X^2) was also employed to infer whether there is a significant difference between EE objectives developed in the curricula materials as a whole. Moreover, the materials were analyzed qualitatively.

On the other hand, the data collected using questionnaire from students and teachers were primarily analyzed using percentage, mean and standard deviation. Then, to identify the mean attitude and achievement scores of students in line with their sex, grade level and place of residence, an independent t-test was employed. The mean achievement and attitude scores of students among the four schools were analyzed using one–way ANOVA, and the computations in relation to chi- square, mean, standard deviation, t-test, ANOVA were performed using SPSS 12.0 for Windows by taking the level of significant 0.05.

Finally, the data collected from open-ended questions, interview and observation were briefly described and synchronized with the rest data.

Chapter 4: Presentation and Analysis of Data

In the twenty-first century, as discussed in the background and review of related literature parts of this study, education has been given central role to play and address environmental problems at local, national and global contexts. Not only education is expected to address these problems, but also it should play significant role for sustainable development of a nation in particular and the globe in general by integrating theory with practice. Education, at different levels, can only play these roles when its philosophical foundation is cemented and developed in line with the roles education is expected to play in the education policy of a given country. These can be expressed by the aims, general and specific objectives of the policy document.

At the end of the 20th century and the eve of twenty- first century, Ethiopia developed the New Education and Training Policy (FDRE, 1994). The policy document included aims, objectives of education and training, and overall strategy. One of the objectives of this research is to assess whether the objectives (general and specific ones) developed in this document address the relationship between education, our environment and development. In other words, are they related with the objectives of EE?

Aims, General and Specific Objectives in the New Education and Training Policy Related to EE

a) **Aims**-some of the aims of education developed in our education policy are related with the aims of EE. They are to:

- strength the individual's and society's problem solving capacity, ability and culture;
- improve, change, develop and conserve our environment for the purpose of an all-rounded development; and
- bring up citizens with the necessary productive, creative and appreciative capacity to participate fruitfully in the development and utilization of resources and the environment at large (FDRE, 1994).

To achieve such aims of education, the general and specific objectives of the policy also include elements of EE objectives.

b) **General Objectives Related to the above Aims of Education**

- Develop the physical and mental potential and the problem solving capacity of individuals by expanding basic education in particular and education in general;
- Bring up citizens who can take care of and utilize resources; and
- Cultivate the cognitive, creative, productive and appreciative potential of citizens by appropriately relating education to the environment and societal needs (FDRE, 1994).

c) **Specific Objectives Related to the above Aims of Education**

- To develop and enrich student's inquisitive ability and raise their creativity and interest in aesthetic;
- To promote education that can produce citizens who possess national and international outlook on the environment, protect natural resources and historical heritages of the country; and
- To provide education that can produce citizens who have developed attitudes and skills to use and tend private and public property appropriately (FDRE, 1994).

As stated above, some of the aims of education, general and specific objectives in the policy document clearly show that the three domains of learning (cognitive, psychomotor and affective) are clearly developed in it. Moreover, the three components of EE: education about the environment (empirical elements), education in the environment (aesthetic elements) and education for the environment (ethical elements) are also given their own places by relating education to our environment, and the needs and problems of our society. Above all, in this document, education has been given significant role in changing students' attitudes to utilize, conserve and protect their environment for the purpose of all-rounded development (social, economic, etc.) of Ethiopia, as well as the globe.

In other words, according to FDRE (1994), the outcomes of education are expected to develop students` whole personality having the right cognitive ability, skills typically problem solving and positive attitudes to natural resources, personal and public property in particular, and to the local, national and global environment in general. As a result, students can solve the societal and their problems at local, national and global contexts.

In general, since the aims, general and specific objectives of the policy document are at decision level, the objectives, contents and teaching methods of EE are explicitly and implicitly stated and developed in the document. Nevertheless, are they translated into curricula materials like curriculum guides and students' textbooks? According to FDRE (1994) and Derebssa (2004), the source for preparing curricula materials are the objectives developed in the education policy of a given country.

Objectives Developed in the Curricula Materials

As discussed before, the source of objectives for different curricula materials such as curriculum guides and students' textbooks is the objectives developed in the education policy of a given country. When the New Education and Training Policy of Ethiopia was assessed whether EE objectives are developed or not, it is found that they are stated in the policy document explicitly and implicitly. Hence, to identify whether these objectives are translated into the curricula materials, grade nine and ten geography and biology curricula materials revised in 2004 were assessed using environmental education objectives (knowledge, skills, attitudes and participation).

Table 1: Objectives Developed in Geography Curriculum Guides

Grade Level	Total Objectives Developed		EE Objectives Developed in the Total Objectives							
			Knowledge		Skills		Attitudes		Participation	
	No.	%	No.	%	No.	%	No.	%	No.	%
Nine	126	100	65	51.6	3	2.3	1	0.8	3	2.4
Ten	178	100	55	30.9	1	0.6	1	0.6	1	0.6

As can be seen in Table 1, grade nine geography curriculum guides incorporated 51.6% of EE knowledge objectives whereas skills (2.3%), attitudes (0.8%) and participation (2.4%) did get the least attention. Grade ten geography curriculum guides also relatively focused on EE knowledge (30.9%) and did not include skills (0.6%), attitudes (0.6%) and participation (0.6%) as expected. However, unlike the EE objectives developed in our policy, almost all the units in both grade levels depicted that skills, attitudes and participation of EE objectives were forgotten. On the other hand, according to ICDR geography expert, the three domains of learning were

included in the newly revised curriculum guides. Similarly, the curricula materials of grade nine and ten biology were also assessed in line with EE objectives as presented in table 2.

Table 2: Objectives Developed in Biology Curriculum Guides

Grade Level	Total Objectives Developed		EE Objectives Developed in the Total Objectives							
			Knowledge		Skills		Attitudes		Participation	
	No.	%	No.	%	No.	%	No.	%	No.	%
Nine	180	100	39	21.7	1	0.6	8	4.4	2	1.1
Ten	193	100	40	20.7	1	0.5	16	8.3	3	1.6

As depicted in table 2, the majority of the objectives developed (21.7% & 20.7%) in grade nine and ten biology curriculum guides incorporated the knowledge aspects of EE. Furthermore, although their share was very small, unlike the emphasis given in geography curricula materials (0.8% & 0.6%), attitude objectives had been given some places in biology curriculum materials (4.4% & 8.3%). On the other hand, according to ICDR biology expert, objectives of EE (knowledge, skills, and attitudes) were given their own places.

Generally, to assess whether there is a difference in number of observed and expected EE objectives in relation to objectives developed in curricula materials of both subjects, chi-square goodness of fit test(X^2) was employed.

Table 3: Chi-square goodness of fit test for EE Objectives Developed in the Materials

EE Objectives	Observed Frequencies	Expected Frequencies	Chi-Square (X^2)	degree of freedom (df)
Skills	6	60.0		
Participation	9	60.0		
Attitudes	26	60.0		
Knowledge	199	60.0		
Total	240		433.23*	3

*p<0.05

As shown in table 3, there was a very high significant difference between number of observed and expected EE objectives developed in both geography and biology curriculum guides, $X^2(3,N=231) =413.554$, $p<0.05$.

Generally, the objectives developed in both geography and biology curricula materials showed that the three domains of learning: cognitive, psychomotor and affective ones were not given at least relative attentions leave alone EE objectives. The objectives developed in both subjects curriculum guides relatively focused on EE knowledge. Skills typically problem solving one was totally overlooked as opposed to the policy objectives. Unlike in the geography curricula materials, attitude objectives were given some attention in biology curriculum guides. Above all, the ICDR experts' responses did not match with the objectives developed in both materials.

However, scholars like Blooms in Derebssa (2004), the three domains of learning (cognitive, psychomotor and affective, together with their sub-categories) should be given relative emphasis. Besides, according to FDRE (1994), education has to be given to develop students` intellectual ability, skills typically problem solving and positive attitudes to private and public properties and national and international environment. Further, Palmer (1998) typically recommended that to bring the holistic development of an individual, EE knowledge and understanding, skills and attitudes should be treated in an integrated manner. Above all, he strongly recommended, in his dynamics model of planning and implementing EE, to develop individual EE knowledge and understanding, skills, attitudes and participation, educators typically curriculum experts and teachers should develop and plan curricula materials and the actual teaching and learning process by integrating the three components of EE: education about the environment, education in or through the environment and education for the environment. To assess whether these components were integrated or not, the contents and methods of teaching and learning developed in both geography and biology curricula materials and student textbooks were analyzed in line with Palmer's Model.

Contents and Teaching Methods

To achieve EE objectives, it needs the choice of appropriate contents and teaching and learning methods. This necessitates the integration of education about the environment

(empirical elements in our environment ,e.g. air, water, soil, vegetation, people and their relationships and interdependence with the environment, etc.), education for the environment(ethical elements in consuming, preserving and protecting our environment by resolving environmental problems and conflicting issues due to the interaction and interference of people with their environment) and education in or from the environment (aesthetic elements, typically facilitates learning in the real environment by doing, touching, observing, appreciating, practicing)that invites students active involvement through their senses (Palmer, 1998; Beck and Earl , 2000).

The last component of EE, education in or through the environment focused on the teaching and learning methods of EE. This typically emphasizes using the real environment as learning laboratory while learning and teaching about and for the environment through first hand experiences. Palmer and Neal (1994) underlined, "...there is no single ' right or wrong ' way to approach the teaching and learning of environmental education ....it is however, essential that first-hand experiences of the environment are at the forefront of teaching and learning"(p. 37). This shows that the three components of EE should be interwoven during developing curricula materials and in the actual teaching and learning processes so that students can develop knowledge, skills and attitudes as a whole. Hence, the third research question raised whether the three components of EE are integrated in both biology and geography curricula materials or not. As result, these materials were analyzed in line with this objective.

Table 4: Contents and Teaching Methods Developed in Geography Curriculum Guides

Grade Level	Total units		Units that integrated Education about, in and for the environment	
	No.	%	No.	%
Nine	5	100	1	20.0
Ten	6	100	1	16.7

When curriculum experts develop contents and sub- contents in curriculum guides of different subjects, they should not only focus on facts at local, national and global contexts (education about the environment). Rather, they should identify and integrate environmental

issues and problems that are threatening for this and the coming generation at local, national and global levels (education for the environment). They should also choose and develop the appropriate methods of teaching and learning in line with the facts, issues and problems outlined in each subjects typically in each units and sub-units as much as possible.

In relation to these components of education (education about, in and for the environment), geography curriculum guides of both grade nine and ten were assessed in table 4. Table 4 depicts that only a single unit relatively treated the components in each grade level. The rest units in both grade levels emphasized on facts at Ethiopian and global contexts although some environmental facts put here and there. The major problem observed in all units of these materials was that no space was left for the actors (teachers and students) to address local environmental and societal issues and problems accordingly. Moreover, the progressive teaching and learning methods that invite students active involvement including project, field study (e.g. field visit and practical exercises in the real environment), and problem solving that facilities addressing students` real life problems were given little attention in the methodology section of the materials. According to ICDR geography expert, teachers were advised to teach students in the real environment. Further, he added that our examination style highly affects the teaching methods and content selection; he believed that problem solving approach is still argumentative to be utilized. Nevertheless, Chelliah (1985) and UNECO-UNEP (2000) identified problem solving as one of the main and the appropriate EE teaching methods to address practical and real life problems.

Table 5: Contents and Teaching Methods Developed in Geography Students` Textbooks

Grade Level	Total units		Units that integrated Education about, in and for the environment	
	No.	%	No.	%
Nine	5	100	1	20.0
Ten	6	100	1	16.7

What is different in students' textbooks from the curriculum guides is that activities were developed although the majority of them focused on asking students to retrieve facts after a page

or pages or within a page. Although some of the activities might touch some environmental issues and problems, they did not give chances to students to identify and solve serious environmental problems in different contexts.

On the other hand, contents that present Ethiopian and global environmental problems even did not invite students to identify a real problem in relation to the topic under discussion and suggest best possible solutions in their local context in line with their knowledge and experiences. Rather, the contents were found prescriptive: the problem raised under a topic or a sub-topic, its causes, consequences and measures to be taken were presented in detail. Like in the curriculum guides, no space or gap was left in students' textbooks for the teacher and his or her students to relate the teaching and learning process relevant to their local environmental and societal problems and issues.

Table 6: Contents and Teaching Methods Developed in Biology Curriculum Guides

Grade Level	Total units		Units that integrated Education about, in and for the environment	
	No.	%	No.	%
Nine	7	100	1	14.3
Ten	8	100	1	12.5

As depicted in table 6, the three components of EE were relatively integrated well in a single unit in both grade levels. The rest mostly focused on scientific facts at global context. Unlike contents presented in geography curriculum guides and students' textbooks, there are some places left for teachers and their students in terms of a project in each unit to address local environmental problems and issues around the school and in the zone or the region. Although attempts were made to plan active learning and teaching methods (e.g. project, field study, experiment), problem-solving approach was not developed well to develop students` problem solving skills.

Table 7: Contents and Teaching Methods Developed in Biology Students' Textbooks

Grade Level	Total units		Units that integrated Education about, in and for the environment	
	No.	%	No.	%
Nine	7	100	1	14.3
Ten	8	100	1	12.5

Like in geography students` textbooks, in table 7, a single unit treated the three components of EE in each grade levels. On the other hand, efforts were made to include the third components of EE, education in the environment through teaching and learning methods like project and experiments developed in the students' textbooks in more number compared with the curriculum guides of both grade levels. However, most of them might not instigate students to be creative, active and problem solver rather to be adoptive experiments done a long times ago. For instance, students who live in rural area might do an experiment on the advantages and disadvantages of fertilizer: organic versus inorganic. On the other hand, according to ICDR biology curriculum expert, new teaching methods like project discussion, role-plays, case studies, field visits were introduced in both the curriculum guides and students' textbooks of both grade levels. Nevertheless, most of the projects did not help the students to develop problem solving skills as they were placed in the wrong place, focused on trivial activities and purely scientific experiments.

For example, according to MOE (2005, pp.28-57), unit two of grade nine biology textbook discusses 'Nutrition and Digestion'. Some of the contents and projects developed look like this:

2.1. What is Nutrition?

- Modes of Nutrition

> Project: The different types of autotrophic and heterotrophic nutrition are discussed in unit 5 under "biotic components of the ecosystem". Read the portion of unit 5 and other biology books in the library to learn more about phototrops, chemotrophs, holozoic, saprophytic and parasitic nutrition.

2.2. Food

- Nutrients in Food
- Groups of Nutrients (carbohydrate, lipids, proteins, mineral, vitamins, etc.)
- Test for Food

Experiment on: testing for starch, for simple sugar, disaccharides, fats and oils, and vitamins.

2.3. Nutrition in Animals

Balanced diets

Vegetarian diet

Project: List the foods you ate for the last three days and evaluate your diet. a) Did you obtain the correct meal from each of the four food groups each day? b) If not what change do you need to make) What are your approximate average daily intake of energy in terms of KJs (calculate).

2.5. The Mammalian Digestive System

- Digestion in the mouth
- Digestion in the stomach

Project: By doing a simple library research or by interviewing a biologist or a physician write a one page report on what would have happened if you had no stomach.

- Digestion in small intestine
- The large intestine

Project: Do this activity in groups. Gather information on the possible causes and solutions of food problem in Ethiopia and its impact on development. What could your contribution as citizens. Repot your finding to the class.

The contents and the projects presented above did not address serious and relevant issues under each sub-topic. For instance, under the sub- topic 'Nutrition in Animals', malnutrition which is a serious problem at local and in Ethiopia contexts like problems of not feeding children and getting balanced diet and problems related with feeding culture were not treated at all. On the other hand, the last project developed in this unit was not designed in the right place compared with the sub-topic, the large intestine. This project can be best treated in unit five, 'Organism and their Environment' under the sub-topic 'Human Population and Food Problem'.

In summary, the content and teaching methods typically that invite students` active involvement in the real environment were presented well in grade nine and ten biology curriculum guides and students` textbooks compared with these grade geography curriculum guides and students` books. Moreover, unlike the content presented in geography materials, problems were developed in the form of projects, not presented in prescriptive manner. Generally, Palmer (1998) underlined that although there is a possibility of shifting from one components of EE to the other in terms of emphasis; it is not good to ignore one or the other components of EE among the three: education about, in or from, and for the environment if our intention is to develop students` knowledge, skills and attitudes as a whole.

EE Evaluation Techniques

To identify whether the objectives developed in the curricula materials are achieved through the chosen contents and teaching and learning methods, it requires developing evaluation items in line with the developed objectives (EE knowledge, skills, attitudes and participation). Although these objectives were not integrated well in both geography and biology curricula materials and students textbooks as analyzed before, the evaluation items developed in the curricula materials were assessed, together with the corresponding students' textbooks.

Table 8: Evaluation Techniques Developed in Geography Curriculum Guides

Grade Level	Total Evaluation items developed		Evaluation items that help to evaluate environmental					
			Knowledge		Attitudes		Skills typically problem-solving	
	No.	%	No.	%	No.	%	No.	%
Nine	97	100	13	13.4	1	1.4	0	0
Ten	161	100	26	16.15	1	0.8	0	0

As can be seen in table 8, the evaluation items developed in grade nine and ten geography curricula materials focus on helping students to recall facts learnt in the materials. The same is true for evaluation items (multiple choice, true-false, short answer, etc.) developed in students' textbooks. They focused on facts written in students` textbooks in each unit. Rather, they were not designed to help students to see the interrelationship and interdependence between both

living and non-living things. In addition, they did not help them to analyze, evaluate and predict the consequences of an action on their environment. Above all, attempts to evaluate students` attitudes to their environment and problem solving skills are almost totally ignored.

In short, evaluation techniques related to EE should enable students to see the relationship and interdependence of living and non- living things in an integrated manner. Rush et al. (1999) underlined, "Any evaluation that applies the principles of focusing on the achievement of the desired environmental education outcomes will need to consider the extent to which interdisciplinary, behavioral change and critical thinking factors are achieved (p.80)". Above all, UNESCO (2000) surrey study showed that evaluation techniques in EE should be developed not only to evaluate the cognitive domains but also the psychomotor and the affective ones.

Table 9: Evaluation Techniques Developed in Biology curriculum Guides

Grade Level	Total Evaluation items developed		Evaluation items that help to evaluate environmental					
			Knowledge		Attitudes		Skills typically problem-solving	
	No.	%	No.	%	No	%	No	%
Nine	137	100	21	15.3	7	5.1	0	0
Ten	109	100	17	15.6	7	6.4	0	0

As shown in table 9, the majority of evaluation items developed in the curriculum guides focused on facts that might be memorized written in students' textbooks. Like the evaluation items developed in geography curricula materials and students' textbooks, the evaluation items developed in grade nine and ten biology curricula materials did address some knowledge aspects in both grade levels(15.3% and 15.6%) respectively. The items developed, in students` textbooks, at the end of each unit also did not invite students to reflect what values developed in learning each unit. Rather, like the presentation of some environmental problems in geography students` textbooks: their causes, consequences and measures to be taken, the values to be developed were prescribed at the end of each unit in both grade nine and ten biology curricula guides and students` textbooks. For instance, each unit of the curriculum guides of grade nine

and ten biology contains all or some of the following values: Responsibility, Self-confidence, Pursuit of wisdom, Rule of Law, Active Community Participation, Industriousness, Equality, Justice and Patriotism (ICDR, 2004).

Almost all of these values were listed at the end of each unit. On the one hand, the contents in each unit might not lead students to develop the same values although they might help the subject teacher to be familiar with various values to facilitate students' reflections on values they developed through the teaching and learning process using the appropriate content and teaching methods. On the other, in both grade levels students` textbooks, values and how the values can be developed are thoroughly described rather than students are asked to reflect the values they developed. MOE (2005, pp.216-217), for instance, described at the end of unit seven of grade ten biology students textbooks as:

> " ....No conservation means no survival. Survival also requires positive values and attitudes. Conserving nature is saving nature. If you have developed the right attitude towards conserving nature that means you have the same attitude towards saving....Legal issues that forbid cutting down trees from the forest, and hunting wild animals are issues of rule of law. Such issues cloud be translated into your individual life and require that you develop the value of rule of law. Most of the conservation activities need community efforts. You, as a member of your community have responsibility in such efforts and should participate in community endeavors of conservation, which, of course, requires the value of active community participation....

This quote prescribes values as facts as if every student could memorize them. If the intention is to assess the achievement of attitude objectives developed at the end of each biology curriculum guide of both grade nine and ten, oral and written opinion questions might be posed for the students so that they can reflect the value they developed. If they cannot reflect the intended values, the teachers might check the appropriateness of the content and the teaching and learning methods utilized. As discussed in the review part, Thomas (1990) stressed that if students are expected to play their active role in utilizing and protecting our environment, the contents of the curricula materials should be integrated with environmental problems like the green house effect, acid rain, ozone depletion, deforestation and waste disposal, and issues like legislation, incentives, exploration and invention, recycling and reclaiming in the materials that help to inculcate positive values in students` mind. As a result, they can discuss, argue and debate on such serious environmental problems and come up with the best solutions by

criticizing and appreciating people interference and interaction with their environment, not by memorizing the prescribed values by experts. From this, students can develop positive attitudes to their environment, and begin utilizing, conserving and protecting resources wisely.

Following the description of the values and how they can be developed, according to MOE (2005, p.217), an evaluation item was developed as:

> Discuss and Reflect: What are the values you developed while learning this unit? How do they affect you? How do you think cloud such values be strengthened? You may consider the following values: Responsibility; self-confidence; pursuit of wisdom; Rule of law; saving; Patriotism; Active Community participation; Truth, Love; Freedom.

Learning this unit, however, the prescription comes first followed by evaluation item developed well and followed by the prescription of the same values as stated in the above box.

On the other hand, ICDR biology and geography experts who revised the materials, Environmental Education Expert in Environmental Protection Authority and Education Program and Teachers Education Development Expert at MOE were interviewed for their efforts and contribution in revising the materials and making the teaching and learning process relevant to the lives of students and the society by developing students' problem solving skills as developed in the education policy.

According to the MOE expert, there is no environmental education unit in MOE; there is no attempt to implement the recommendation made by the Environmental Education Project team in 1992. In addition, according to the expert, they did not check whether the general and specific objectives of the education policy related to EE are translated into secondary school curricula materials; they also did not check whether the curricula materials developed by ICDR are responsive to: our environment in general, the needs and problems of our society, and develop students` problem solving skills in particular; they did not do these in ESDPs since their supervision is weak to assess such critical issues, as described by the expert. Above all, the expert believed that we are not at the stage of integrating theory with practice in our education.

To make secondary education relevant to the society, their horizontal relationship with key stakeholders (e.g. EPA, MOA) is weak. Rather, they have strong relationship with non-governmental organizations. This shows that the efforts and practices to implement the objectives developed in the new education and training policy typically that relate education to our environment to address the local, national and global environmental problems are not encouraging.

Among the main stakeholders of MOE, EPA (1997) developed 'ENVIRONMENTAL POLICY', and 'CROSS-SECTORAL ENVIRONMENT POLICIES'. One of the policies aimed at"... to promote the teaching of environmental education on a multi-disciplinary basis and to integrate it into the ongoing curricula of schools and colleges and not treat it as a separate or additional subject, though this should also be done at the tertiary level"(p.23). In line with this objective, EPA environmental education expert was interviewed about his efforts and contributions in curricula materials development and in the teaching and learning process to integrate EE in different curricula materials in the formal education. According to the expert, the authority developed a policy, and different environmental legislations, and gave training in collaboration with the regional EPA. Further, the authority focused on non- formal education using print and electronic media, EE clubs in schools to disseminate information and change the behaviors and attitudes of our people. In the formal education, experts were participated in integrating EE at primary level (1-4). However, in revising and developing curricula materials above this level, experts did not have direct involvement except some discussions made with ICDR experts and short training given in science faculty Addis Ababa University at postgraduate level. This shows that the contribution of EE expert in sharing and choosing the right model to integrate EE that can address serious environmental problems at local, Ethiopian and global contexts into different curricula materials is insignificant compared with the objectives developed in the environmental policy by the authority.

Finally, in relation to the rationale, model of curriculum integration employed if one of the rationale to revise the curricula materials is to integrate EE, their training in EE and the participants in revising the curriculum guides, ICDR biology and geography curriculum experts were interviewed together with other issues synthesized in the analysis made before. According

to the experts, there were two rationales: the rule that force them to revise curricula materials every five years; and the order from the higher government officials to include rural development, values, and aspects of economy, HIV/AIDS, international relation, population issues, globalizations, and so forth. However they got short training on EE, they did not use model of EE curriculum integration since the rationale was not to integrate EE in the materials. Regarding the participants, they tried to collect comments from teachers and students.

In summary, the EE objectives developed in our education and training were not properly translated into grade 9 and 10 geography and biology curriculum guides and students' textbooks. Skills typically problem solving ones were totally ignored as opposed to the policy objective. Attitude objectives had at least been given some place in biology curricula materials of these grade levels. Similarly, the contents and teaching methods developed in the materials did not coincide with the general and specific objectives developed in the policy document especially in relation to developing problem solving skills and students attitudes towards national and international environmental issues. To translate objectives related to EE, MOE was not able to establish EE and did not coordinate efforts of stakeholders like EPA and MOA. On the other hand, the aims and objectives of the new education and training policy emphasized on relating education to our environment, integrating theory and practice, developing students` problem solving skills and positive attitudes to national and global environment were inadequately translated into the curricula materials. EPA, the responsible organ to our environment in general and EE in particular, was not found participating in the integration of EE into secondary school curricula materials as opposed to one of the sectoral policies objectives developed in the Environment Policy by the authority.

Teachers are the main actors to implement objectives developed in our education policy. They can fill the gap observed between the policy objectives and the curricula materials. In doing so, they might have the right belief about EE, their role in the teaching and learning process, and in the community. The third research question focused on this issue: How biology and geography teachers of these grade levels implement the newly revised curriculum guides and student textbooks by integrating EE?

Teachers: The Key Actors of the Teaching and Learning Process

Since curricula materials like textbooks have their own inherent weaknesses such as homogeneity of learning and teaching approach that does not cater for the variety of learning domain, and over-easiness that teachers follow textbooks uncritically (Ur, 1996), teachers have great responsibility to address such shortcomings of textbooks and other curricula materials to achieve objectives developed at a policy level in a given country. They can accomplish this responsibility when they get the right pre-service and in service training. For instance, if one of the policy objectives of a given country is to develop students' environmental knowledge and awareness, problem solving skills and positive attitudes to their environment, teachers should be trained on how to integrate EE. As a result, they can identify local, national and global environmental problems and issues and include them in their subject. Moreover, they can include EE objectives such as knowledge, skills, attitudes and so forth in an integrated manner in their lessons. To achieve such objectives, they might utilize different teaching and learning methods such as field study, problem-solving, project that invite students to learn from practical activities and first hand experiences (Lea Filho and O`Loan, 1996).

Therefore, the exposure of teachers to EE during their pre-service and in-service training or through workshop, their attitudes to EE, the teaching and learning process and the roles they have to play as a teacher, member of the school and the nearby community were assessed in the sample schools and presented as follows.

Table 10: Teachers who got pre-service and in service training on EE

Qualification / service/ Department	Teachers who					
	got training		did not get training		Total	
	No.	%	No.	%	No.	%
Diploma	4	40.0	6	60.0	10	100
Degree	7	31.8	15	68.2	22	100
1-2 years	6	37.5	11	64.7	17	100
3 and above	5	31.2	11	68.8	16	100
Biology	6	31.6	13	68.4	19	100
Geography	5	35.7	9	64.3	14	100

As shown in table 10, 60.0% and more did not get any training on how to integrate EE in their subject areas. Further, if they got training, teachers were asked to mention EE objectives, contents, teaching methods and evaluation techniques. And their responses were summarized as follows.

Regarding EE objectives, however, they did not list them precisely, they tried their best as in a specific ad general way: *know and define their environment well and properly; solve any environmental problems in the society; protect the natural environment; understand environmental problems; learn from their environment; relate the science in their textbooks with existing environment; take care of our environment from destruction; utilize their environment for satisfaction of need and to promote their development and so forth.* When their objectives were analyzed, they tried to develop EE objective in relation to knowledge, awareness, skills and participation. Nevertheless, they forgot the attitude ones.

Concerning EE contents, they listed as: *environment and development, natural resources, interaction between organisms and their environment, soil in Ethiopia, vegetation, preserving plant and animal species, definition of geographical environment, interaction between man and his geographical environment, management and conservation of natural resources, planting trees, soil and water conservation, renewable and non-renewable resources.* Although they mentioned some of EE contents, they forgot current serious environmental problems and their consequences (e.g. soil erosion, deforestation, poverty, drought, global warming, ozone depletion), and the role of people to address the local, national and global problems. They were also asked to mention teaching methods of EE contents. And their responses were summarized in figure 4.1.

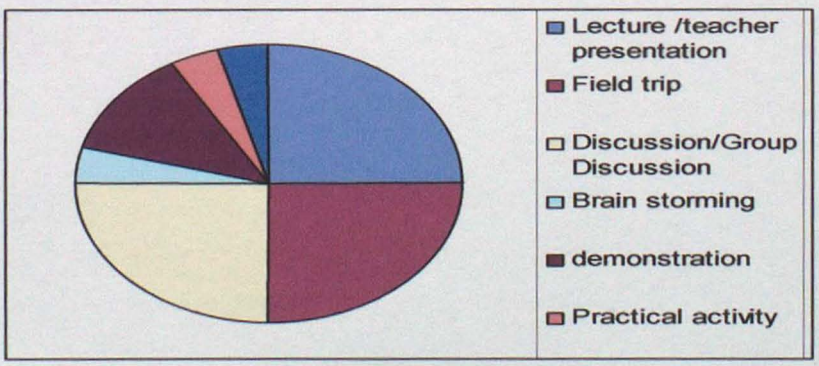

Figure 4.1. Pie Chart showing teaching methods of EE mentioned by the teachers

Figure 4.1 shows that lecture, field trip and discussion were found the major EE teaching methods mentioned by teachers who got training. Although there is no single best method of EE, field trip, which is one of the way students learn in or from the environment, got equal place with lecture and discussion. Nevertheless, as EE focuses on environmental problems, issues and their solutions, problem solving and practical activities in the real environment, they were given little place by the classroom teachers during the teaching and learning process as observed in the four schools. Above all, not only classroom teachers but also plasma TV teachers were observed using lecture consistently and dominantly. In addition, although the plasma presentation makes the lesson visually vivid by showing concrete and abstract objects and things, it was observed that it did not allow students and teachers to identify and solve local , Ethiopian and global environmental problems. Even, when the plasma teacher poses a question for the classroom, the time given to tackle the question was very short, and both the students and the teachers were observed as if they were watching TV. The worst is that the revised curriculum materials of grade nine and ten biology were not covered by the Plasma TV transmission. What was in the air was the curricula materials of this subject before the revision.

The same was true for the subject geography. The teacher came in, wrote the topic on the board and continued presenting the lesson from students` textbooks and / or notes prepared as if he/ she were the only sources of knowledge. Students were observed taking notes and listening their teachers most of the time passively. This is best expressed in Freire (1972), "Education...becomes an act of depositing in which the students are the depositories and the teacher is the depositor...the teacher teaches and the students are taught; the teacher knows everything and the students know nothing; the teacher thinks and the students are thought about; the teacher talks and the students listen; the teacher acts and the students have the illusion of acting through the action of the teacher; the teacher confuses the authority of knowledge with his own professional authority which he sets in opposition to the freedom of the students; and the teacher is the subject of the learning process while the pupils are mere objects ,and so forth"(pp.45-47). As the same time, teachers' choice of field trip and discussion as major EE teaching methods were found theoretical, not practical when they are compared what happened in the classroom and their responses through questionnaire.

Generally, teachers were asked the main problems to teach outside the classroom by relating facts to local, national and global environmental problems; not to apply different teaching and learning methods such as field study, project, problem solving, role-playing; and the problems observed in the plasma TV instruction.

According to the majority of the teachers, they did not teach out side the classroom because of shortage of time to cover the vast contents in the textbooks, large number of students, lack of training, load of periods, and poor coordination and management of the school. They also mentioned that they did not relate the teaching and learning process to the local, national and global environmental problems because the textbooks did not treat such issues very well; the concerned bodies did not help teachers in terms of training, resources (e.g. audio visual and print materials on national and global environmental problems, internet access to identify recent data and information on the status of local, national and global environmental problems, etc.); the rigidity and the absence of real local, national and global environmental problems in the plasma lessons.

Moreover, they usually did not apply active teaching and leaning methods since students believe that the teacher does not have enough knowledge if he/she does not tell them everything; the curricula materials are not developed for such learning and teaching style. Even the textbooks contain vast contents that cannot be covered through such methods with the allotted time.

Regarding the plasma TV lessons, according to biology teachers, the problems observed in the plasma TV lessons, are speed of the plasma teacher, short time given to do activities in the classroom, lack of interaction that make students and teacher passive listeners, using lecture method dominantly, difficulty of the language to comprehend ideas, together with the accent of the TV teacher. The lessons were not also oriented with current local, national and global environmental problems. In short, their responses showed that there are interrelated problems and beliefs on the teaching learning process through Plasma TV.

Furthermore, besides giving training in pre-service and in-service programmes, teachers should be familiar with revised curricula materials through workshop if the new inputs in terms of objectives, contents, teaching methods and evaluation and assessment techniques are going to

be implemented effectively. Regarding the newly revised curriculum guides and students' textbooks of grade nine and ten biology and geography, teachers were asked whether they were made familiar with the new inputs or not. Their responses were summarized in table 11.

Table 11: Teachers who took workshop on the newly revised curricula materials of biology and geography (9-10)

Qualification /Service/ Department	Teachers who					
	took workshop		did not take workshop		Total	
	No.	%	No.	%	No.	%
Diploma	2	22.2	7	77.8	9	100
Degree	1	4.5	21	95.5	22	100
1-2 years	1	6.3	16	94.1	17	100
3 and above	2	13.3	14	87.5	16	100
Biology	2	10.5	17	89.5	19	100
Geography	1	7.1	13	92.9	14	100

As can be see in table 11, nearly none of the teachers was introduced about the new inputs in the revised curriculum guides and students' textbooks of grade nine and ten biology and geography. Therefore, it is very difficult to expect the implementation of these materials as intended.

In addition, the attitudes of the teachers to EE, the teaching and learning process and their roles in the school and community were also assessed and presented in table 12.

Table 12: The Attitude of Teachers to EE

	Respondents Having									
	Favorable Attitudes				Neutral Attitudes		Unfavorable Attitudes			
Items	5	4	Total	%	3	%	2	1	Total	%
E1	26	6	32	96.96	1	3.03	0	0	0	0
E2	15	13	28	84.8	2	6.06	2	1	3	9.1
E3	16	14	30	90.9	3	9.1	0	0	0	0
E4	25	7	32	96.96	1	3.03	0	0	0	0
E5	19	11	30	90.9	2	6.06	1	0	1	3.03
E6	13	13	26	78.8	3	9.1	3	1	4	12.12

NB: 5 = Strongly agree, 3 = Undecided, 2 = Disagree, 4 = Agree, 1 = Strongly disagree

E1= In my view, EE enables teachers to make their teaching relevant to the lives of their students and the society.
E2= EE has little importance since environmental problems are very familiar.
E3= I believe that EE is the main important part of quality education at different levels.
E4= If schools are expected to address societal problems, EE should be the key component of the teaching –learning process.
E5= I believe that EE is a cure for our environmental problems.
E6= I do not think that environmental problems can be solved through teaching EE.

As shown in table 12, almost all the teachers were found having favorable attitudes to EE. As a result, they might include aspects of EE at local, Ethiopian and global contexts in the actual teaching and learning process. Smith (1990) supported that the teachers' beliefs about education affect the actual practices in the classrooms.

Table 13: Teachers' Attitudes to the Teaching and Learning Process

	Respondents Having									
	Favorable Attitudes				Neutral Attitudes		Unfavorable Attitudes			
I Items	5	4	Total	%	3	%	2	1	Total	%
T1	4	7	11	33.3	6	18.2	11	5	16	48.5
T2	8	12	20	60.6	3	9.1	6	4	10	30.3
T3	9	13	22	66.7	7	21.2	1	2	3	9.1
T4	10	10	20	60.6	3	9.1	6	3	9	27.3
T5	0	7	7	21.2	4	12.1	13	8	21	63.6
T6	7	14	21	63.6	5	15.2	4	2	6	18.2
T7	1	11	12	36.4	4	12.1	13	4	17	51.5
T8	9	12	21	63.6	1	3.03	7	3	10	30.3
T9	2	5	7	21.2	2	6.1	15	9	24	72.7

T1= I believe that a teacher should be the source of knowledge in the classroom.
T2= Teaching my students in the immediate environment is time consuming.
T3= I feel secure when I teach my students in and out of the classrooms.
T4= I do not think that students should be recipients of knowledge from their teacher.
T5= I think students should be taught facts in their textbooks.
T6= I do not believe that students, being they are too young, should be taught how to identify problems, prioritize and solve them.
T7= In my opinion, students should be taught to score good grade, not how to solve problems.
T8= I enjoy using a variety of teaching methods in a given period.
T9= I believe that teaching my students facts in their textbooks enable them to solve their environmental problems.

Nevertheless, unlike their attitude to EE, the teachers were not found having clear views about the teaching and learning process including the sources of knowledge in the classroom, what students are taught, and teaching methods employed typically using the real environment and problem solving approach. In this regard, nearly half (48.5%) of them believed that a teacher should be the source of knowledge in the classroom. Nearly one–third of the teachers (27.3%) believed that students should be recipients of knowledge from their teachers. Meanwhile, 72.7% of the teachers believed that teaching students facts in their textbooks made them problem solvers; and 51.5% of them agreed that students should be taught to score good

grade, not how to solve a problem. On the contrary, 63.6% of them believed that students should not be taught facts in their textbooks. This shows that the teachers did not have clear views about the sources of knowledge (teachers, textbooks, students, the real environment), what they should be taught (facts, problems or in combination) and the methods of teaching typically problem solving approach.

Moreover, students not only are taught facts from their textbooks but also how to identify and solve problems and issues related to their environment and lives. This requires equipping students with skills, at different levels of education, on how to identify, prioritize and solve "...practical problems related to real life" (Chelliah, 1985, p.3).

Table 14: Teachers Attitudes to their Roles in the School and Community

	Respondents Having									
	Favorable Attitudes				Neutral Attitudes		Unfavorable Attitudes			
Items	5	4	Total	%	3	%	2	1	Total	%
Ri	19	10	29	87.9	4	12.1	0	0	0	0
R2	21	10	31	93.9	1	3.03	0	1	1	3.03
R3	11	9	20	60.6	4	12.1	6	3	9	27.3
R4	6	12	18	54.5	6	18.2	7	2	9	27.3
R5	13	6	19	57.6	1	3.03	9	4	13	39.4

R1= As an individual, teachers, like development agents, are responsible for fighting environmental ignorance in the community.
R2= As a member of the community, my duty is not only teaching my students but also the school and nearby community.
R3= I believe that my contribution to solve intense environmental problems in Ethiopia is very little.
R4= As a teacher, my role is imparting knowledge to my students.
R5= I believe that my role is facilitating my students` learning, not imparting knowledge.

The teachers should have the right attitudes to their roles as a teacher, as a member of the school and the community. In this regard, 93.9% and 87.9% of them were found having favorable attitudes to fight environmental ignorance by teaching their students and the community at large. On the contrary, nearly one–third of the teachers (27.3%) believed that they have almost no contribution to address environmental problems in Ethiopia. However, in countries like Ethiopia where most of the people are illiterate having little access to

communication, the teachers are expected to teach and disseminate environmental education through their students. Moreover, only 57.6% of them have the view that their role is facilitating of students` learning, not imparting knowledge whereas 39.45% have the view that they have to impart knowledge to their students. However, Jantjes' personal reflections showed that being effective teacher does not mean imparting knowledge, knowledge that is developed by educators such as curriculum experts, subject specialists. Rather effective teacher needs to motivate, facilitate and lead students` active learning (Morrow & King, 1998). This becomes more effective when the teachers relate education to the real environment of the students and the society, and when the teachers invite students to share and reflect problems in their environment and to find possible solutions that are related to the topics under discussion. Hence, students not only become active learner but also develop environmental knowledge, problem solving skills and positive attitudes to their environment being the contents they share are problems and the methods utilized may be brain-storming, discussion, debate, problem solving, and so forth.

Students` Environmental Knowledge, Skills and Attitudes

Students Environmental Knowledge

Environmental knowledge is very significant for students to see the interdependence and interrelationship between people with their environment. It is also very important to identify the consequences of people interference with their environment, and to evaluate and take the right measures to alleviate the problems at local and Ethiopian contexts. Therefore, assessing the achievement of students` environmental knowledge is vital.

Table 15: Students` Environmental Knowledge Achievement in Relation to a Standard Set (70%) by their Teachers

Schools	Grade Level	Total Students Who took the test		students who achieved including and above the standard		students who achieved below the standard	
		No.	%	No.	%	No.	%
Molale	9	49	100	7	14.3	42	85.7
(MO)	10	36	100	3	8.3	33	91.7
Mehal Meda	9	60	100	7	11.7	583	88.3
(MM)	10	14	100	4	28.6	10	71.4
Debre Sina	9	46	100	1	2.2	45	97.8
(DS)	10	19	100	4	21.1	15	78.9
Debre Brihan	9	70	100	5	7.1	65	92.9
(DB)	10	79	100	6	7.6	73	92.4
Total	9	225	100	20	8.9	205	91.1
	10	148	100	17	11.5	131	88.5

Table 15 depicts the majority of students of grade nine and ten at Molale (85.7% & 91.7%), Mehal Meda (88.3% & 71.4%), Debre Sina (97.8% & 78.9%), and Debre Birhan (92.9% & 92.4%) achieved below the standard set by their teachers. In general, when the students who achieved the set standard are compared, grade ten students (11.5%) better scored than grade nine students (8.9%) did. However, this might not tell us whether this difference is statistically significant. Therefore, total achievement test score for each student was computed into hundred (see Appendix-H) and further statistical analysis was made.

Table 16: Descriptive Statistics for Achievement Test Scores by Grade Level

Variable	Grade	N	Mean	Standard Deviation
test score	nine	225	49.51	13.13
	ten	148	52.23	12.38

Table 17: T-test for Independent Samples of Grade nine and ten Students

Variable	t	df	Mean Difference
test score	2.00*	371	2.72

* P < 0.05

As can be seen in table 16, the mean achievement score of grade nine students was 49.51 with a standard deviation of 13.13. The corresponding figures of grade ten students were 52.23 and 12.38 respectively. This shows that there was slight mean difference between the two grade levels students' achievement mean scores. The analysis in table 17 also showed a significant difference between grade nine and ten students mean achievement score, t (371) =2.00, $p < 0.05$. This showed that grade ten students performed better than grade nine (mean difference=2.72).

Table 18: Descriptive Statistics for Achievement Test Scores by Sex

Variable	Sex	N	Mean	Standard Deviation
test score	male	220	51.84	13.23
	Female	153	48.79	12.21

Table 19: T-test for Independent Samples of Sex

Variable	t	df	Mean Difference
test score	2.26*	371	3.05

* P < 0.05

As shown in table 18, the mean achievement score of male students was 51.84 with a standard deviation of 13.23. The corresponding figures for female students are 48.79 and 12.21 respectively. The mean comparison in table 19 showed that there was a statistically significant difference between male and female students (mean difference=3.05), t (371) =2.26, $p < 0.05$. This implies males achieved better than female.

Table 20: Descriptive Statistics for Achievement Test Scores by Place of Residence

Variable	Residence	N	Mean	Standard Deviation
test score	Urban	194	50.62	13.18
	Rural	179	50.56	12.61

Table 21: T-test for Independent Samples of Urban and Rural Students

Variable	t	df	Mean Difference
test score	0.045*	371	.06

* P > 0.05

Table 20 depicts that the mean achievement scores of urban students was 50.62 with a standard deviation of 13.18. The corresponding figures of rural students were 50.56 and 12.61 respectively. Form their means, it seems that there was no as such observable difference between urban and rural students' achievement scores. Table 21 also supports that there was no statistically significant difference between rural and urban students` mean achievement scores, t (371) =0.05, p > 0.05.

To see if there is statistical significant mean difference in terms of schools, descriptive statistics and one way ANOVA were employed.

Table 22 Descriptive Statistics for Mean Scores by Schools

Schools	N	Mean	Standard Deviation
MO	85	53.12	12.03
MM	74	51.49	13.05
DS	65	49.31	12.96
DB	149	49.26	13.13
Total	373	50.59	12.89

Table 23: ANOVA Summary for Achievement Test by Schools

Source of Variation	Sum of Squares	Degree of Freedom	Mean Square	F Ratio
Between Groups	972.29	3	324.10	1.97*
Within Groups	60847.95	369	164.90	
Total	61820.24	372		

* P > 0.05

As shown in 23, there was no statistically significant mean difference among the four schools, F (3,369) = 1.97, $p > 0.05$. In addition, the differences observed among the schools in table 22 might be due to high or low scores, or sampling error.

Attitudes of Students to their Environment

One of the main objectives our new Education and Training Policy is to bring up citizens who can take care of and utilize resources; produce citizens who possess national and international outlook on the environment, protect natural resources and historical heritages of the country; and produce citizens who have developed attitudes and skills to use and tend private and public property appropriately (FDRE, 1994). One of the research questions also raises the question: To what extent do students have positive attitude to consume and protect their environment towards sustainable development? And the data collected through Likert type scale was analyzed as follows.

Table 24: The Attitudes of Grade Nine Students to Utilizing their Environment

	Respondents Having									
	Favorable Attitudes				Neutral Attitudes		Unfavorable Attitudes			
Items	5	4	Total	%	3	%	2	1	Total	%
U1	105	49	154	71.6	17	7.9	11	33	44	20.5
U2	123	49	172	77.8	20	9.1	18	11	29	13.1
U3	117	52	169	77.5	21	9.6	8	20	28	12.8
U4	103	62	168	77.0	20	9.2	15	15	30	13.8
U5	63	61	124	57.9	35	16.4	31	24	55	25.7
U6	120	54	174	80.9	15	6.9	13	13	26	12.1
U7	58	54	112	52.1	31	14.4	34	38	72	33.5
U8	67	46	113	51.8	23	9.6	24	62	82	37.6

U1= In my view, we should not worry about non-renewable resources.

U2= To me, we have to consume resources not by forgetting the coming generation.

U3= I believe that poverty and drought have occurred in our country for many times because God curses us.

U4= In my view, we should use wood fuel rather than biogas and solar to conserve our natural resources.

U5= We need to change our feeding habit from' Injera' to other available food items.

U6= I feel that poverty and drought have occurred in our country because we are poor in our resource management.

U7= I believe that conservation of the living and the non-living elements of our environment are crucial for our development.

U8= In my view, people are severely exploiting their environment.

As shown in table 24, most of the students were found having favorable attitudes towards consuming resources from the environment except in items five, seven and eight where nearly half of the students did have unfavorable and unclear attitudes. For instance, 25.7 % of the students did not want to change their feeding habit from 'Injera' to other available food items where ' Teff ' and other cereals cannot be grown due to different environmental problems. Moreover, 33.5 % of the students did not agree that poverty and drought have occurred in our country for many times because we are poor in our resource management whereas only 52.1% of them agreed with this view. Further, 37.6% of the students did not believe that people are severely exploiting their environment. Still 20.5% of the students believed that they should not worry about non-renewable resources; and 12.8 % of them also believed that poverty and drought have occurred in our country for many times because we are cursed by God. These show that some of the students did have cultural and religious impacts on utilizing their environment. In addition, the attitude of students to protect their environment was presented in table 25.

Table 25: The Attitudes of Grade Nine Students to Protecting their Environment

	Respondents Having									
	Favorable Attitudes				Neutral Attitudes		Unfavorable Attitudes			
Items	5	4	Total	%	3	%	2	1	Total	%
P1	115	51	166	79.8	8	3.8	14	20	34	16.3
P 2	164	33	197	88.7	6	2.7	8	11	19	8.6
P 3	88	59	147	67.4	23	10.6	27	21	48	22.0
P 4	21	34	55	25.0	38	17.3	69	58	127	57.7
P 5	119	46	165	77.1	11	5.1	7	31	38	17.8
P 6	86	74	160	72.7	27	12.3	14	19	33	15.0
P 7	134	49	183	83.9	13	5.9	8	14	22	10.1
P 8	44	66	110	49.5	46	20.7	31	35	66	29.7
P 9	18	39	57	25.6	38	17.0	54	74	128	57.4
P 10	62	40	102	47.2	29	13.4	35	50	85	39.4
P 11	86	51	137	61.7	32	14.4	19	34	53	23.9

P1= Nature itself makes our ecological system balance, so no need of conserving it.
P2= In my view, everybody is responsible to protect his or her environment.
P3= I believe that environmental illiteracy is the main cause of environmental problems at North Shoa and in Ethiopia.
P4= I believe that our government should not give license for industry owners if their plants have serious impact on our environment.
P5= In my view, farmers can set fire on forests when they need additional farmland.
P6= I feel our government is the responsible organ for our environmental problems and their solutions.
P7= I feel that we, students should play the dominant role in protecting our environment in developing countries like Ethiopia.
P8= I feel that protecting my local environment is the responsibility of development agents and health extension workers.
P9= In my view, to create job opportunity for the unemployed, our government has to give license for industry owners although their plants might have impact on our environment.
P10= I believe that anybody does not have the right to use plants or animals as he or she likes.
P11= I feel that we, students might not play key roles in protecting our environment because we are not matured.

Table 25 depicts that students did not have clear opinion in protecting their environment. On the one hand, 88.7% of them believed that everybody is responsible to protect his or her

environment. On the other hand, 29.7% of them agreed that protecting their local environment is the responsibility of development agents and health extension workers whereas only 49.5% of them disagreed. 23.9% of them also believed that they might not play key roles in protecting their environment because they are not matured. Above all, 57.4% of the students agreed that our government has to give license for industry owners to create job opportunity for the unemployed although their plants might have impact on our environment. Similarly, only 25.0% believed that our government should not give license for industry owners if their plants have serious impact on our environment whereas 57.7% of them had unfavorable attitude. This might be that the attitude of students to protect their environment is superficial. Similarly, the attitudes of grade ten students to their environment were presented in table 27 and 28.

Table 26: The Attitudes of Grade Ten Students to Utilizing their Environment

	Respondents Having									
	Favorable Attitudes				Neutral Attitudes		Unfavorable Attitudes			
Items	5	4	Total	%	3	%	2	1	Total	%
U1	79	31	110	74.8	11	7.5	9	17	26	17.7
U2	92	32	124	84.4	5	3.4	12	7	19	12.8
U3	79	32	111	75.5	12	8.2	8	16	24	16.3
U4	70	45	115	79.9	9	6.3	13	7	20	13.9
U5	41	41	82	57.3	27	18.9	22	12	34	23.8
U6	79	48	127	87.6	6	4.1	9	3	12	8.3
U7	24	52	76	53.5	23	16.2	27	16	43	30.3
U8	39	35	74	60.2	11	8.9	21	17	38	30.9

As can be seen in table 26, more than 50% of the students were found having positive attitudes on how to utilize their environment. However, 30.3% and 30.9% of them did not agree that conservation of the living and the non-living elements of our environment are crucial for our development; and people are severely exploiting their environment. Like grade nine students, 23.8% of them believed that no need of changing their feeding habit from 'Injera' to other available food items; and 17.7% of them did not worry about non-renewable resources.

Further, 16.3% of the students believed that poverty and drought have occurred in our country for many times because God curses us.

Table 27: The Attitudes of Grade Ten Students to Protecting their Environment

	Respondents Having									
	Favorable Attitudes				Neutral Attitudes		Unfavorable Attitudes			
Items	5	4	Total	%	3	%	2	1	Total	%
P1	80	37	117	79.1	11	7.4	11	9	20	13.5
P 2	102	25	127	86.4	3	2.0	5	12	17	11.6
P 3	26	49	73	55.7	19	14.5	27	12	39	29.8
P 4	14	16	30	20.5	20	13.7	55	41	96	65.8
P 5	99	30	129	88.9	4	2.8	6	6	12	8.3
P 6	55	58	113	78.5	13	9.0	11	7	18	12.5
P 7	82	42	124	84.9	4	2.7	13	5	18	12.3
P 8	44	51	95	64.2	16	10.8	23	14	37	25.0
P 9	14	23	37	26.1	25	17.6	49	31	80	56.3
P 10	40	33	73	51.4	10	7.0	29	30	59	41.5
P 11	71	34	105	71.9	17	11.6	14	10	24	16.4

Table 27 also shows that grade ten students did not have clear opinion in protecting their environment like grade nine ones. On the one hand, 86.4% of the students believed that everybody is responsible to protect his or her environment. On the other hand, 25.0% of them agreed that protecting their local environment is the responsibility of development agents and health extension workers. Moreover, 65.8% of the students did not support the view that the government should not give license for industry owners if their plants have serious impact on our environment. Likewise, 56.3 % of them believed that our government has to give license for industry owners to create job opportunity for the unemployed although their plants might have impact on our environment. Above all, 41.5%, of the students perceived as if animals and plants were created to the personal satisfaction of human beings. In short, from the data observed, students do not have clear positive attitudes to their environment.

Above all, based on the analysis made using percentage above, we cannot identify whether there is a statistical significant attitude difference between grade nine and ten, male and female, and urban and rural students to their environment. Hence, the researcher made further analysis.

Table 28: Descriptive Statistics for Attitude Test Scores by Grade Level

	Grade	N	Mean	Standard Deviation
Attitude Score	nine	225	67.56	10.98
	ten	148	67.43	11.00

Table 29: T-test for Independent Samples of Grade nine and ten Students

Variable	t	df	Mean Difference
Attitude Score	0.11*	371	0.13

*p > 0.05

In table 28, there was almost no difference between the mean attitudes of scores of grade nine and ten students. Significant mean difference was not also observed in table 29, t (371) = 0.11, $p > 0.05$. This might be due the short knowledge gap between the two grade levels.

Table 30: Descriptive Statistics for Attitude Test Scores by Place of Residence

Variable	Residence	N	Mean	Standard Deviation
Attitude Score	Urban	194	67.72	10.62
	Rural	179	67.27	11.38

Table 31: T-test for Independent Samples of Urban and Rural Students

Variable	t	df	Mean Difference
Attitude Score	0.39*	371	0.44

*p > 0.05

As shown in tables 30 and 31, there was no statistically significant mean attitude score difference between urban (M=67.72, SD=10.62) and rural (M=67.27, SD=11.38) students, t (371) = 0.39, p > 0.05.

Table 32: Descriptive Statistics for Attitude Test Scores by Sex

	Sex	N	Mean	Standard Deviation
Attitude Score	Male	220	67.99	11.66
	Female	153	66.79	9.91

Table 33: T-test for Independent Samples of Male and Female Students

Variable	t	df	Mean Difference
Attitude	1.04*	371	1.20

*p > 0.05

As can be seen in table 32 and 33, there was no statistically significant difference between male (M = 67.99, SD = 11.66) and female students (M = 66.79, SD = 9.91) mean attitude scores, t (371) =1.04, p > 0.05.

To see whether there is a statistical mean attitude score significant differences among the four schools, one- way ANOVA was employed.

Table 34: Descriptive Statistics for Mean Scores by Schools

Schools	N	Mean	Standard Deviation
MO	85	68.14	12.67
MM	74	65.05	12.29
DS	65	69.35	8.13
DB	149	67.55	10.19
Total	373	67.50	10.98

Table 35: ANOVA Summary for Attitude Scores by Schools

Source of Variation	Sum of Squares	df	Mean Square	F
Between Groups	701.42	3	233.81	1.96*
Within Groups	44113.82	369	119.55	
Total	44815.24	372		

*P > 0.05

Table 34 showed that students at Debre Sina got the highest mean score (69.35) and at Mehal Meda the lowest (65.05); and Debre Brihan (67.55) and Molale (68.14) got nearly equal magnitude. However, the ANOVA summary in table 35 depicted that there was no statistical significant mean difference among the schools as a whole, $F(3,369) = 1.96$, $p > 0.05$. There fore, the differences observed in the schools might be due to high or low scores, or sampling errors.

Students` Skills of Identifying and Solving Environmental Problems

Students were asked to list down the most serious environmental problems at their local (North Shoa), Ethiopian and global contexts, together with their causes, solutions and participants to implement the proposed solutions. One of the main objectives of the new Education and Training Policy is developing problem solving skills of students (FDRE, 1994); and the intent of Palmer (1998) dynamics model of planning and implementing EE is to develop students` knowledge, attitudes and skills in an integrated manner.

Table 36: Environmental Problems at Local Context (North Shoa)

1.1	**Problems**	MM (N=74)	MO (N=85)	DS (N=65)	DB N=149)	Total (N=373)	Percentage of the Total
	population growth	16	38	14	53	121	32.4
	soil erosion	30	38	2	11	81	21.7
	deforestation	3	18	15	23	59	15.8
	Drought	27	10	8	12	57	15.3
	water pollution	27	16	3	11	57	15.3
	Air pollution	9	9	6	12	36	9.7
	HIV/AIDS	8	9	4	12	33	8.8
	Illiteracy	4	12	4	14	34	9.1
	Climate change	5	3	5	16	29	7.8
1.2.	**Causes**						
	Deforestation	18	12	11	12	53	14.2
	population growth	18	20	4	27	69	18.5
	poor agricultural practices	9	14	5	4	32	8.6
	Illiteracy	10	14	11	8	43	11.5
	Unwise use of natural resources	11	5	2	12	30	8.0
	Not using Contraceptives	4	5	2	11	22	5.9
	Absence of family planning	3	2	3	4	12	3.2
	poverty	9	16	2	4	31	8.3
	Drought	2	3	7	3	15	4.0
1.3.	**Their Solutions**						
	Education	10	23	11	45	89	23.9
	Family planning	5	11	8	4	28	7.5
	Using Contraceptives	6	5	1	4	16	4.3
	Planting trees	6	10	4	12	32	8.6
	Protecting and conserving plants and animals	3	5	5	4	17	4.6
	Using resources wisely	4	2	2	16	24	6.4
	Making Terracing	6	5	5	8	24	6.4
	Using solar energy	2	3	1	4	10	2.7
1.4.	**Participants**					0	
	The Educated (students, teachers, etc.)	2	7	4	3	16	4.3
	The Society	1	20	16	29	66	17.7
	The government	3	14	4	20	41	11.0

Table 36 shows that population growth is the most serious environmental problem at North Shoa as identified by 32.4 % of the respondents. Soil erosion and deforestation got the second and the third places by 21.7% and 15.8% of the respondents. Moreover, drought and water pollution had equal place (15.3%) by the respondents. In addition, students were asked to identify the main causes for the most serious environmental problems in their local context. Population growth (18.5%) still found as a major cause followed by deforestation (14.2%) and illiteracy (11.5%). This is too vague; the cause for population growth is population growth. However, according to UNEP (2006), the most serious environmental problem in highland areas is soil erosion due to deforestation, land degradation and population pressure.

Furthermore, students were asked to identify the solutions for the most serious environmental problems they identified. Education was chosen as a one of the best solutions by 23.9% of the students. However, the major responsibility to implement this solution was left for the society (17.7 %) whereas the expected key actors like teachers, students and other educated bodies got small attention (4.3%) by the students themselves. From their responses, one can infer that they did not get the right training and practice on how to identify serious problems, define, prioritize and solve the local, societal and their problems by selecting the right solutions in the teaching and learning process. Generally, it seems that students are not well skilled in identifying and solving real life problems.

-Table 37: Environmental Problems in Ethiopian Context

2.1	**Problems**	MM (N=74)	MO (N=85)	DS (N=65)	DB (N=149)	Total (N=373)	Percentage of the Total
	Soil erosion	9	15	3	7	34	9.1
	population growth	14	35	21	45	115	30.8
	deforestation	13	7	8	18	46	12.3
	desertification	10	3	3	8	24	6.4
	HIV/AIDS	8	10	3	19	40	10.7
	Drought	8	7	5	23	43	11.5
	Poverty	12	21	1	4	38	10.2
	Climatic Change	3	2	4	16	25	6.7
	Air Pollution	8	14	2	8	32	8.6
	Water Pollution	4	9	1	4	18	4.8
2.2	**Causes**						
	Drought	10	5	3	4	22	5.9
	Poverty	12	11	4	3	30	8.0
	population growth	16	24	6	16	62	16.6
	Deforestation	6	3	7	12	28	7.5
	Illiteracy	9	7	3	15	34	9.1
	Not using Contraceptives	2	5	2	4	13	3.5
	Absence of family planning	1	5	3	2	11	2.9
	poor agricultural practices	2	3	3	4	12	3.2
2.3.	**Their Solutions**						
	Education	9	16	4	27	56	15.0
	Family planning	4	7	3	3	17	4.6
	Planting trees	2	4	3	2	11	2.9
	Making terracing	3	7	5	6	21	5.6
	Using Contraceptives	3	4	3	8	18	4.8
	Wise use of resources	3	3	10	4	20	5.4
	Working hard	3	9	2	4	18	4.8
	Using solar energy	2	3	5	3	13	3.5
2.4.	**Participants**					0	
	The Educated (students, teachers, etc.)	1	10	1	8	20	5.4
	The Society	16	22	7	59	104	27.9
	The government	8	10	7	30	55	14.7

Besides, students were also asked to list down the most serious environmental problems in Ethiopia. As shown in table 38, population growth (30.8%) was identified as the most serious problem followed by deforestation (12.3%) and drought (11.5%) in Ethiopian context. HIV/AIDS (10.7%) and poverty (10.2%) were identified as the fourth and fifth serious environmental problems. Banton (2005) in UNEP (2006) discussed that Africa including Ethiopia has been facing different serious environmental problems like poverty, deforestation, desertification, soil erosion and health problems. For example, Africa experienced widespread food shortages, 22,000,000 in central Africa and 10,000,000 in Ethiopia alone in 2005.

The students found population growth (16.6%) as the main cause for serious environmental problems in Ethiopian context too, which is still too vague. Illiteracy (9.1%) and poverty (8.0%) followed. Regarding suggesting the solutions, students believed that education (15.0%) is the main means to alleviate these problems. Nevertheless, in countries like Ethiopia where a lot is expected from the educated such as teachers, students, agriculture experts, according to the students the major responsibility lies on the shoulder of the society (27.9%) whereas they took the least share (5.4%). This did not show the maturity of students in having the right skills in selecting the right participants to teach their family in particular and the society to bring behavioral changes, planning their family to control population growth at local and Ethiopian contexts in general.

Table 38: Environmental Problems at Global Context

3.1	**Problems**	MM (N=74)	MO (N=85)	DS (N=65)	DB (N=149)	Total (N=373)	Percentage of the Total
	Poverty	7	8	1	4	20	5.4
	population growth	21	14	15	22	72	19.3
	Air pollution	25	27	13	45	110	29.5
	Global warming	15	15	6	36	72	19.3
	HIV/AIDS	12	10	8	19	49	13.1
	Drought	7	9	8	4	28	7.5
	Desertification	7	5	4	4	20	5.4
	Deforestation	5	9	3	4	21	5.6
	Ozone depletion	2	6	5	4	17	4.6
	Acid Rain	1	1	2	1	5	1.3
	Industrializations	2	3	4	4	13	3.5
	Water pollution	3	4	1	4	12	3.2
	Illiteracy	5	3	6	4	18	4.8
3.2	**Their Causes**						
	population growth	12	10	3	8	33	8.8
	Illiteracy	18	7	3	5	33	8.8
	Not using Contraceptives	4	2	4	6	16	4.3
	Industrialization	12	18	5	12	47	12.6
	Deforestation	10	9	10	8	37	9.9
	Drought	10	2	5	4	21	5.6
	Poverty	1	5	1	4	11	2.9
	Unsafe sex	3	4	5	4	16	4.3
3.3	**Their Solutions**					0	
	Education	15	9	7	26	57	15.3
	Family planning	3	7	4	6	20	5.4
	Planting trees	2	7	1	6	16	4.3
	Using Contraceptives	3	3	7	4	17	4.6
	Wise use of resources	6	4	7	5	22	5.9
	Working hard	3	7	6	4	20	5.4
	Using Solar/water power	6	5	3	4	18	4.8
3.4	**Participants**					0	
	The Educated (students, teachers, etc.)	7	5	6	7	25	6.7
	The Society	21	11	11	18	61	16.4
	The government	9	9	4	30	52	13.9
	People in the World	5	12	4	6	27	7.2

Nowadays, not only environmental problems are serious at local and Ethiopian contexts, but they are globally too. Students were also asked to mention the most serious environmental problems globally. As can be seen in table 38, students identified air pollution (29.5%) as the most serious environmental problem in the world followed by population growth and global warming (19.3%) by getting equal magnitude. However, the failures in the management of our human environment result in serious environmental problems such as global warming, ozone depletion, acid rain globally (UNEP, 2006). That is why global warming is the top sensitive agenda all over the world now.

Further, industrialization (12.6%) were found as the major cause for the most serious environmental problems in the world followed by deforestation (9.9%), population growth and illiteracy by getting equal amount(8.8%). Regarding their solution, still students found education the key to alleviate local, Ethiopian and global environmental problems. However, as participants preferred to address serious environmental problems at local and Ethiopian contexts, still the educated shared the least responsibility (6.7%) compared with the lion share given to the society (16.4%) and the government (13.9%).

On the other hand, principals in the four schools were interviewed about their managerial and academic support to the teachers to implement problem-solving approach, teach contents in the immediate environment, and to address environmental problems in the nearby community by having close relationship. According to their response, their contribution is very little due lack of training, financial problem, class size, and technical support from the zonal and woreda education officers. Above all, the community tried to support the schools in terms of money, labor and so forth whereas the schools` contribution to address environmental problems in the community was found negligible. These directly affect students` ability to integrate theory with practice. These also did not help students to develop responsibility in addressing environmental problems in their local, Ethiopian and global contexts.

In general, the data from students` achievement test, attitude score and open-ended questions to assess students` problem solving skills showed that the students do not have the right knowledge about their environment, environmental issues and problems, and they are not changed behaviorally and skilled mentally to be the key actors in addressing local, Ethiopian and

global environmental problems which are intense now. According to the data collected and analyzed, these attribute to different factors like the place given to EE in the curricula materials, teachers` training on how to integrate EE in their subject areas, and the methods of teaching and learning developed in the materials, as well as employed in the actual teaching and learning process by the classroom or through plasma TV teachers, and so forth.

Discussion

Generally, the objectives of the new education and training policy were assessed in relation to EE objectives, contents and teaching methods. The results showed that the policy document included EE objectives explicitly and implicitly. So did its contents and teaching methods. However, when the curriculum guides and students' textbooks of the selected subjects for this study were assessed in line with EE objectives developed in the policy document, they were inadequately translated. This result conforms to one or two of Psacharopouls (1990) evaluation findings on the gap between educational policy and the actual practices and failures in some African countries.

To him either the policy intention was lip service, a political statement or it lacked valid theoretical model and feasibility to educators such as curriculum experts to translate it into curricula materials. For instance, the policy objectives focused on developing students who are knowledgeable, skillful in solving their and societal problems and having positive attitudes to their environment at national and global contexts. However, the result of the content analysis showed, curriculum experts seemed that they faced to translate the objectives developed in the policy document that are emanated from different major philosophy of education. Above all, the study also showed that they did not have sufficient training or qualification on EE that might help them how to integrate objectives related to knowledge, skills and attitudes. In other words, if they had been trained well on how to integrate EE into the curricula materials, they would not have faced problems of incorporating education about, for, in or from the environment that are vital to integrate the three domains of learning.

Specifically, objectives developed in the curriculum guides and students' textbooks relatively addressed EE knowledge though they focused on fragmented facts. As a result, they were not appropriate for students to: understand the interactions and interdependence of living

and non-living things; aware how the culture, religion, consuming and feeding habits, political, economic and social practices affect their environment; identify and clarify the roles that every citizen has to play to resolve environmental problems at local, Ethiopian and global contexts. Moreover, objectives related to attitudes got little attention compared with knowledge objectives. In addition, the objectives did not help students to clarify values and develop positive attitudes to their environment as they were developed in prescriptive manner. Therefore, they might not be motivated to consume and protect resources by considering their environment and the coming generation. Objectives related to skills, typically developing students' problem solving were totally ignored. The skills objectives developed in the materials focused on reading (map, amount of rainfall, speed of wind, etc.), measuring temperature and manipulating microscope. Although these are very important, they alone do not enable students to identify and solve environmental problems. Hence, students did no get the chance to investigate and solve environmental problems and issues that are intense in their locality. Moreover, statistical significant difference was observed between the number of EE objectives developed and expected in the curricula materials in general, $X^2(3, N=231) = 413.554, p < 0.05$.

EE objectives were not treated in the curricula materials of grade nine and ten biology and geography in an integrated way. Palmer (1998), in his dynamic model of planning and implementing EE, underlined that EE knowledge, skills and attitudes are inseparable and should be given relative emphasis. Above all, to develop students' EE knowledge, skills and attitudes in an integrated manner, he showed that the three components of EE: education about, for, in or from the environment should be integrated in the planning and implementing curricula materials.

The analysis made on the incorporation of the three components of EE showed that facts (education about the environment) had got the highest place in both the curriculum guides and students` textbooks whereas environmental problems and issues (education for the environment) and learning from the real environment had the lowest place in the materials. In other words, the three components of EE were not synthesized well in both subjects. Only a single unit was found relatively integrating the three components of EE from each subject in each grade level. This approach of integrating EE into the curricula materials was not advised to address different environmental issues and problems that can be treated well in different units (UNESCO-UNEP,

1987 in Dessalegn, 1998). As a result, for schools like in Ethiopia where there are crowded timetable, multidisciplinary model of integration, infusing environmental issues in different subjects and units is recommended (UNESCO, 1994). According to EPA (1997), EE should be taught in multidisciplinary way in the school curricula of primary and secondary level. However, the authority did not contribute towards the development of such system when secondary education curricula materials were revised to make them relevant to the lives of students in particular and our society in general.

As the researcher closely inspected the content presentations of the curricula materials, ICDR curriculum experts did not identify serious environmental issues and problems, and integrated them well even in the units that were found integrating education about, for, in or from the environment. This might be because of their rationales: prescribed contents form higher government figures and the rule that force them to revise materials every five years.

Further, it seems that they did not search for recent research works done in their subject areas. For instance, Aklilu (2001) found that contents in geography curricula materials were not presented as they could be. And he recommended contents to be addressed at national and global contexts in the forthcoming curricula revision. Nevertheless, these contents were not found in the newly revised curricula materials of grade nine and ten geography as expected. Above all, the present study showed that MOE did not have EE unit that can coordinate, organize and contribute to expert's knowledge of such model of integration, not only to translate properly the policy objectives into curricula materials but also to make the teaching and learning process effective and relevant in line with the problems and needs of our society. On the other hand, the practice of EE at different levels of education in different countries including Africans, according to Palmer (1998), showed that EE unit has played significant roles in integrating EE into school curricula and doing research related to curricula materials development and employing appropriate teaching methods that are relevant to the lives of the society.

Furthermore, the evaluation techniques developed in the curricula materials focused on students' recalling facts learned from the curricula materials. They did not include items which use to evaluate attitudes and skills' objectives plus practical activities that are inseparable parts of

EE and pertinent to education to play significant role to sustainable development. For instance, for attitude objectives developed in biology curricula materials, evaluation items developed in the materials were found prescribing values in each unit. This conforms to the findings of UNESCO (2000) survey on the Incorporation of Environmental Education into School Curricula. The survey showed that the evaluation of EE was conducted using the conventional practices for science and social studies, using paper and pencil tests. In other words, the evaluation techniques focused on evaluating the achievement of cognitive domain. However, this does not enable teachers and other educators to evaluate students' behavioral change in terms of problem solving skills, attitudes and participation that are the desired qualities from students in this century to alleviate intense environmental problems at local, national and global contexts. However, they are not given due attention when revising curricula materials of grade nine and ten biology to bring such desired change in our students.

Since teachers are the key agents for implementing objectives in education policy and in the curricula materials, their attitudes to EE, the teaching and learning process and the roles that they can play in the school and the community are indispensable. The results of the assessment showed that teachers' attitudes to EE were found favorable whereas their attitudes to the sources of knowledge, how students should be taught, and their roles in the school and in the community were not encouraging. Nearly half of the teachers (48.5%) believed that they are the sources of knowledge. However, the sources of knowledge are not only classroom teachers, but also the interaction among curricula materials, students, teachers and the real environment that both students and teachers can get first hand experiences, learn by doing, and develop skills and appreciate aesthetics. Further, 63.6% of them believed that students should be taught facts in their textbooks and 72.7% of them agreed that this made students problem solver. However, the present philosophy of EE and the actual practices in different countries in the world showed that teachers are not only expected to teach facts written in curricula materials but also they have to integrate local, national and global environmental problems and issues from the environment or from secondary sources so that students can debate, discuss, argue and come up with their own solutions. To accomplish this effectively, teachers need to be trained on how to integrate EE in their subject areas in the teaching and learning process.

However, the result from open-ended questions showed that most of the biology and geography teachers who participated in this study did not get training on how to integrate EE into their subject areas in the actual teaching and learning process. Almost none of the teachers participated in workshop that introduced the new inputs in the revised materials of both subjects and grade levels. And none of the teachers was observed implementing some new inputs in terms of teaching methods like projects in biology textbooks and some practical activities in geography textbooks. As observed, Plasma TV made both teacher and students passive listeners and receivers of knowledge from a central source in biology lessons. This confirms to some of the research findings of Hussein (2006) on " Secondary Schools in Ethiopia and The Satellite Television Education (STE): A Digitalized Perpetuation of Control on Human Mind" : "seeing students as knowledge seeking rather than understanding seeking; seeing teaching as a process of pouring knowledge into the minds of students and learning as a process of receiving that knowledge as a perfect, unquestionable truth; and discouraging teachers and their students from becoming critical thinkers by turning them into human 'databanks'." This contradicts with the objectives of our education policy, producing citizens having problem solving skills and positive attitudes to our environment by integrating theory with practice for an all-rounded development of personalities. This is also highly paradoxical to the approaches that MOE has followed in black and white, learning and teaching should focus on student -centered and problem solving approaches.

Finally, the outcomes of the teaching and learning process using the revised materials and teachers of these subjects and grade levels, students` environmental knowledge, attitudes and skills, were assessed using criterion-referenced test, Likert-type scale and open-ended questions. The result showed that most of the students achieved below the standard set (70%) by their teachers. This conforms to Melaku`s (1994) finding of trainees environmental knowledge. On the other hand, Bartosh (2003) identified that students in schools where EE programme ran, were found achieving the highest scores in environmental knowledge compared with students where EE did not run.

Although the majority of the students achieved below the standard set, their achievement was compared in terms of grade level, sex and place of residence. As a result, significant mean difference was observed between male and female students, $t\ (371) = 2.26$, $p < 0.05$, and grade

nine and ten students, t (371) = 2.00, $p < 0.05$. This showed that grade ten students achieved better than grade nine, and male students achieved better than female, in relation to grade level, which agrees with findings of Aklilu (2001), Ehrampoush and Baghiani Moghadam (2005) in relation to gender differences respectively. However, there was no statistically significant mean achievement score difference observed between urban and rural students, t (371) = 0.045, $p > 0.05$. Generally, the ANOVA summary showed that no statistical significant mean difference was obtained in the schools as a whole, F (3,369) = 1.97, $p > 0.05$.

Regarding students attitudes, no statistically significant mean difference was observed between male and female students, t (371) = 1.04, $p > 0.05$, grade nine and ten students, t (371) = 0.11, $p > 0.05$, and urban and rural ones, t (371) = 0.39, $p > 0.05$. The ANOVA summary also depicted that no statistically significant mean attitude score difference in the schools as a whole, F (3,369) = 1.96, $p > 0.05$. This might be due to different reasons. First, as Iverson (1976) in Melaku (1994) identified, and the content analysis and observation made for this research showed that the affective domain is not properly treated in the curricula materials and in the actual teaching and learning process. Second, the experiences, narrow knowledge gap between grade nine and ten students might contribute to no significant attitudinal difference. Third, the students' real life experiences and the actual teaching and learning process might not invite students to have significant attitude difference in utilizing and protecting their environment. Finally, the Likert-type scale items developed by the researcher might have a weakness to discriminate the attitudes of students in terms of sex, place of residence and grade level.

In relation to students' problem solving skills, the result of this study showed that the curricula materials and the teaching and learning process did not invite students to identify and solve serious environmental problems at local contexts. Their response from open-ended questions also showed that they were not able to identify environmental problems according to their intensity, causes, and solutions to address the problems adequately. Above all, the majority of the students failed to identify the problems as shown in table 36, 37 and 38.

To sum up, although the new education and training policy included EE objectives, they were insufficiently translated into grade nine and ten geography and biology curricula materials,

which are typical subjects to integrate EE as identified by different scholars as discussed in the review part of this paper. As result, the curricula materials did not entertain the skills typically problem solving and attitude objectives though the knowledge ones were better developed compared with the first two. The contents and the teaching and learning methodology developed in the materials and in the actual teaching and learning process did not integrate education about, for, in or from the environment that are vital to develop students` environmental knowledge, skills and attitudes as a whole. Above all, the efforts made by MOE, ICDR curriculum experts and EPA to integrate EE into the selected subjects curricula materials were not contributing to make education play its roles in developing students knowledge, skills, attitudes and participation to solve the present day serious environmental problems in their locality and in Ethiopian contexts towards sustainable development. In other words, the contributions of MOE, ICDR curriculum experts and EPA in integrating EE into biology and geography curricula materials revised in 2003/4, and teachers of these subjects through the actual teaching and learning process did not prepare students to contribute their best to sustainable development of our country that agrees with the findings of Yeneken et al. (2002). Hence, the attempt made on this research and its results might instigate researchers and educators for further research at national level. As education has been given central role to play for sustainable development of a nation and the whole globe in this century, researchers should also give great attention in doing intense research on how to integrate EE at different levels of our education system as Hopkins et al. (1996) in Yeneken et al. (2002) underlined that " The roots for sustainable development are firmly planted in environmental education".

Chapter 5: Summary, Conclusion and Recommendations

Summary and Conclusion

The main objective of this study was to assess the integration of EE into both grade nine and ten biology and geography curriculum guides and students' textbooks, and so did into the actual teaching and learning process at North Shoa. To achieve this objective, the following research questions were formulated.

1. Do the objectives developed in our educational and training policy incorporate EE?
2. Are the objectives, contents, teaching methods and evaluation techniques of EE integrated into grade nine and ten biology and geography curriculum guides and students` textbooks?
3. How do teachers of these subjects and grade levels implement the curriculum guides and students` textbooks by integrating education about, in and for the environment?
4. Do students have EE knowledge, positive attitudes to their environment and problem - solving skills?

On the one hand, to assess the integration of EE into curriculum guides and students' textbooks of grade nine and ten biology and geography, both qualitative and quantitative data were collected through content analysis. And to collect both types of data, categories were developed and unit of analysis determined. Then, coding sheet was developed and categories were defined and introduced to coders. Quantitative data were collected by the selected coders (teachers) and the qualitative ones by the researcher. On the other hand, to assess the integration of EE into the teaching and learning process, both qualitative and quantitative data were collected. To assess students' environmental knowledge and attitudes to their environment, criterion-referenced test and Likert-type scale were developed by the subjects' teachers and the researcher respectively. Together with the achievement test, some open-ended questions were developed by the researcher to assess students` problem solving skills. In addition, to identify the attitudes of teachers to EE, the teaching and learning process and their roles, Likert-type scale and open- ended questions were developed by the researcher. To cross check, the data collected in such a way, observation checklist was developed and the teaching and learning process was observed. Since education typically, EE requires coordination and collaboration, major contributors like MOE, EPA, ICDR curriculum experts of these subjects and school

principals were interviewed by preparing semi – structured interview regarding their contribution in revising the curricula materials and facilitating and supporting teachers to make the teaching and learning process relevant to the lives of the students and the society at large.

Before collecting the actual data, pilot study was done by the researcher. After the instruments were refined and tested for their reliability, the final data were collected from 373 sample students from four schools: Molale, Mehal Meda, Debre Sina and Debre Brihan (225, 60.3 % of grade nine and 148, 39.7% of grade ten; 220, 58.98% male and 153, 41.01% female). Teachers (33) of these subjects were also participated. School principal from each school, ICDR geography and biology curriculum experts, experts from MOE and EPA were participated as key informants. Then, the data collected from these participants were analyzed both qualitatively, and quantitatively (using descriptive statistics like pie chart, percentage, frequency, mean and standard deviation, and parametric statistics like t- test, one-way ANOVA, and non-parametric test - Chi- square for goodness of fit).

The result of the contents analysis made on grade 9 and 10 biology and geography curricula materials showed that EE objectives (knowledge, skills, attitudes and participation) were not adequately integrated in the curriculum guides of both subjects though knowledge objectives had been given a little emphasis. Objectives related to attitudes explicitly developed in the new education and training policy were unsatisfactorily translated into these materials. The same was true for objectives related to problem solving skills, which were totally forgotten in the materials. Regarding EE contents and teaching methods, only a single unit in each subject and grade level relatively incorporated education about, for, in or from the environment. The evaluation techniques developed in the curricula materials did not match with EE objectives. They focused on assessing facts that students might learn in the curricula materials. Although attempts were made to evaluate some of the attitude objectives developed in biology curricula materials, they were found prescriptive rather than giving chances for the students to reflect the values they developed through learning each unit.

Most of the teachers, who are the main actors in implementing the policy objectives and the curricula materials, did not get training on how to integrate EE into their subject areas. Even those who took training faced problems to identify EE objectives, contents and teaching methods

and evaluation techniques. Above all, like the geography teachers that dominated their students' learning, biology teachers and their students were found dominated by Plasma TV.

The outcomes of the teaching and learning process were also assessed to identify students' environmental knowledge, attitudes to their environment and their problem solving skills. The result showed that the majority of the students performed below the standard set (70%) by their teachers in relation to their environmental knowledge and understanding. However, when their achievement scores were analyzed in terms of the independent variables (sex and grade level), statistically significant mean difference was obtained, t (371) = 2.26, $p <$ 0.05, t (371) = 2.00, $p < 0.05$ respectively. On the other hand, the mean difference between urban and rural students were found insignificant, t (371) = 0.05, $p > 0.05$. And the ANOVA summary also did not show significant mean difference in the schools as a whole, F (3,369) = 1.97, $p > 0.05$.

Moreover, regarding their attitudes to utilizing and protecting their environment, students were found having inappropriate view. The analysis made based on the independent variables also showed insignificant mean attitude score difference between male and female students, t (371) = 1.04, $p > 0.05$, grade nine and ten students, t (371) = 0.11, $p > 0.05$, and urban and rural ones, t (371) = 0.39, $p > 0.05$. The ANOVA summary also did not show statistically significant mean difference in the schools overall, F (3,369) = 1.96, $p > 0.05$.

Finally, the assessment made on students' problem solving skills showed that students failed to identify serious environmental problems in their local area leave alone problems in Ethiopian and global contexts. So did their causes, solutions and participants to implement the solutions.

Thus, based on the above results it can be concluded that EE was not integrated into grade nine and ten biology and geography curriculum guides revised in 2004, and students' textbooks written in 2005/2006, in line with its objectives, contents, teaching methods and evaluation techniques that prepare students to contribute to sustainable development of Ethiopia. Although there were some attempts to include EE objectives typically knowledge, contents and teaching methods and evaluation techniques in each subject and each grade level, the three

components of EE: education about, for, in or from the environment, which are the way to integrate EE objectives (knowledge, skills, attitudes) in planning curricula materials, were not developed in an integrated way in line with the appropriate model of integrating EE. So did in the actual teaching and learning process though they were integrated explicitly and implicitly in the new education and training policy developed in 1994.

Recommendations

Integrating EE into different subjects at different levels of education is not an easy task. It needs coordination and cooperation of the top manager and the subordinates with classroom teachers and the community. Although we had six years of experiences in EE as a project level, the present secondary education practices have given little attention to it. However, EE has been practiced in both developing (including Africa) and developed countries. This is to make the curricula materials relevant to the lives of the students and the society, to make students active learners, to make education play active roles in addressing economic, social, political and environmental problems, and to bring sustainable development of a nation.

In so doing, different countries might have different priority areas according to their real economic, social and environmental problems. As a result, we should learn from our past lessons and share such useful practices now even from our neighbors like Kenya, Uganda and the like to make our education relevant to address serious economic, social, political and environmental problems, and to lead our country to sustainable development. This might not be accomplished by developing a good education policy alone. Rather, it should be translated into practice. To accomplish this, EE objectives integrated in our education policy should be adequately translated into different curricula materials and in the actual teaching and learning process. As this study identified, there is a gap in translating the policy objectives related to EE into grade 9 and 10 geography and biology curricula materials and the actual practices. Hence, in line with the results of the present study, the researcher recommends the following:

1. MOE should take the greatest responsibility in establishing the right organs like EE unit under the ministry, in ICDR, and in regions so that regions might have sub- units down to school and community level. Hence, education will not only be coordinated effectively to be relevant to the society at different levels, it will also produce citizens

who are active participants to solve environmental and other problems at different levels by having problem solving skills and positive attitudes to their environment.

2. EPA, like its cross sectoral policies in the Environment Policy, should be active participant in integrating EE into school subjects at different levels of education to equip the younger generation with the appropriate environmental knowledge, skills, attitudes, and participation to bring sustainable development of our country.

3. Since the aims and objectives of our education and training policy are the sources of different curricula materials, experts who will revise grade ten and nine biology and geography curriculum guides should use the policy objectives as a major source and guideline. They should also incorporate empirical findings and recent theories or educational innovations into the revised curricula materials.

4. Although it is possible to integrate EE into all subjects, great attention should be given for subjects like biology and geography during curriculum revision.

5. During curriculum revision, in addition to curriculum experts, EE educators or experts, teachers and the community and stakeholders like EPA, MOA should contribute their best to integrate EE into different subjects from local, national and global dimensions. In doing this, serious environmental issues and problems should be prioritized and integrated.

6. EE should be taken as crosscutting issue together with what are mentioned in ESDP III such as 'Civic and Ethical Education', Gender and Quality education to integrate theory with practice that lead to development as stated in the policy document.

7. Curriculum experts should leave some space in the curricula guides and students textbooks for teachers and students so that they can make the content and teaching methods relevant to the students' lives in particular and the society in general.

8. School principals should play significant role in breaking the barriers between the nearby community and the school community not only by asking the community for

financial and labor support to facilitate the schools, but also by making the school community contributors to addressing the problems of the community.

9. Teachers who have been teaching non- plasma subjects should break the tradition or the way they were taught. Besides traditional teaching and learning methods, which are highly teacher dominated, they should utilize progressive methods like problem solving, field visit including practical activities, project, survey and so forth that allow students to address real problems in their locality. Further, they should not focus on transmitting facts written in curricula materials. They should identify and brainstorm serious environmental problems around the school and show to their students how to solve it or let the students find best solutions and practically implement them. Then, our education begins its role towards sustainable development of Ethiopia.

10. Above all, on the one hand, our education policy objectives related to EE emphasized in relating education to our environment to develop students' environmental knowledge, positive attitudes to their environment and problem solving skills by relating theory with practice. On the other hand, the present practice of secondary education teaching and learning through plasma TV focused on transmitting recorded factual information four or five years ago in one way. Hence, students and teachers cannot adjust the lesson according to their local environmental problems and issues. They also cannot integrate, debate, reflect, and find solutions for the timely environmental problems and issues at local, national, and global contexts. Rather, they were observed passive listeners and actors in their own learning. Therefore, nationwide intensive research is expected from IER in particular and other educators and institutions in general on how to use Plasma TV to achieve the objectives of our education policy typically to make our education play its role to sustainable development of Ethiopia by preparing students not only to alleviate environmental problems in their own contexts but also to be creative, productive and life long learners through observation from their environment and participation.

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Appendix-A

Background Information of the Main Research Participants

A. Population and Number of Students Participated in the Study

Schools	Grade Nine						Grade Ten					
	Total			Who Participated			Total			Who Participated		
	M	F	T	M	F	T	M	F	T	M	F	T
Molale	929	751	1680	27	22	49	618	373	991	25	11	36
Mehal Meda	1201	895	2096	35	25	60	317	108	425	12	2	14
Debre Sina	877	750	1627	25	21	46	322	201	523	13	6	19
Debre Brihan	1152	1279	2431	33	37	70	1230	998	2228	50	29	79

NB: M-Male

F-Female

T- Total

B. Total Teachers and those Participated in the Study

Department	Total			Who Participated		
	M	F	T	M	F	T
Geography	14	3	17	11	2	13
Biology	20	3	23	17	3	20

C. Summary of Participant Teachers in terms of Qualification and Services

Department	Qualification		Service	
	Degree	Diploma	1-2 years	3 and above years
Geography	8	5	5	8
Biology	13	7	12	8

Appendix –B

Coding Sheets

A. Coding sheet I

This coding sheet is prepared to assess the integration of EE objectives into curriculum guides revised in 2003/4

General information

Subject: **Biology Curriculum Guides**

Grade: **Nine and Ten**

Unit of analysis: **Objectives developed in the materials**

Direction for coding

Read each objective developed in the sampled units of both grade nine and ten biology curriculum guides and put the total number under each category of EE indicated in the following table. To maker your coding easier and consistent, look at the definitions of EE objectives and action verbs under each domain of learning which are attached with this coding sheet.

Thank you very much

EE Objectives	number of each category found integrated		Remark
	Grade level		
	Nine	Ten	
Knowledge			
Skills			
Attitudes			
Participation			
Total objectives Developed in the materials			

B. Coding sheet II

This coding sheet is prepared to assess the integration of EE objectives into curriculum guides revised in 2003/4

General information

Subject: **Geography Curriculum Guides**

Grade: **Nine and Ten**

Unit of analysis: **Objectives developed in the materials**

Direction for coding

Read each objective developed in the sampled units of both grade nine and ten biology curriculum guides and put the total number under each category of EE indicated in the following table. To maker your coding easier and consistent, look at the definitions of EE objectives and action verbs under each domain of learning which are attached with this coding sheet.

Thank you very much

EE Objectives	number of each category found integrated		Remark
	Grade level		
	Nine	Ten	
Knowledge			
Skills			
Attitudes			
Participation			
Total objectives Developed in the materials			

C. Coding sheet III

This coding sheet is prepared to assess the integration of EE contents and teaching methods into the curriculum guides revised in 2003/4

General information

Subject: **Biology Curriculum Guides**

Grade: **Nine and Ten**

Unit of analysis: **A unit as a whole**

Direction for coding

Read the contents presentation and the teaching methods developed in line with the contents and decide whether each sampled unit integrated education about, for, in or from the environment. To make your coding easier and consistent, look at the definitions of education about, for, in or from the environment which are attached with this coding sheet.

Thank you very much

Grade Level	Total number of units that integrate the three components of EE: education about, for, in or from the environment	Remark
Nine		
Ten		

D. Coding sheet IV

This coding sheet is prepared to assess the integration of EE contents and teaching methods into the curriculum guides revised in 2003/4

General information

Subject: **Geography Curriculum Guides**

Grade: **Nine and Ten**

Unit of analysis: **A unit as a whole**

Direction for coding

Read the contents presentation and the teaching methods developed in line with the contents and decide whether each sampled unit integrated education about, for, in or from the environment. To maker your coding easier and consistent, look at the definitions of education about, for, in or from the environment which are attached with this coding sheet.

Thank you very much

Grade Level	Total number of units that integrate the three components of EE: education about, for, in or from the environment	Remark
Nine		
Ten		

E. Coding sheet V

This coding sheet is prepared to assess the integration of EE objectives into curriculum guides revised in 2003/4

General information

Subject: **Biology Curriculum Guides**

Grade: **Nine and Ten**

Unit of analysis: **Evaluation Items developed in the materials**

Direction for coding

Read each evaluation items developed in the sampled units of both grade nine and ten biology curriculum guides and put the total number under each category of EE indicated in the following table. To maker your coding easier and consistent, look at the definitions of EE objectives and action verbs under each domain of learning which are attached with this coding sheet.

Thank you very much

Items developed to Evaluate EE Objectives	number of each category found developed in the materials		Remark
	Grade level		
	Nine	Ten	
Knowledge			
Skills			
Attitudes			
Participation			
Total evaluation items Developed in the materials			

F. Coding sheet VI

This coding sheet is prepared to assess the integration of EE objectives into curriculum guides revised in 2003/4

General information

Subject: **Geography Curriculum Guides**

Grade: **Nine and Ten**

Unit of analysis: **Evaluation Items developed in the materials**

Direction for coding

Read each evaluation items developed in the sampled units of both grade nine and ten biology curriculum guides and put the total number under each category of EE indicated in the following table. To maker your coding easier and consistent, look at the definitions of EE objectives and action verbs under each domain of learning which are attached with this coding sheet.

Thank you very much

Items developed to Evaluate EE Objectives	number of each category found developed in the materials		Remark
	Grade level		
	Nine	Ten	
Knowledge			
Skills			
Attitudes			
Participation			
Total evaluation items Developed in the materials			

G. Pilot study results of inter-coders agreement on sample biology curriculum material

Observed frequencies coder 1
Expected frequencies EE Objectives

Coder 2	Knowledge	Skills	Attitudes	Participation	Row Total
Knowledge	9	0	0	0	9
	4.05	1.05	2.25	1.35	
Skills	0	2	0	1	3
	1.35	0.45	0.75	0.45	
Attitudes	0	1	5	0	6
	2.25	0.9	1.55	0.9	
Participation	0	0	0	2	2
	0.9	0.3	0.5	0.3	0.25
Column Total	9	3	5	3	N = 20

$$CR = \frac{2M}{N_1 + N_2}$$

= 2X 18/ 20 +20

=36/40

= 0.9

$$\% \text{ expected agreement} = \frac{2E}{N_1 + N_2}$$

= 2 X 6.3 /20 + 20

= 0.32

$$\text{Scott's pi} = \frac{\% \text{ observed agreement} - \% \text{ expected agreement}}{1 - \% \text{ expected agreement}}$$

= 0.9 – 0.32/1 – 0.32

= 0.85

Similarly, for inter-coder agreement was calculated for geography curricula materials coders and found 0.90.

Appendix -C

Addis Ababa University
School of Graduate Studies
Institute of Educational research

1. Questionnaire for Teachers

1.1. Objective: The main objective of this questionnaire is to identify teachers' attitudes to Environmental Education (EE), the teaching learning process by integrating EE into the newly revised curriculum guides and student textbooks of grade 9-10 geography and biology. Since this research has been done for academic purpose, I assure you that all verbal and written responses are confidential. Therefore, your honest reply is highly appreciated. Please do not write your name.

Thank You Very Much!

1.2. Personal Information:

Name of Your School: _____
Sex:_____Department:_____Qualification_____(e.g.degree,diploma) Number of years in teaching: _____

1.3 Questions related to teachers` attitudes to EE, the teaching learning process and their role in their school and nearby community

Direction I: Put tick mark (√) under Strongly Agree (5), Agree (4), Undecided (3), Disagree (2), or strongly Disagree (1) accordingly.

R. No.	Items	5	4	3	2	1
	A. About EE					
1	In my view, EE enables teachers to make their teaching relevant to the lives of their students and the society.					
2	EE has little importance since environmental problems are very familiar.					
3	I believe that EE is the main important part of quality education at different levels.					
4	If schools are expected to address societal problems, EE should be the key component of the teaching –learning process.					
5	I believe that EE is a cure for our environmental problems.					

R. No.	Items	5	4	3	2
6	I do not think that environmental problems can be solved through teaching EE.				
	B. About the Teaching and Learning Process				
7	I believe that a teacher should be the source of knowledge in the classroom.				
8	Teaching my students in the immediate environment is time consuming.				
9	I feel secure when I teach my students in and out of the classrooms.				
10	I do not think that students should be recipients of knowledge from their teacher.				
11	I think students should be taught facts in their textbooks.				
12	I do not believe that students, being they are too young, should be taught how to identify problems, prioritize and solve them.				
13	In my opinion, students should be taught to score good grade, not how to problems.				
14	I enjoy using a variety of teaching methods in a given period.				
15	I believe that teaching my students facts in their textbooks enable them to solve their environmental problems.				
	C. About their Roles in the School and Community				
16	As an individual, teachers ,like development agents, are responsible for fighting environmental ignorance in the community.				
17	As a member of the community, my duty is not only teaching my students but also the school and nearby community.				
18	I believe that my contribution to solve intense environmental problems in Ethiopia is very little.				
19	As a teacher, my role is imparting knowledge to my students.				
20	I believe that my role is facilitating my students` learning, not imparting knowledge.				

1.4. Questions related to teachers' knowledge and awareness of teaching their subjects to students by integrating EE

Direction II: Write your answers for the following questions as completely as much as you can.

1. Do you have some training or orientation how to integrate EE into your subject area to make your teaching relevant to the lives of students and the society in your pre-service training at college or university level? Yes ____ No_____
2. If your answer for question 1 is 'Yes', what are EE:
   A. objectives?

   _____

   _____

   B.contents?

   _____

   _____

   C. teaching methods?

   _____

   _____

   D. evaluation techniques?

   _____

   _____

3. List some of the inputs you get through seminar or workshop to implement the revised materials if you have participated.

   _____

   _____

4. What are the main difficulties you have faced to:
   A. teach outside the classroom?

   _____

   _____

   B. teach by relating facts to local, national and global environmental problems?

   _____

   _____

   C. apply different teaching methods especially that address students' active learning such as problem solving, role-play, field study, etc.?

   _____

   _____

5. Are the above problems you have faced observed in instructions if your subject area is covered by plasma TV technology? Would you please list some of them?

   _____

   _____

Thank You Very Much!!

Appendix -D

2. Classroom Observation Checklist

Objective: the objective of this checklist is to assess the actual learning –teaching process: the way teacher presents a lesson and interacts with his or her students ,student –student interaction in pair or group; the way a content is related with real problems of our environment; how students are learned from first hand experiences or asked to visualize environmental problems in their surrounding and discus or debate ;how a teacher make the teaching –learning process activity or task oriented; how a teacher use a variety of teaching methods ranging from lecture to problem solving.

R. No.	Items	1	2	3	4
1	Lecture is given throughout the period				
2	Students listen and write while the teacher talks and writes on the board.				
3	The teacher uses different teaching methods in a period.				
4	Teacher facilitates students learning by posing a problem making students to find a solution in and out of the classroom.				
5	Students discuss in pairs or groups by relating facts learned with their immediate environmental problems				
6	Students and their teacher relate facts in their textbook with local, national or global environmental problems.				
7	The teaching learning process focuses on facts written on students` textbook				
8	The teacher uses the teaching methods developed in the curriculum guides and students textbooks.				
9	Students learn from the environment led by their teacher.				
10	Students are invited to present their group discussion or project work in class.				
11	Students are asked to share environmental problems in their village, town or city to their classmates, and their possible solutions.				
12	Students debate about environmental problems in class				
13	Students act out the role of others interaction and interference with their environment.				

Key: 1- Always
2- Usually
3-Sometimes
4- Not at all

Appendix –E

3. Semi –structured Interview Questions

3.1. for ICDR Curriculum Experts (Biology and Geography)

1. What is the rationale to revise:
   A. geography curriculum guides and textbooks of grade 9-10?

   B. biology curriculum guides and textbooks of grade 9-10

2. If one of the rationales is to integrate environmental aspects into:
   A. the subject geography, which model of curriculum integration was used?

   B. the subject biology, which model of curriculum integration was used?

3. Who participated in auditing and revising the curriculum guides?

4. Is there any attempt to integrate EE into these materials?

5. What kind of teaching methods are designed in the curriculum to teach students?
   A. Environmental knowledge?

   B. Environmental skills?

   C. Environmental attitudes and values?

6. What are the methods and techniques of evaluation developed in the curriculum?

7. What is your qualification, training, or orientation in environmental education?

3.2. Interview Questions for Environment Protection Authority (EPA) Environmental Education Department Expert

1. What are some of the efforts made by EPA to overcome our environmental problems?

2. What are some of the efforts made to change the behavior and attitudes of our people?

3. What are some of the stakeholders of this authority to implement 'Environmental policy' in our country?

4. What are the roles of EE department in this authority?

5. Does it contribute to the formal education in terms of:
   A. curriculum development?

   B. disseminating EE knowledge in the classroom?

   C. organizing EE/nature club in schools?

   D. financing, provision of resources and teaching methods?

3.3. Interview Questions for MOE Expertise

1. Is there a National Environmental Education programme unit in MOE and at different levels of education?

2. Is there any attempt of including the recommendation made by Environmental Education Project team in 1992 in our country?

3. Is 'A Guiding Document on Environmental Education in Ethiopia ' available in secondary schools?

4. In what way do you check the general and specific objectives that address the relationship between our environment and education in our education policy integrated into secondary school curricula?

5. To improve the quality of education in general and at secondary level in particular, what are the foci areas of the educational process?

6. How do you ascertain that the newly revised secondary school curricula materials prepared by ICDR are responsive to our environment, health etc., in general and the learning process in particular to develop the problem solving skills of students?

7. What about the pedagogy and methods of work in these materials in line with the present philosophy of our education?

8. Do you think that our environmental problems have been given due attention as a crosscutting issue in ESDP I, II and III documents and practices?

9. How do you check that secondary education addresses the needs and local problems of our society?

10. What are the main stakeholders of this ministry to make secondary education relevant to the society?

3.4. Interview Questions for school Directors

1. What is your managerial, academic, material and financial support to make the teaching learning process effective in terms of:

A. implementing problem solving teaching method?

B. teaching contents in the immediate environment?

C. participating in solving environmental problems of the nearby community of the school?

2. Are there any aspects of interaction and collaboration between your school and the nearby community to resolve current environmental problems?

3. How often do woreda and zonal supervisors and curriculum experts give technical, academic and material support to your school community to make the teaching-learning process relevant to the lives of the students and the society?

4. To what extent do you facilitate situations for each department typically to biology and geography in the teaching –learning process to integrate theory with practice?

5. How often does EPA disseminate publications about our environmental problems to your school?

6. How often do you invite guests to share their experiences from EPA, health and agricultural department at woreda, zonal, regional or federal level?

7. Is there enough place and facilities such as water, equipment, etc., to relate theory learned in the classroom into practices out side the class?

Appendix - F

Addis Ababa University,
School of Graduate Studies,
Institute of Educational research

4. Questionnaire for Students

Objective: The objective of this questionnaire is to assess students' knowledge and understanding about their environment, and attitude to their environment. Because this research has been done for academic purpose, your honesty, reporting your real practice, is highly appreciated. Moreover, I assure you that all your verbal and written responses are confidential. Please do not write your name.

Thank You Very Much!

4.1. Personal Information:

Name of Your School: _____

Sex: _____ Grade Level: _____ Place of Residence: Urban ☐ Rural ☐

4.2. Questions to identify students' knowledge and understanding about the interaction and interference of people with their environment

Direction I: Choose the best answer for the following questions and write your answer on the space provided.

____1. Which one of the following is the main source of food in the world?

A. autotrophs B. heterotrophs C. plants D. animals

____2. Which one of the following nutrient is the most important for human health?

A. carbohydrate B. protein C. vitamin D. all

____3. Who is responsible to solve environmental problems at North Shoa and in Ethiopia?

A. the government B. the rich C. every citizen D. all

____4. Which of the following **is not** the cause of food shortage at North Shoa?

A. soil erosion B. population explosion C. poor resource management

D. crop rotation

____5.The primary source of energy in the ecosystem is

A. the sun B. algae C. moon D. fungi

___6. Who is responsible for controlling population growth in Ethiopia?

A. teachers B. parents C. the government D. all

___7. Population growth is a serious problem for our environment because

A. Resources are limited on planet Earth

B. People use resources effectively and wisely

C. People would like to conserve resources for the future generation

D. there is a shortage of human resource

___8. Biodiversity is important for

A. ecological and climatic stability B. medicines and drugs C. energy source D. all

___9. The threat to biodiversity is

A. habitat destruction B. global warming C. direct human intervention D. all

___10. Which one of the following **is not** true about photosynthesis? It:

A. is a base for the world's food supply

B. is a means for balance in the atmosphere

C. might not help to balance the concentration of oxygen and carbon dioxide

D. all

__11. Which one is advised to be utilized as energy source in your locality in particular and in Ethiopia in general?

A. wood fuel B. petroleum C. solar D. all

___12. Which one is the possible consequence of climatic change resulting from global warming?

A. desertification B. drought C. loss of biodiversity D. all

___13. Which one of the following is the main global issue nowadays?

A. Air pollution B. Scarcity of fresh water C. climatic change D. all

___14. Which is the most endangered animal species in Ethiopia due to lack of conservation?

A. Walia Ibex B. Hyena C. Nyala D. Chilada Baboon

___15. Which **is not** a factor for the severe loss of soil in your locality and in Ethiopia?

A. poor land management B. deforestation C. afforestation D. all

__16. The most serious environmental problem of Ethiopia is

A. water pollution B. air pollution C. population growth D. soil erosion

___17. The main environmental problem in highly industrialized countries is

A. deforestation B. drought C. desertification D. air pollution

__18. Which part of Ethiopia is highly affected by land degradation?

A. Southern B. Eastern C. Western D. Northern

__19. The main cause of population growth in Ethiopia is

A. women fertility B. illiteracy C. improvement of living standard

D. effective disease prevention

___20. The most important way to combat environmental damage is

A. legislation B. incentives C. education D. recycling

4.3. Questions developed to assess the skills of students in identifying problems at local Ethiopian and global contexts together with their causes, solutions and participants to implement the suggested solutions

Direction II: Write your answers for the following questions as much as you can.

1. What are most serious environmental problems in your village, town or zone?

_____

A. What are their causes?

_____

B. What are their solutions and who should take part to implement these problems?

_____

2. What are the most serious environmental problems in Ethiopia?

_____

A. What are their causes?

_____

B. What are their solutions and who should take part to implement these problems?

3. What are the most serious environmental problems globally?

A. What are their causes?

_____

B. What are their solutions and who should take part?

_____

4.4. Questions students` attitudes to their environment by utilizing and protecting it.

Direction III: Put tick mark (√) under Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D), or Strongly Disagree (SD) accordingly to your attitude.

R. No.	Items	SA	A	U	D	SD
	A. Utilization					
1	In my view, we should not worry about non-renewable resources.					
2	To me, we have to consume resources not by forgetting the coming generation.					
3	I believe that poverty and drought have occurred in our country for many times because we are cursed by God.					
4	In my view, we should use wood fuel rather than biogas and solar to conserve our natural resources.					
5	We need to change our feeding habit from' Injera' to other food items.					
6	I feel that poverty and drought have occurred in our country because we are poor in our resource management.					
7	I believe that conservation of the living and the non-living elements of our environment is crucial for our development.					
8	In my view, people are severely exploiting their environment.					
	B. Protecting					
9	Nature itself makes our ecological system balance, so no need of conserving it.					
10	In my view, everybody is responsible to protect his or her environment.					
11	I believe that environmental illiteracy is the main cause of environmental problems at North Shoa and in Ethiopia.					
12	I believe that our government should not give license for industry owners if their plants have serious impact on our environment.					
13	In my view, farmers can set fire on forests when they need additional farmland.					
14	I feel our government is the responsible organ for our environmental problems and their solutions.					
15	I feel that we, students should play the dominant role in protecting our environment in developing countries like Ethiopia.					
16	I feel that protecting my local environment is the responsibility of development agents and health extension workers.					
17	In my view, to create job opportunity for the unemployed, our government has to give license for industry owners although their plants might have impact on our environment.					
18	I believe that anybody does not have the right to use plants or animals as he or she likes.					
19	I feel that we, students might not play key roles in protecting our environment because we are not matured.					

I Thank You Very Much!

Appendix -G

በአዲስ አበባ ዩኒቨርሲቲ

የድህረ ምረቃ ትምህርት

የትምህርት ጥናትና ምርምር ተቋም

4. በተማሪዎች የሚሞላ የጽሑፍ መጠይቅ

ዓላማ:- የዚህ መጠይቅ ዓላማ ተማሪዎች ስለአካባቢያቸው ያላቸውን ዕውቀትና ግንዛቤ እንዲሁም ለአካባቢያቸው ያላቸውን ዝንባሌ ለመገምገም ነው። ጥናቱ የሚደረግበት ዋና ምክንያት ለትምህርታዊ ፋይዳ ስለሆነ ትክክለኛ (ተገቢ) መረጃ በመስጠትህ/ሽ በቅድሚያ ከልብ አመሠግናለሁ። በተጨማሪም የአንተ ወይም የአንቺ የቃልም ሆነ የጽሑፍ ምላሽ በምሥጢር እንደሚያዝ አረጋግጣለልሃለሁ/ሻለሁ።

ማሳሰቢያ፡ - በዚህ መጠይቅ ላይ ስምህን/ሽን መፃፍ የለብህም/ሽም።

አመሠግናለሁ!!

4.1 የግል ሁኔታ መግለጫ (Personal Information)

የት/ቤትህ/ሽ ስም_____

ዕድ_____ የክፍል ደረጃ ----------

መመሪያ አንድ:- የ X ምልክት በመጠቀም መልስ ስጥ/ጪ።

የመኖሪያ ቦታ:- የዞን/ ወረዳ ከተማ ☐ ገጠር ☐

4.2 ቀጥሎ የቀረቡት ጥያቄዎች ሠዎች ከአካባቢያቸው ጋር ያላቸውን መስተጋብር (interaction) እና በአካባቢያቸው ላይ የሚያደርጉትን ጣልቃ ገብነት (interference) ተማሪዎች ምን ያህል እንደሚያውቁ ለመረዳት የተዘጋጁ ናቸው።

መመሪያ ሁለት:- ለሚከተሉት ጥያቄዎች በይበልጥ መልስ ናቸው የምትለውን/ይውን መርጠህ/ሽ በመልስ መስጫ ቦታው ላይ ፃፍ/ፊ።

_____1. ከሚከተሉት ውስጥ በዓለም ደረጃ ዋነኛ የምግብ ምንጭ የሆነው የትኛው ነው?

ሀ/ አውቶትሮፍስ (autotrophs) ለ/ ሄትሮትሮፍስ (hetrotrophs)

ሐ/ እፅዋት መ/እንስሳት

_____2. ለሠው ልጅ ጤና በጣም ጠቃሚ የሆነው ንጥረ ነገር የትኛው ነው?

ሀ/ ካርቦሃይድሬት ለ/ ፕሮቲን ሐ/ ቪታሚን መ/ ሁሉም

_____3. በሰሜን ሸዋም ሆነ በኢትዮጵያ የአካባቢ ችግሮችን environmental problems) ለመቅረፍ ኃላፊነት ያለበት ማነው? ሀ/ መንግሥት ለ/ ባለሀብቶች ሐ/ እያንዳንዱ ዜጋ መ/ ሁሉም

_____4. ከሚከተሉት ውስጥ በሰሜን ሸዋ ለምግብ እጥረት ምክንያት ያልሆነው የትኛው ነው?

ሀ/ የአፈር መሸርሸር ለ/ የሕዝብ ቁጥር መጨመር

ሐ/ አግባብነት የጐደለው የሀብት አጠቃቀም መ/ አፈራርቆ መዝራት

_____5. በኢኮሲስተም (ecosystem) ደረጃ የመጀመሪያ (primary) የሀይል ምንጭ የሆነው የትኛ ው ነው? ሀ/ ፀሐይ ለ/ አልጌ (algae) ሐ/ ጨረቃ መ/ ፈንጋይ (fungi)

_____6. በኢትዮጵያ የሕዝብ ቁጥር መጨመርን ለመቆጣጠር ኃላፊነት ያለበት ማን ነው?

ሀ/ መምህራን ለ/ ወላጆች ሐ/ መንግሥት መ/ ሁሉም

_____7. የሕዝብ ቁጥር መጨመር ለአካባቢያችን (to our environment) አሳባቢ የሆነበት ምክንያት ለምንድን ነው?

ሀ/ በምድር ላይ ያለ ሀብት ውስን ስለሆነ

ለ/ ሠዎች ሀብትን በአግባቡና በብልህነት መጠቀም ስለሚፈልጉ

ሐ/ ሠዎች ሀብትን ለመጪው ትውልድ ማስተላለፍ ስለሚፈልጉ

መ/ የሠው ኃይል እጥረት ስላለ

_____8. የብዝሀ ሕይወት (biodiversity) ጠቀሜታ ምንድን ነው?

ሀ/ ሥነ ምህዳር (ecology) እና የአየር ንብረት እንዳይዛባ ለ/ ለመድኃኒቶች ቅመማ

ሐ/ ለኃይል ምንጭነት መ/ ሁሉም

_____9. ለብዝሀ ሕይወት (biodiversity) መመናመን አስጊ የሆነው የትኛው ነው?

ሀ/ የመኖሪያ ውድመት (habitat destruction) ለ/ የአየር መዛት መጨመር (global warming) ሐ/ የሠው ልጅ ቀጥተኛ ጣልቃ ገብነት መ/ ሁሉም

_____10. ስለ ፎቶሲንቲስስ (photosynthesis) ትክክል ያልሆነው የትኛው ነው? ሀ/ የዓለም የምግብ ምንጭ መሠረት ነው ለ/ የአትሞስፈርን (atmosphere) ሚዛን ለመጠበቅ ይረዳል ሐ/ የኦክስጅንንና የካርቦንዳይ ኦክሳይድን መጠን ለማጣጣም አይረዳም መ/ ሁሉም

_____11. በተለይ በአንተ/በአንቺ አካባቢ እንዲሁም በአጠቃላይ በኢትዮጵያ ለሐይል ምንጭ ፍጆታ መዋል ያለበት የትኛው ነው?

ሀ/ የማገዶ እንጨት ለ/ ፔትሮሊየም ሐ/ የፀሐይ ብርሃን (solar) መ/ ሁሉም

_____12. ከሚከተሉት ውስጥ በመዛት መጠን መጨመር ምክንያት በሚከሰተው የአየር ንብረት ለውጥ ውጤት የሆነው የትኛው ነው? ሀ/ በረሃማነት ለ/ ድርቅ

ሐ/የብዝሀ ሕይወት መመናመን (loss of biodiversity) መ/ ሁሉም

_____13. በአሁኑ ጊዜ አለም አቀፋዊ ይዘት ያለው ችግር የትኛው ነው?

ሀ/ የአየር ብክለት ለ/ የንፁህ የመጠጥ ውሃ እጥረት ሐ/ የአየር ንብረት ለውጥ መ/ ሁሉም

_____14. በኢትዮጵያ በእንክብካቤ እጥረት ምክንያት በመጥፋት ላይ ያለ ዝርያ የቱ ነው?

ሀ/ ዋሊያ አይቤክስ (Walia Ibex) ለ/ ጅብ (Hyena)

ሐ/ ኒያላ (Nyala) መ/ ጭላዳ ባቡን (Chilada Baboon)

_____15. በኢትዮጵያ እንዲሁም በአካባቢህ/ሽ ለከባድ የአፈር መሸርሸር ምክንያት ያልሆነው የቱ ነው? ሀ/ አግባብነት የጐደለው የመሬት አጠቃቀም/አያያዝ (poor land management)

ለ/ ዲፎርስቴሽን (deforestation) ሐ/ አፎርስቴሽን (afforestation) መ/ ሁሉም

_____16. በኢትዮጵያ በጣም አሳሳቢ የሆነው አካበቢያዊ ችግር (environmental problem)

ሀ/ የውሃ ብክለት (water pollution) ለ/ የአየር ብክለት (air pollution)

ሐ/ የሕዝብ ቁጥር መጨመር (population growth) መ/ የአፈር መሸርሸር (soil erosion)

_____17. በኢንዱስትሪ በበለፀጉት አገሮች ዋነኛ የአካባቢ ችግር (environmental problem) የሆነው የትኛው ነው?

ሀ/ ዲፎርስቴሽን (deforestation) ለ/ ድርቅ ሐ/ በረሃማነት መ/ የአየር ብክለት (air pollution)

_____18. በኢትዮጵያ በመሬት መራቆት (land degradation) የተጠቃው የትኛው ክፍል ነው?

ሀ/ የደቡብ ለ/ የምሥራቁ ሐ/ የምዕራብ መ/የሰሜኑ

_____19. በኢትዮጵያ ለሕዝብ ቁጥር መጨመር ዋነኛ ምክንያት የሆነው የቱ ነው?

ሀ/ የሴቶች ወላድነት (women fertility) ለ/ መሀይምነት (illiteracy)

ሐ/ የኑሮ ሁኔታ መሻሻል (improvement of living standard)

መ/ በሽታን በብቃት መከላከል መቻል (effective disease prevention)

_____20. የአካባቢን ጉዳት (environmental damage) ለመከላከል ዋነኛ መፍትሔ የሆነው የትኛው ነው? ሀ/ ሕግ (legislation) ለ/ የማበረታቻ ክፍያ (incentives)

ሐ/ ትምህርት (education) መ/ መልሶ መጠቀም (recycling)

4..3. የሚከተሉት ጥያቄዎች የተዘጋጁት የተማሪዎችን የችግር ፈቺ ክህሎት (Problem solving skills) **ለመገምገመ ነው:: በተለይም በአካባቢያቸው፣ በኢትዮጵያ እንዲሁም በዓለመ ደረጃ በአሁኑ ስዓት ያሉትን አሳሳቢ የአካባቢ ችግሮች እና መንስኤዎቻቸውን፣ መፍትሄዎቻቸውንና መፍትሄዎቹን ለመተግበር መሳተፍ ያለባቸውን ተማሪዎች መለየት መቻለቸወን ለመፈተህ ነው::**

መመሪያ ሦስት :- ለሚከተሉት ጥያቄዎች በባዶ ቦታው ላይ መልስ ስጥ/ጪ::

1. በአካባቢህ እንዲሁም በሰሜን ሸዋ ዞን በጣም አሳሳቢ የሆኑት የአካባቢ ችግሮች (serious environmental problems) ምን ምን ናቸው?

_____

ሀ/ የነዚህ ችግሮች መንስኤምን ምን ናቸው?

ለ/ መፍትሔዎቹስ ምን ምን ናቸው? ችግሮችን ለመፍታት መሳተፍ ያለበት ማን ነው?

2. በኢትዮጵያ በጣም አሳሳቢ የሆኑት የአካባቢ ችግሮች (environmental problems) ምን ምን ናቸው?

ሀ/ የነዚህ ችግሮች መንስኤ ምን ምን ናቸው?

ለ/ መፍትሔዎቹስ? ችግሮችን ለመፍታት ማን ይሳተፍ?

3. በአለም አቀፍ ደረጃ በጣም አሳሳቢ የሆኑት የአካባቢ ችግሮች (global environmental problems) ምን ምን ናቸው?

ሀ/ መንስኤዎቻቸው ምን ምን ናቸው?

ለ/ መፍትሔዎቹስ ምን ምን ናቸው? ችግሮችን ለመፍታት ማን ይሳተፍ?

3.4 ቀጥሎ የቀረቡት ጥያቄዎች ተማሪዎች አካባቢያቸውን በመጠቀም (utilizing) እና በመጠበቅ (protecting) ረገድ ያላቸው ዝንባሌ ምን እንደሚመስል ለመረዳት የተዘጋጁ ናቸው::

መመሪያ አራት:- ቀጥሎ በቀረቡት ዐረፍተ ነገሮች ፊት ለፊት 5፣ 4፣ 3፣ 2፣ 1 የሚሉ አማራጮች ተሰጥተዋል:: 5 = በጣም እስማማለሁ፣ 4 = እስማማለሁ፣ 3 = አልወሰንኩም፣ 2 = አልስማማም እና 1 = በጣም አልስማማም ሲሆኑ፤ የአንተን/የአንቺን ዝንባሌ በሚያመለክተው አማራጭ ሥር

የ (✓) ምልክት በማድረግ መልስ ስጥ/ስጪ::

ተ.ቁ	አርዕስት	5	4	3	2	1
	ሀ/ አካባቢን መጠቀም በተመለከተ					
1	በእኔ አመለካከት ስለማይታደሱ ሀብቶች (non-renewable resources) መጨነቅ የለብንም::					
2	እንደኔ እንደኔ የተፈጥሮ ሀብታችንን መጠቀም ያለብን መጭውን ትውልድ ከግምት ውስጥ በማስገባት ነው::					
3	በእኔ እምነት በኢትዮጵያ ድህነትና በሽታ በተደጋጋሚ እየተከሰቱ ያሉት እግዚአብሔር ስለረገመን ነው::					
4	በእኔ አመለካከት የተፈጥሮ ሀብታችንን ለመጠበቅ መጠቀም ያለብን የግንዶ እንጨት እንጂ ባዮ ጋዝ (biogas) እና የፀሐይ ብርሃን (solar)ን አይደለም::					
6	የአመጋገብ ባሕላችንን ከእንጀራ ወደ ሌሎች የምግብ ዓይነቶች መቀየር ያስፈልገናል::					
7	በእኔ አስተሳሰብ ድህነትና ድርቅ በኢትዮጵያ ለብዙ ጊዜ እየተከሰቱ ያሉት አግባብነት በሌለው የተፈጥሮ ሀብት አያያዝ ምክንያት ነው::					
8	ተፈጥሮ ራሱ ሥነ ምህዳራዊ (ecological) ሚዛኑን ስለሚጠብቅ መንከባከብ አያስፈልገንም::					
9	በእኔ አመለካከት ሠዎች ከመጠን በላይ አካበቢያቸውን እየበዘበዙት ነው::					
10	በእኔ አመለካከት ለዕድገታችን ቁልፍ የሆነው ጉዳይ በአካባቢያችን የሚገኙ ሕይወት የሌላቸውን ሳይሆን ሕይወት ያላቸው ነገሮች መንከባከብ ነው::					
	ለ/ አካባቢን መጠበቅ በተመለከተ					
11	በእኔ አመለካከት ማንኛውም ሠው አካባቢውን የመከላከል (protect his/her environment) ኃላፊነት አለበት::					
12	በእኔ እምነት በሰሜን ሸዋ እንዲሁም በኢትዮጵያ ላሉ የአካባቢያዊ ችግሮች መንስኤው የእውቀት ማነስ (environmental literacy) ነው::					
13	በእኔ እምነት ኢንዱስትሪዎች በአካባቢ ላይ ጉዳይ የሚያደርሱ ከሆነ መንግሥት ለኢንዱስትሪ ባለሀብቶች ፍቃድ መስጠት የለበትም::					
14	በእኔ አስተሳሰብ ገበሬዎች ተጨማሪ የእርሻ መሬት ሲፈልጉ ጫካዎችን ማቃጠል ይችላሉ::					
15	በእኔ አስተሳሰብ ለአካባቢ ችግሮችም (environmental problems) ሆነ					

	መፍትሔዎቹ ተጠያቂው መንግሥት ነው።					
16	በእኔ አስተሳሰብ ኢትዮጵያን በመሠሉ ታዳጊ አገሮች እኛ ተማሪዎች አካባቢያችንን ለመከላከል ከፍተኛ ሚና መጫወት አለብን።					
17	በእኔ አስተሳሰብ የመኖሪያ አካባቢን (environment) ከውደመት የመከላከል (protecting) ኃላፊነት የልማት ጣቢያ እና የጤና ኤክስቴንሽን ሠራተኞች ነው።					
18	በእኔ አመለካከት ለሥራ አጦች የሥራ ዕድል ለመክፈት ሲባል ኢንዱስትሪዎች በአካባቢያችን ላይ ጉዳት ቢያደርሱም መንግሥት ለኢንዱስትሪ ባለሀብቶች የሥራ ፈቃድ መሥጠት አለበት።					
19	በእኔ እምነት ማንኛውም ሠው እዕዋትንም ሆነ እንስሳትን እንደፈለገ የመጠቀም መብት የለውም።					
20	በእኔ አስተሳሰብ በዚህ የበስለት ደረጃችን እኛ ተማሪዎች አካባቢያችንን ከ ውደመት ለመከላከል ቁልፍ ሚና የምንጫወት አይመስለኝም።					

ክልብ አመሠግናለሁ!!

Appendix-H

Summary of Students` Achievement and Attitude Scores in Relation to their Grade Level, Schools, Sex, and place of Residence

- **Key**

Grade level: 1-nine 2-ten

Schools: 1-Molale 2-Mehal Meda 3-Debre Sina 4-Debre Brihan

Sex: 1-Male 2-Female

Place Residence: 1-Urban 2-Rural

Grade Level	School	Sex	Residence	Test Scores (100%)	Attitude Scores (95%)
1	1	1	1	50	52
1	1	1	1	65	77
1	1	1	1	40	72
1	1	2	1	55	62
1	1	1	2	60	67
1	1	2	1	60	83
1	1	2	1	55	68
1	1	2	1	65	77
1	1	1	2	50	61
1	1	1	2	35	80
1	1	2	2	50	72
1	1	1	2	55	79
1	1	1	1	70	82
1	1	1	1	80	77
1	1	1	1	70	73
1	1	1	1	50	73
1	1	1	1	60	66
1	1	1	2	65	75
1	1	1	2	75	78
1	1	1	2	65	79
1	1	1	2	65	77
1	1	1	2	80	82
1	1	1	2	40	69
1	1	1	2	75	75
1	1	2	1	75	83
1	1	2	1	45	76
1	1	2	1	50	70
1	1	1	1	45	71
1	1	1	1	45	68
1	1	1	1	45	80
1	1	2	2	35	75
1	1	2	2	60	75
1	1	2	2	50	69
1	1	2	2	40	64
1	1	1	2	55	73

1	2	1	1	45	70
1	2	1	1	30	71
1	2	1	1	50	74
1	2	1	1	75	60
1	2	2	2	55	77
1	2	2	2	30	51
1	2	2	2	55	31
1	2	1	2	55	40
1	2	1	2	55	31
1	2	1	2	60	78
1	2	2	2	55	62
1	2	1	2	50	59
1	2	2	2	40	78
1	2	2	2	50	63
1	2	2	1	30	20
1	2	1	1	45	66
1	2	2	1	40	72
1	2	1	1	40	81
1	2	2	1	60	61
1	2	2	1	55	66
1	2	1	1	30	60
1	2	2	1	40	69
1	2	2	1	70	63
1	2	2	1	50	75
1	2	2	1	55	56
1	2	2	1	40	63
1	2	2	1	55	67
1	2	1	2	70	77
1	2	1	2	45	74
1	2	1	2	25	64
1	2	1	2	65	68
1	2	1	2	35	71
1	2	1	2	45	72
1	2	1	2	35	68
1	2	1	2	45	83
1	2	1	2	60	61
1	2	1	2	45	66
1	2	1	1	70	77
1	2	1	1	55	77
1	2	1	1	50	61
1	2	2	2	60	56
1	2	1	1	30	48
1	2	1	1	50	72
1	2	1	2	55	63
1	2	1	1	70	63
1	2	1	1	75	67
1	2	1	1	70	69
1	2	1	1	55	71
1	2	1	1	40	66
1	2	2	1	60	62

1	2	2	1	65	70
1	2	2	1	55	56
1	2	1	2	50	73
1	2	2	1	25	49
1	2	2	1	40	66
1	2	2	1	45	60
1	2	2	1	45	45
1	2	1	2	50	37
1	2	1	2	65	72
1	2	2	2	35	72
2	2	2	1	40	69
2	2	2	1	70	70
2	2	1	2	60	77
2	2	1	2	35	66
2	2	1	2	55	75
2	2	1	2	65	61
2	2	1	2	60	76
2	2	1	2	60	72
2	2	1	2	70	52
2	2	1	2	70	81
2	2	1	1	65	67
2	2	1	1	45	68
2	2	1	1	75	75
2	2	1	1	40	85
1	3	2	2	45	69
1	3	2	2	35	66
1	3	1	1	25	65
1	3	1	2	55	67
1	3	1	2	35	62
1	3	1	2	50	74
1	3	1	2	55	84
1	3	1	2	40	67
1	3	1	1	50	57
1	3	1	2	45	56
1	3	1	2	40	69
1	3	1	2	45	70
1	3	1	2	50	85
1	3	1	1	30	58
1	3	1	1	20	62
1	3	1	1	60	74
1	3	1	1	50	75
1	3	1	1	45	62
1	3	1	1	55	84
1	3	1	1	40	79
1	3	1	1	50	80
1	3	1	1	65	66
1	3	1	1	25	76
1	3	1	1	55	78
1	3	1	1	50	60
1	3	2	2	65	79

1	3	2	2	40	65
1	3	2	2	30	70
1	3	2	2	35	58
1	3	2	2	35	77
1	3	2	2	55	79
1	3	2	2	55	60
1	3	2	1	45	64
1	3	2	2	35	67
1	3	2	2	55	57
1	3	2	1	65	79
1	3	2	1	60	60
1	3	2	1	55	72
1	3	2	1	30	72
1	3	2	1	60	80
1	3	2	1	40	65
1	3	2	1	60	68
1	3	2	1	35	49
1	3	2	1	45	73
1	3	1	1	50	74
1	3	1	1	75	65
2	3	1	1	55	73
2	3	1	1	40	77
2	3	1	1	45	58
2	3	1	1	45	64
2	3	1	1	75	71
2	3	1	1	80	68
2	3	1	1	50	69
2	3	1	1	65	75
2	3	1	2	55	74
2	3	1	2	70	73
2	3	1	2	75	82
2	3	1	2	50	63
2	3	1	2	45	66
2	3	2	1	60	76
2	3	2	1	60	66
2	3	2	1	50	77
2	3	2	2	35	54
2	3	2	2	50	67
2	3	2	2	60	77
1	4	2	2	55	71
1	4	1	1	40	72
1	4	2	2	55	68
1	4	1	2	55	71
1	4	2	2	55	62
1	4	2	2	45	61
1	4	1	1	40	77
1	4	2	2	35	67
1	4	1	2	45	81
1	4	2	2	45	70
1	4	1	2	25	68

1	4	2	1	30	67
1	4	1	2	45	55
1	4	1	1	40	68
1	4	1	1	40	72
1	4	2	1	60	72
1	4	1	2	55	83
1	4	1	1	65	71
1	4	2	1	35	62
1	4	2	1	40	61
1	4	1	2	50	73
1	4	1	2	55	80
1	4	1	2	60	75
1	4	1	2	45	82
1	4	2	2	45	73
1	4	2	2	35	61
1	4	2	2	55	75
1	4	2	2	35	66
1	4	2	2	35	69
1	4	2	2	70	70
1	4	2	2	30	68
1	4	1	2	30	71
1	4	1	2	10	69
1	4	1	2	55	65
1	4	2	1	65	67
1	4	2	1	40	70
1	4	2	1	55	66
1	4	2	1	65	74
1	4	2	1	55	67
1	4	2	1	40	71
1	4	2	1	20	73
1	4	1	1	60	79
1	4	1	1	35	72
1	4	1	1	30	60
1	4	1	1	45	75
1	4	1	1	35	46
1	4	1	2	50	65
1	4	2	1	40	60
1	4	2	1	55	77
1	4	2	1	50	67
1	4	2	1	55	68
1	4	2	1	60	69
1	4	1	1	60	81
1	4	1	1	60	77
1	4	1	1	80	77
1	4	1	1	65	81
1	4	1	1	35	0
1	4	1	1	35	50
1	4	1	1	40	66
1	4	2	1	70	70
1	4	2	1	65	70

1	4	2	1	55	56
1	4	2	2	50	73
1	4	2	1	25	49
1	4	2	1	40	66
1	4	2	1	45	60
1	4	2	2	45	45
1	4	1	2	70	77
1	4	1	2	70	52
1	4	1	2	50	63
2	4	1	2	55	74
2	4	2	2	55	73
2	4	1	1	55	76
2	4	1	1	75	83
2	4	1	2	50	68
2	4	2	2	35	74
2	4	2	2	45	78
2	4	1	2	45	46
2	4	1	2	60	70
2	4	1	1	55	63
2	4	1	1	50	69
2	4	1	2	60	62
2	4	1	2	50	65
2	4	2	2	15	61
2	4	2	1	55	72
2	4	2	2	60	64
2	4	1	2	75	74
2	4	2	1	60	62
2	4	2	2	60	78
2	4	1	1	70	68
2	4	1	2	60	66
2	4	1	1	45	71
2	4	1	1	45	74
2	4	1	1	55	61
2	4	2	2	50	75
2	4	1	1	40	60
2	4	1	2	70	69
2	4	2	1	55	61
2	4	1	2	60	50
2	4	1	2	55	72
2	4	1	1	55	72
2	4	1	1	65	54
2	4	1	1	50	59
2	4	1	1	65	86
2	4	1	2	30	61
2	4	1	2	55	60
2	4	1	2	55	62
2	4	1	2	50	66
2	4	1	1	55	66
2	4	1	1	35	55
2	4	2	1	60	70

2	4	2	1	40	59
2	4	1	1	45	71
2	4	1	1	50	73
2	4	1	1	25	59
2	4	2	1	40	76
2	4	2	2	35	81
2	4	2	2	45	59
2	4	2	2	40	62
2	4	2	2	50	64
2	4	1	2	40	62
2	4	1	2	35	74
2	4	1	2	55	48
2	4	1	2	65	74
2	4	2	2	70	83
2	4	2	1	60	69
2	4	2	1	10	58
2	4	2	1	35	51
2	4	2	1	45	78
2	4	2	2	60	74
2	4	1	2	25	66
2	4	1	2	60	79
2	4	1	2	55	77
2	4	1	2	45	59
2	4	1	2	40	83
2	4	1	2	60	73
2	4	1	2	65	65
2	4	2	1	45	66
2	4	1	1	45	63
2	4	2	1	60	71
2	4	2	1	50	51
2	4	1	1	40	79
2	4	1	1	55	64
2	4	2	1	70	76
2	4	2	1	50	76
2	4	1	2	65	69
2	4	1	2	50	78
2	4	1	2	55	58
2	4	2	2	35	72

Appendix-I

Sample Size Formula♦

i. The formula for calculating the sample size (n) for a simple random sample without replacement is : n=(z/m)2 p(1-P)

Where -z is the value of confidence level, e.g.1.96 for 95%,

-m is confidence interval, e.g., .05=±.05,

-p is the estimated value for the proportion of a sample that will respond to a survey question (e.g., .05=50%).

ii. In addition, Finite Population Correction (FPC) factor is routinely used in calculating sample sizes for simple random samples. Hence, the sample size equation solving for n`(new sample) when taking the FPC into account after calculating 'n' is: n`=n/1+n/N

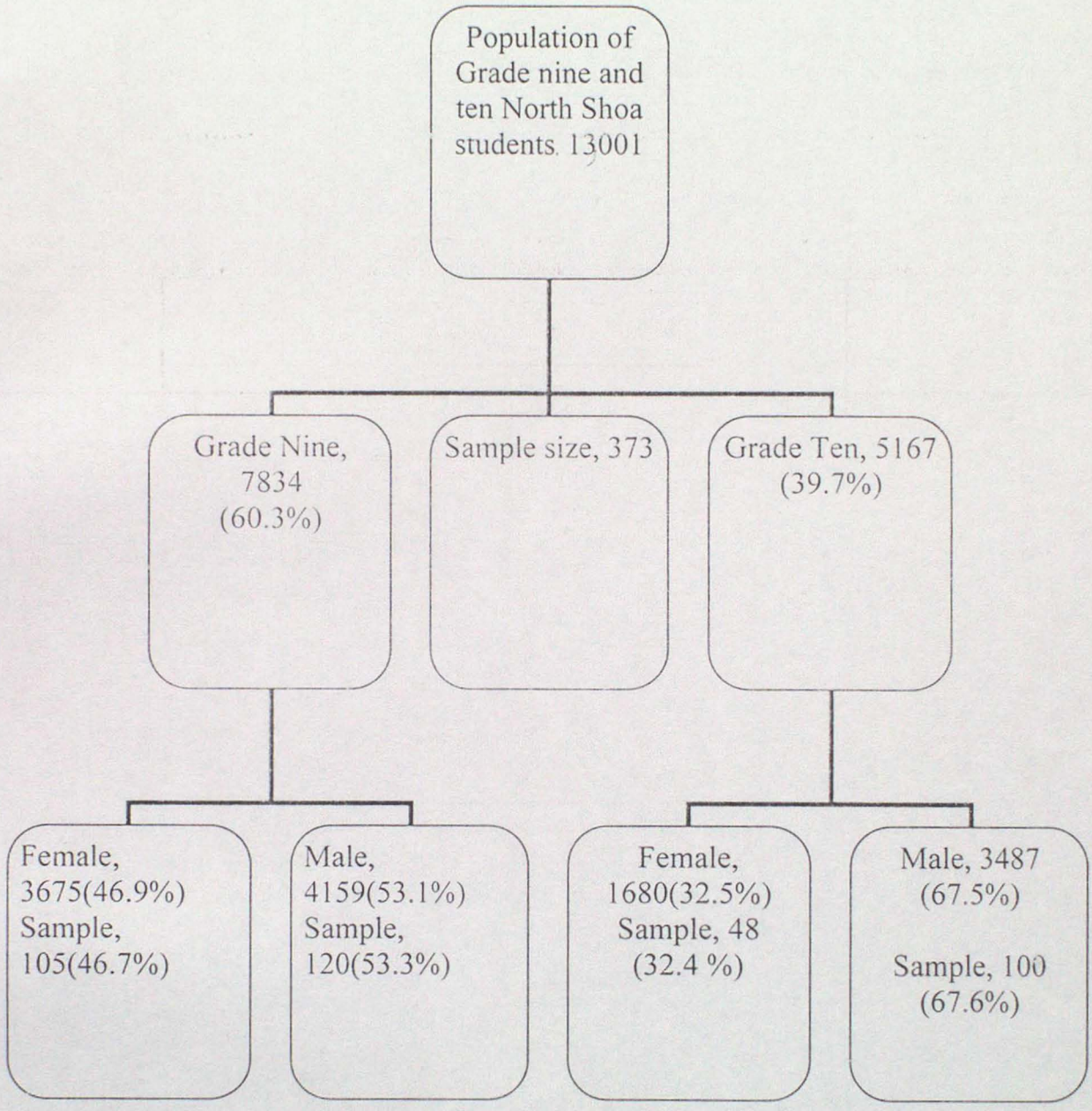
Where- n is the sample size based on calculation using the first formula

-N is Population size

♦ Available at: http://www.raosoft.com/samplesize.html

Appendix-J

Selecting Stratified Sample



NB: sub- grouping continue utile representative sample was chosen from each school

Appendix-K

Reliability of students' attitudes scores from the pilot study on Likert-type scale

I1	I2	I3	I4	I5	I6	I7	I8	I9	I 10	I 11	I12	I13	I14	I15	I16	I17	I18	I19	T
4	5	5	5	2	4	5	5	4	3	4	4	5	4	3	4	4	4	4	78
5	4	4	4	5	5	4	2	3	5	5	2	4	4	5	4	4	2	4	75
5	4	5	5	3	4	4	4	5	4	5	4	2	5	5	4	4	5	5	82
5	5	5	5	5	5	5	1	3	5	5	1	5	3	5	3	5	2	5	78
4	5	5	5	4	5	5	5	2	5	4	5	5	4	5	4	4	5	5	86
5	4	5	5	4	1	5	1	5	4	1	4	5	5	4	5	3	2	1	69
1	5	4	4	5	4	4	5	3	5	4	2	4	4	5	2	2	4	4	71
5	4	5	5	3	5	5	4	4	5	2	3	3	5	5	5	5	2	5	80
4	5	2	5	4	4	1	1	3	5	3	5	2	5	5	5	2	5	5	71
1	2	4	4	4	5	4	2	4	5	4	3	3	4	2	4	2	5	4	66
1	5	3	3	5	5	3	4	3	1	4	2	4	4	5	3	4	4	4	67
4	5	5	4	3	5	5	4	5	5	4	5	5	5	5	4	5	5	4	87
5	5	5	5	2	1	5	3	5	3	3	4	5	4	3	4	4	4	5	75
2	2	2	4	2	4	4	4	4	4	4	2	4	4	4	4	2	1	5	62
3	4	4	5	4	4	2	4	2	4	1	5	5	2	4	2	2	2	5	64
5	5	1	3	4	5	1	4	4	5	5	2	5	4	5	5	2	4	5	74
5	5	5	2	1	2	5	3	5	5	4	4	5	5	5	1	2	3	2	69
5	5	4	4	4	5	4	3	2	4	2	4	3	4	4	4	3	4	4	72
2	2	4	3	2	2	4	3	4	4	2	5	4	4	4	4	4	4	4	65
5	5	5	1	2	3	5	3	5	2	1	5	5	4	3	5	3	5	2	69
4	1	4	4	4	2	1	5	5	4	5	2	5	2	4	5	5	2	3	67
5	5	5	4	4	4	4	2	2	5	4	4	5	4	4	4	2	5	3	75
1	3	1	5	4	2	5	2	5	4	4	2	5	5	5	3	1	2	4	63
4	2	4	4	5	4	5	5	4	4	5	5	5	5	5	4	1	2	5	78
4	5	2	4	4	4	1	2	2	5	4	2	5	2	4	2	5	4	1	62
5	5	5	2	2	5	1	4	1	5	5	2	1	4	5	3	5	5	5	70
5	4	5	4	2	4	5	5	2	3	5	4	2	4	4	2	2	2	4	68
4	4	5	4	5	5	5	4	4	5	5	5	4	4	5	3	4	5	5	85
5	4	5	5	5	2	2	4	5	4	4	3	5	5	2	2	4	4	5	75
4	5	5	5	4	5	5	3	3	5	4	4	5	4	5	5	4	5	5	85
5	4	4	2	5	4	5	2	1	1	5	5	3	4	4	4	2	4	4	68
4	5	5	5	4	4	5	5	3	4	5	5	5	5	5	4	3	3	4	83
5	5	5	3	5	5	5	5	5	3	5	4	5	5	5	5	5	5	5	90
4	4	4	4	4	4	4	4	4	4	1	5	4	4	2	5	4	1	2	68
5	4	5	4	4	1	3	5	1	3	2	5	1	1	1	3	1	5	5	59
4	5	5	5	4	5	4	4	5	5	5	5	5	4	5	2	4	4	4	84
4	2	4	4	5	4	1	3	4	4	4	2	3	2	2	4	4	2	4	62
5	5	4	5	4	5	4	5	5	5	4	5	5	5	5	4	4	5	5	89
4	5	5	5	5	4	4	5	5	5	5	5	3	4	5	5	5	5	5	89
Σ=157	163	164	159	147	151	149	139	141	161	148	145	159	156	163	145	131	142	160	2880
$\bar{X}$=4.0	4.2	4.2	4.1	3.8	3.9	3.8	3.6	3.6	4.1	3.8	3.7	4.1	4.0	4.2	3.7	3.4	3.6	4.1	73.8
S^2=1.7	1.3	1.3	1.1	1.3	1.6	2.1	1.6	1.7	1.2	1.7	1.7	1.5	1.0	1.3	1.2	1.7	1.8	1.3	77.2

$$\alpha = \frac{K}{K-1}\left(1-\frac{\sum \delta_i^2}{\sum \delta_t^2}\right) = \frac{19}{19-1}\left(1-\frac{28.1}{77.2}\right) = \underline{\mathbf{0.68}}$$

Appendix-L

Sample curriculum guides

1. Biology

UNIT1: CELLS

NO. OF PERIODS: 12

UNIT OBJECTIVE:

tudents will gain a general understanding of the structure and function of cells, biological molecules, and exchange of materials with the environment.

UNIT OVERVIEW:

Students will examine some cells of plants and animals using the microscope under the close guidance of the teacher and be able to explain that plants and animals are composed of cells. They will also learn the diversity in size, organization, shape and function of cells. The internal structure of cells will be covered by identification of important organelles of generalized plants and animal cells and matching them with their functions.

Important biological molecules of cells such as proteins, fats, carbohydrates and nucleic acids are covered including their functions. The various mechanisms of material transport across cell membrane are also elaborated, and finally the level of organization is reviewed.

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGY	TEACHING AIDS	EVALUATION
At the end of the sub topics students should be able to: - identify cells - use the microscope to study cells -explain how microscopes magnify objects. - explain the purpose of staining specimens - practice setting up a microscope for use - practice focusing objects with different objectives of a microscope. - tell the shape and structure of plant cells. - tell the shape and structure of animal cells. - state that cells are structural and functional units of life. - state cell theory	**1. Cells** **1.1 Looking at cells** 1.1.1 Microscopes and its magnification 1.1.2 Staining specimens 1.1.3 setting up the microscope for use - Focusing Practice 1.1.4 <u>Activity 1-</u> looking at plant cells <u>Activity 2-</u> looking at animals cells **1.2 Cell types, sizes and shapes.** **1.3 Cell structure and function** 1.3.1 Cell theory	- Demonstrate the techniques in mounting and observing cells under the microscope by taking both plant and animal cells. - Explain the magnification of microscope objectives. - Prepare animal and plant cell specimens on slide, mounting and observing under a microscope. - Discuss using diagrams of different cells including prokaryotes and eukaryotes. - Define cell theory based on the historical progress of	- Compound microscope - Glass slides cover slips - Fresh or permanent slides of plant and animal cells - microscope - glass slide - cover slips - diagram of variety of cells such as mussels, nerve, blood, bone, etc cells. - Drawing of prokaryotic	- Ask students to observe some of the slides themselves. - Ask students to describe the magnification microscopic objectives - Ask students to explain the purpose of staining objects before observing them under a microscope. - Ask observable differences between plant and animal cells. - Ask the differences in shapes of plant and animal cells. - Ask what the building blocks of multi-cellular organisms are.

- state that prokaryotic cell are at a lower level or organization that eukaryotes.	1.3.2 Prokaryotic and eukaryotic cells.	cell study. - Discuss using diagrams of different cells to illustrate prokaryotes and eukaryotes cells.	and eukaryotic cells.	- Ask the difference between prokaryotic and eukaryotic cells

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGY	TEACHING AIDS	EVALUATION
	1.3.3 Parts of a cell (Generalized plaint and animal cell)	- discussing the different organelles of cells, location, structure, and function.	- Enlarged diagram of typical plant cell and animal cell.	- Let students draw the structure of a generalized cell and label the parts.
- compare plant and animal cells.	1.3.4 Comparison of plant and animal cells.			- Ask students to compare and contrast plant and animal cells.
- name the important biological molecules and match them with their functions.	**1.4 Biological molecules** 1.4.1 Inorganic compounds 1.4.2 Organic compounds - carbohydrate - lipids - proteins	- Discuss and explain the functions and types of important biological molecules		- List some biological molecules in a cell. - Ask the function of each biological molecule in cells.
- tell that the movement of materials into and out of cells is governed by the	**1.5 The cell and its environment** -permeability of the cell	- Discuss cell and its environment.	- diagram showing cell and its environment	- Ask the components of cellular environment. - Ask students to explain the property of cell membrane

nature and concentration of materials both inside and outside the cell. - tell that the cell membrane is a selectively permeable structure allowing the passage of smaller molecules across it. - show that some materials move from an area of high concentration to an area of low concentration by the process of diffusion. - explain that water is selectively transported across cell membrane by the process of osmosis.	membrane 1.5.1 Diffusion and osmosis - diffusion - osmosis - Isotonic, hypnotic and hypertonic solutions. <u>Activity 3.</u> Demonstration of osmosis	- Demonstrate the process of diffusion using a colored substance in water - Demonstrate the process of osmosis using drawing and if possible with thistle funnel osmometer experiment.	- Colored solid or liquid - water in a glass container. - A series of drawings to show that water crosses a barrier which a larger molecule can not.	as a selectively permeable structure . - Ask the direction of movement of the color material. - Ask why the material moves in that direction, i.e., from high to low concentration.

SPECIFIC OBJECTIVES	CONTENTS	METHODOLOGY	TEACHING AIDS	EVALUATION
- show that plant cells become flaccid when they lose water to the environment. - show that plant cells absorb water and become more turgid. - explain that both plasmolysis and turgor pressure are caused by differences in the concentration of the cell environment. - state that the transport of some materials of the cells across cell membranes is passive and does not need the expenditure of energy by the cell while in others that cell expends energy and moves them by active transport. - tell that cells are organized based on functions. - list the levels of organized from simple to complex.	- Plasmolysis and turgor pressure Activity 4. Observing cells immersed in different concentrations. Activity 5. Turgor pressure experiment - Passive and active transport **1.6 Levels of organization** (tissues, organs and organ system). **1.7 Analysis of values** learnt in this unit - responsibility	- Use series of diagrams to explain plasmolysis and turgor pressure and demonstrate by using potato cylinders at different levels of salt (or glucose) concentration. - Discuss and explains the two types of transport, i.e., passive and active, - Revise the previously learnt knowledge of tissues, organs and organ-systems. - Allow students to reflect on what values they developed along each lesson. For example,	- series of diagrams of plant cell showing flaccid and turgid cells - series of potatoes cylinders and different concentrations of solutions. - diagrams showing passive and active transport. - Drawing showing the levels of organization.	- Ask them to show that cells become flaccid and turgid. - Ask students to tell what they observe from the experiments. - Ask them to explain how plasmolysis and turgor pressure are caused. - Ask the difference between passive and active transport. - Ask students to give examples for each level of organization. - Ask them to reflect

- reflect on the values they developed while learning this unit.	- industriousness - self confidence - pursuit of wisdom - etc.	responsibility is developed while using laboratory equipments (microscope); self confidence is developed while conducting experiments; pursuit of wisdom is developed throughout the teaching learning process and so on.		(through whole class discussion) on the values they developed during each lesson.

2. Geography

UNIT III: Physical Geography: Weather and climate No. of periods 5

General Objectives: after completing this unit, students will be able to:-

- Recognize major elements of weather and climate and factors influencing them
- Develop an understanding of the formation, types and distribution of major climatic zones in Ethiopia.
- Realize major world climates and their classification;

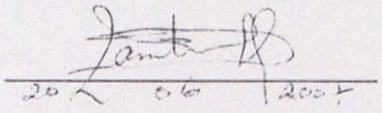
Specific Objectives	Contents	Pds	Methodology	Teaching Aids	Evaluation and Follow-up
Students will be able to:- - Describe the origin, composition and structure of the Atmosphere. -Explain factors influencing the climate of Ethiopia. -With the help of a map, describe the distribution of major elements of climate in Ethiopia -Locate major climate zones of Ethiopia on a map -Analyze climate data of the different regions of Ethiopia -Discuss factors worsening the effects of drought in	3.1.Earths Atmosphere 3.1.1.origin,composition and structure 3.2.Climate of Ethiopia 3.2.1.Elements and Controls 3.2.2.Distribution of major elements of climate 3.2.3.Climate zones of Ethiopia 3.2.4. Drought in Ethiopia 3.3.World Climates 3.3.1.Major classification	1 1 1	-Pose a question to check whether students know the atmosphere and then ask them to give you its definition. -Provide simple explanation about the origin, composition and structure of the atmosphere. -Let students discuss the elements and factors influencing the climate of Ethiopia. -Encourage students to discuss the distribution of major elements of climate in Ethiopia. -Give more information on the elements and controls of climate in Ethiopia. -On the physical map of Ethiopia, demonstrate the climatic or temperature	- Diagram - Charts - Graphs -Climate map of Ethiopia	-Ask students to do the exercise set on the origin, composition and structure of the atmosphere. -Pose oral questions on factors influencing the climate of Ethiopia. -Ask students to describe the distribution of major elements of climate in Ethiopia. -Ask students to explain the effects of drought in Ethiopia and the possible ways of overcoming its impact. - Ask students to list the

Ethiopia -Explain possible ways of overcoming the impact of drought -Identify major classification systems of world climate -Locate major climate regions of the world on a map -Discuss causes of world climate change -Discuss measures taken to overcome the impact of climate change	systems -Ancient Greeks' classification -Koppen's five major climatic types 3.3.2Major world climates -Tropical -Temperate -Polar 3.3.3Causes of world climate change -natural -human made -effects of world climate change .Measures taken to overcome the impact of climate	1 1	zones of Ethiopia. -Open up discussion on the prevailing conditions of drought in the country and ways of overcoming the impact of drought. -Explain major world climate classification systems relying on important points only and show the major world climates on a map. -Let students discuss causes of world climate change and its impact on various ecological environments. -Urge students to pinpoint measures taken to overcome the impact of climate change.	-Climate map of the world	major classification systems of world climates. -Ask each student to locate major climates of the world on a wall map. -Ask students to explain causes of world climatic change. -Ask students to analyze climatic data provided. Pose a question so that students discuss ways by which the impacts of climate changes are done away with through environmental protection. -Ask students do the review questions, at the end of the unit, at home.

	change .wind break .check dams .reforestation .afforestation				

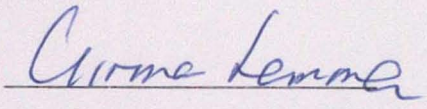
Declaration

I, the undersigned declare that the thesis, my original work, has not been presented for a degree in any other university and that all sources of material used for the thesis have been duly acknowledged.



Damtew Wolde

This thesis has been submitted for the examination with my approval as a university advisor.



Ato Girma Lemma

July 2007